U. S. AIR FORCE

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

2022–2026

DYESS AIR FORCE BASE

ABILENE, TEXAS

(See INRMP signature pages for plan approval date)

ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the United States Air Force's (USAF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which includes Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Where applicable, external resources, including Air Force Instructions (AFIs); Department of Defense Instructions (DoDIs); USAF Playbooks; federal, state, and local requirements; Biological Opinions; and permits are referenced.

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

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

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

DOCUMENT CONTROL

Standardized INRMP Template

In accordance with (IAW) the Air Force Civil Engineer Center (AFCEC) Environmental Directorate (CZ) Business Rule (BR) 08, *EMP Review, Update, and Maintenance*, the standard content in this INRMP template is reviewed periodically, updated as appropriate, and approved by the Natural Resources Subject Matter Expert (SME).

This version of the template is current as of 06/26/2020 and supersedes the 2018 version.

NOTE: Installations are not required to update their INRMPs every time this template is updated. When it is time for installations to update their INRMPs, they should refer to the eDASH EMP Repository to ensure they have the most current version.

Installation INRMP

Record of Review—The INRMP is updated no less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. IAW the Sikes Act and Air Force Manual (AFMAN) 32-7003, *Environmental Conservation*, the INRMP is required to be reviewed for operation and effect no less than every five years. An INRMP is considered compliant with the Sikes Act if it has been approved in writing by the appropriate representative from each cooperating agency within the past five years. Approval of a new or revised INRMP is documented by signature on a signature page signed by the Installation Commander (or designee), and a designated representative of the United States Fish and Wildlife Service (USFWS), the state wildlife and fish agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries when applicable (AFMAN 32-7003).

Annual reviews and updates are accomplished by the installation NRM, and/or a Section Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the Section Natural Resources Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of USFWS, state fish and wildlife agency, and NOAA Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signing the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

INRMP APPROVAL/SIGNATURE PAGES

Dyess Air Force Base

7 CES/CEIE

710 Third Street

Dyess Air Force Base, Texas

This 2022 INRMP update has been prepared in accordance with regulations, standards, and procedures of the Department of Defense and the United States Air Force in cooperation with the United States Fish and Wildlife Service and the Texas Parks and Wildlife Department. The following signatures indicate the mutual agreement of the parties concerning the conservation, protection, and management of the fish and wildlife resources presented in this Integrated Natural Resources Management Plan.

KRAMER.JOSEPH.K.1094369769 Digitally signed by KRAMER.JOSEPH.K.1094369769 Date: 2022.04.15 11:02:32 -05'00'

Joseph K. Kramer, Colonel, USAF — Date
Commander, 7th Bomb Wing
Dyess Air Force Base

Dyess Air Force Base

7 CES/CEIE

710 Third Street

Dyess Air Force Base, Texas

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AMY LUEDERS

Digitally signed by AMY LUEDERS
Date: 2021.12.09 07:36:24 -07'00'

Amy Lueders
Regional Director, Southwest Region
United States Fish and Wildlife Service

Date

Dyess Air Force Base

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710 Third Street

Dyess Air Force Base, Texas

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7 December 2021

Carter Smith
Executive Director
Texas Parks and Wildlife Department

Date

EXECUTIVE SUMMARY

This 2021 INRMP updates the INRMP prepared in 2016, in compliance with AFMAN 32-7003 and DoDI 4715.3, *Natural Resources Conservation Program* (3 May 1996, with change 2, 31 August 2018).

This 2021 INRMP is prepared to achieve an ecosystem-based management program directed toward healthy ecological conditions while sustaining military readiness and socio-economic values. The ultimate purpose of Dyess Air Force Base (AFB) natural resources management is to support present and future mission requirements while promoting ecological integrity and biological diversity in compliance with federal, state, and local standards. Implementing the 2021 INRMP, as mandated by the Sikes Act and amended by the Sikes Act Improvement Act of 1997, is a means by which the conservation and rehabilitation of natural resources is carried out. Over the long term, implementation of this and future INRMPs will guide base staff in maintaining and improving the sustainability and biological diversity of terrestrial and aquatic ecosystems at Dyess AFB.

Dyess AFB was created in the mid-1950s. Early management of natural resources focused primarily on converting the old Tye Army Airfield and surrounding farm and ranch land into a Strategic Air Command military installation. Isolated mesquite forests associated with small tracts of rangeland and intermittent stream channels were left intact and are still present today but, for the most part, the base was leveled and presented a flat, open landscape. Land management consisted of fence line to fence line mowing with little concern given to the protection of topsoil or storm-water quality. Topsoil was harvested for fill material and Little Elm Creek was diverted and straightened in an attempt to transport stormwater through the base as quickly as possible. As the base grew, land management focus was directed at maintaining landscaped areas around recreational, industrial, and housing facilities. The effects of urbanization and construction altered the area vegetation so that, in many locations, the current plant composition bears little resemblance to historical vegetation communities. Beginning in the early 1990s, large tracts of open space were systematically withdrawn from mowing activities in an effort to reduce maintenance costs. Secondary succession has resulted in even-aged stands of honey mesquite (*Prosopis glandulosa*). Shade-tolerant Texas wintergrass or speargrass (*Nassella leucotricha*) is the dominant groundcover plant within the mesquite woodlands. What remains of local grasslands are short to mid-grass grasslands and include silver bluestem (*Bothriochloa laguroides*), perennial threeawn (*Aristida purpurea*), buffalograss (*Bouteloua dactyloides*), Texas grama (*Bouteloua rigidiseta*), sideoats grama (*Bouteloua curtipendula*), and white tridens (*Tridens albescens*).

The long-term vision of Dyess AFB natural resources management is focused on, and the base is committed to, improving storm-water quality, capture, and conservation through proper watershed management, and to sustaining and enhancing native species diversity by using best management practices (BMPs) to improve soil fertility, control invasive species, protect special-status species and their habitats, and restore native plant communities. This approach requires a long-term view of human activities, including military uses, and biological resources as part of the same environment. By incorporating an ecosystem approach to natural resources management, all species will prosper.

The INRMP provides a means of coordinating natural resources management with other planning elements of the Dyess AFB Installation Development Plan. The intent is that the INRMP will be implemented and revised periodically under the management of the Base Civil Engineer, with input from an interdisciplinary, professional planning team that includes, but is not limited to, the environmental element, the pest management element, airfield management, flight safety, civil engineers, range and community planners, security forces, golf course and outdoor recreation specialists, and so on. Furthermore, the INRMP must be coordinated with the USFWS and the TPWD.

The INRMP management philosophy is developed under the concept of natural resources stewardship. Stewardship is the management of a resource base with the goal of maintaining or increasing the resource's value indefinitely into the future. The goal of Dyess AFB natural resources stewardship is to manage all aspects of the resource base in such a way that multiple uses, whether for mission training, outdoor recreation, wildlife habitat, watershed management, landscape enhancement, or preservation, are compatible with each other and the long-term sustainability and health of the ecosystem in which these activities occur.

This plan presents both broad philosophical guidance as well as specific goals. The overarching goal of natural resources management supports ecological processes and functions in a way that any management action undertaken will benefit the whole. The specific goals used to guide natural resources management on Dyess AFB are listed below.

1. Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive natural resources staff.
2. Ensure compliance with the Sikes Act, Endangered Species Act, Migratory Bird Treaty Act, Executive order 13186 (Migratory Birds), and applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.
3. Apply BMPs and Executive Orders 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.
4. Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while protecting resources from overuse and damage.

The INRMP goals and objectives must be given consideration early in the planning process for projects and mission changes on Dyess AFB. For the INRMP to be an effective planning document, all appropriate installation staff, offices, flights, and other groups must be aware of and comply with the INRMP. The INRMP must be reviewed as to operation and effect by the parties thereto on a regular basis, but no less often than every five years.

1.0 OVERVIEW AND SCOPE

This Integrated Natural Resources Management Plan (INRMP) was developed to provide for effective management and protection of natural resources. It summarizes the natural resources present on the installation and outlines strategies to adequately manage those resources. Natural resources are valuable assets of the United States Air Force (USAF). They provide the natural infrastructure needed for testing weapons and technology, as well as for training military personnel for deployment. Sound management of natural resources increases the effectiveness of USAF adaptability in all environments. The USAF has stewardship responsibility for the physical lands on which installations are located to ensure that all natural resources are properly conserved, protected, and used in sustainable ways. The primary objective of the USAF natural resources program is to sustain, restore, and modernize natural infrastructure to ensure operational capability and no net loss in the capability of USAF lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural resources, discusses related concerns, and provides program-management elements that will help to maintain or improve the natural resources within the context of the installation's mission. The INRMP is intended for use by all installation personnel. The Sikes Act is the legal driver for the INRMP.

1.1 Purpose and Scope

The Department of Defense (DoD) is the steward of approximately 25 million acres of public lands, and the USAF is responsible for managing approximately 9 million of these acres. The air, land, and water resources on these properties directly support DoD's military training and readiness capabilities. They also harbor pristine wildlife habitat and ecosystems that support a wide variety of unique species and a wealth of opportunities for recreational and other renewable uses.

The Dyess Air Force Base (AFB) INRMP implements USAF principles for ecosystem management by setting goals for attaining a desired land condition that maintains or restores native ecosystem types across their natural ranges where practical and consistent with the military mission; maintaining or restoring ecological processes, such as fire and other disturbance regimes, where practical and consistent with the military mission; maintaining or restoring the hydrological processes in streams, floodplains, and wetlands, when feasible; using regional approaches to implement ecosystem management by collaborating with other DoD components, as well as other federal, state, and local agencies, and adjoining property owners; and providing for outdoor recreation and other practical uses of the land and its resources, provided that such uses do not inflict long-term ecosystem damage or negatively impact the USAF mission.

Biodiversity conservation is an integral part of ecosystem management. The INRMP will establish goals that maintain or re-establish viable populations of all native or indigenous species when practical and consistent with the military mission.

The INRMP will identify exotic or invasive species (including native mesquite [*Prosopis* sp.] that is not adequately controled under current patterns of anthropogencially altered disturbance regimes) that impact biodiversity and ecological health and implement programs to control and/or eradicate those species. Joint control strategies will be implemented with other federal, state, and local cooperating agencies and adjacent landowners to increase the effectiveness of control measures.

The INRMP will identify special-status natural communities or species and develop and implement strategies oriented toward their conservation when practical and consistent with the military mission.

This document serves as the INRMP for Dyess AFB and is intended to function as a "road map" for natural resources management. It was developed using an interdisciplinary approach to ecosystem management.

This INRMP is an integral part of Dyess AFB's overall land management process. Implementation of the 2021 INRMP will help to ensure that Dyess AFB lands continue to support present and future mission requirements while preserving, improving, and enhancing ecosystem integrity. This INRMP provides a document for planning and managing Dyess AFB natural resources and provides a means of coordinating natural resources management with other planning elements of the base's General Plan.

This INRMP is a dynamic document that integrates all aspects of natural resources management and the rest of the installation's mission. Its goals and objectives must be given consideration early in the planning process for projects and mission changes on Dyess AFB. For this INRMP to be an effective planning document, all appropriate staff, offices, flights, and other groups will be made aware of the INRMP and refer to it early in the planning stages of all construction projects and proposed mission changes that could affect natural resources management and the goals and objectives of this plan.

INRMPs must provide 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's National Marine and Fisheries Service (NOAA Fisheries) to formally designate critical habitat on military lands, and the National Defense Authorization Act of fiscal year (FY) 2004 changed the Endangered Species Act (ESA), Sec 4(a)(3), to prevent these agencies from doing so.

SECURITY INSTRUCTIONS AND RECORD OF CHANGES

The title of this plan is the Dyess Air Force Base Integrated Natural Resources Management Plan, (Dyess AFB INRMP). The 2021 Dyess AFB INRMP supersedes the Dyess AFB INRMP that was prepared in 2016.

This plan is a public document.

Reproduction of this document is permissible for preparation of supporting plans and education.

This plan contains portions of Air Force Manual (AFMAN) 32-7003, *Integrated Natural Resources Management*, and other sources as listed in the reference section of this plan and in Section 14.1.1, *Appendix A. Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP*.

The following changes were made as part of the five-year update.

- Reformatted to conform to the 2020 USAF INRMP template
- Climate change information added
- Updates made to species taxonomy and nomenclature, checklists, and treatment acreages
- Fully redesigned Goals, Objectives, and Projects (Chapter 8) to reflect current and planned Natural Resources management
- Updated the Annual Work Plans (Chapter 10) to reflect for the 2021–2026 planning period
- Included background information where needed to provide context for new projects

1.2 Management Philosophy

This plan was developed under the philosophy of natural resources stewardship. Stewardship is the management of a resource base with the goal of maintaining or increasing the resource's value indefinitely into the future. The goal of USAF natural resources stewardship is to manage all aspects of the resource base in such a way that multiple uses, whether for mission training, commercial production, outdoor recreation, aesthetics, or preservation, are compatible with each other and the long-term sustainability and

health of the ecosystem in which these activities occur. This INRMP is focused on supporting the base mission requirements while complying with the Sikes Act, ESA, Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), Clean Water Act (CWA), federal natural resources conservation laws and regulations, and various Executive Orders (EOs), including EO 11988—*Floodplains Management*, EO 11990—Protection of Wetlands, EO 13186—*Responsibilities of Federal Agencies to Protect Migratory Birds*, EO 12962—*Recreational Fisheries*, and EO 13112—*Invasive Species*.

The Dyess AFB 2021 INRMP was developed in an interdisciplinary manner. Planning and decision-making for an INRMP is integrated with the base's comprehensive planning, proposed-project planning, pest-management planning, reducing the Bird/Wildlife Aircraft Strike Hazard (BASH), airfield-management planning, golf course environmental-management planning, and grounds maintenance planning. This plan represents the contributions of a broad range of expertise including specialists in vegetation, wildland fire, wildlife, wetlands, hydrology, soils, landscape management and planning, cultural resources, and recreation planning. The intent is that this INRMP will be implemented and revised periodically under the management of the Base Civil Engineer (7th Civil Engineer Squadron [7 CES]) with input from an interdisciplinary professional team assigned through the installation Environmental, Safety, and Occupational Health (ESOH) Leadership Council.

This plan presents both broad philosophical guidance as well as specific goals. The focus of this INRMP is on present and future use of the land, the land's role in support of military missions, and its support of human communities. Maintaining or restoring ecosystem integrity is the plan's overarching goal and influences all aspects of this INRMP. Some land-management goals, for instance, involve several INRMP program areas. Highly specific objectives, on the other hand, relate to only one project or issue within a program area, such as supplementing wildlife waters. The range of both broad goals and specific objectives presented in this INRMP promotes a more inclusive approach to addressing various natural resources management issues.

This INRMP will be reviewed annually and updated every five years. During the most recent five-year update, which covers the 2021–2026 planning period, an assessment was made to identify projects that were achieved in the previous planning period. In addition, goals, objectives, and projects were reorganized to better represent current management activities on the installation and to ensure that the document contributes to the overall aim of using an ecosystem-management approach to support present and future mission requirements while preserving, improving, and enhancing ecosystem integrity.

As part of the INRMP process, areas of Dyess AFB have been classified and mapped as land-management units. Land-management units for unimproved grounds correspond largely to open-space designations associated with floodplains, the Cantonment area, quantity/distance safety buffers associated with explosive ordnance disposal, firing ranges, and weapons storage. Other units on improved and semi-improved grounds are typically divided among housing; airfield operations and maintenance; and administrative, industrial, commercial, medical, and outdoor recreation land uses.

This INRMP addresses management aspects of five land classifications, as follows.

- Riparian Floodplains
- Improved Grounds
- Semi-Improved Grounds
- Unimproved Grounds
- Wetlands and Waters

1.3 Authority

This plan is prepared under authority of the Sikes Act, 16 USC 670 *et. seq*.; Department of Defense Instruction (DoDI) 7310.5, *Accounting for Sale of Forest Products*; DoDI 4715.03, *Natural Resources Conservation Program*; Air Force Policy Directive (AFPD) 32-70; AFMAN 32-7003; and Headquarters (HQ) Global Strike Command (GSC)/National Environmental Policy Act Manager (CEIE) guidance on INRMPs.

The Sikes Act, 16 United States Code (USC) § 670a, requires an INRMP to be written and implemented for all DoD installations with significant natural resources. This plan has been developed cooperatively between the installation, the USFWS, and the Texas Parks and Wildlife Department (TPWD). The USAF natural resources program ensures continued access to land, air, and water resources to conduct realistic military training and testing, as well as to sustain the long-term ecological integrity of the resource base.

This INRMP is developed under, and proposes actions in accordance with (IAW), applicable DoD and USAF policies, directives, and instructions. AFMAN 32-7003 provides the necessary direction and instructions for preparing an INRMP. Issues are addressed in this plan using guidance provided under legislation, EOs, directives, and instructions, including DoDI 4715.03; AFPD 32-70, *Environmental Quality*; and AFMAN 32-7003. DoDI 4715.03 provides direction for DoD installations to establish procedures for an integrated program for multiple-use management of natural resources. AFPD 32-70 discusses general environmental quality issues, including proper cleanup of polluted sites, compliance with applicable regulations, conservation of natural resources, and pollution prevention. AFMAN 32-7003 also provides guidance on preserving cultural resources at USAF installations. See section 14.1.1, *Appendix A—Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP*, for a summary of key legislation and guidance used to create and implement this INRMP. Refer to the complete listing of Air Force Instructions (AFIs), AFMANs, the Federal Register, and the USC to ensure that all applicable guidance documents, laws, and regulations are reviewed. Installation-specific policies, including state and local laws and regulations are summarized in the table below.

Installation-Specific Policies (including State and/or Local Laws and Regulations)	
N/A	There are no installation-specific policies.

1.4 Integration with Other Plans

The Installation Development Plan (IDP) for Dyess AFB was completed in November 2014, in part, to help guide future growth at Dyess AFB. The IDP provides an installation profile that identifies essential characteristics and capabilities of the base and synthesizes four key planning components that embody future improvement and development planning for the base: Composite Constraints and Opportunities; Land Use; Infrastructure; and Capital Improvement.

The IDP is intended to facilitate the orderly development of the base as it fulfills its existing and future missions, consistent with physical, environmental, and regulatory constraints. To assist with guiding development, seven development envelopes (Area Development Plans) are identified in the IDP. These development areas represent a balance between environmental concerns and the need to provide areas for future development.

Preparation of this INRMP was coordinated with preparation of the IDP. All management recommendations in this INRMP were compared against the IDP to confirm that activities included in the two plans do not

conflict. Land-use areas identified for development and open space in the two plans were coordinated to ensure that the plans were consistent.

This INRMP has been incorporated by reference into the IDP.

Other applicable installation management plans were integrated into the INRMP text and are referenced throughout. These plans are appended in Section 14, APPENDICES. The INRMP text will be revised during each update to reflect changes in those plans.

2.0 INSTALLATION PROFILE

Office of Primary Responsibility	Wing Commander has overall responsibility for implementing the Natural Resources Management program and is the lead organization for monitoring compliance with applicable federal, state, and local regulations.
Natural Resources Manager/Point of Contact (POC)	Name: Conner Cox Phone: (325)-696-5958 Email: conner.cox.ctr@us.af.mil
State and/or local regulatory POCs (include agency name for Sikes Act cooperating agencies)	United States Fish and Wildlife Service Joshua Emery Phone: (512) 490-0057 ext. 222 Email: Joshua_Emery@fws.gov Texas Parks and Wildlife Department Richard Hanson, Field Office Contact Phone: (806) 761-4936 Laura Zebehazy, Program Lead Phone: (512) 389-4638 Email: whab@tpwd.texas.gov Natural Resources Conservation Services Lee Knox, Soil Conservationist Phone: (325) 692-8238 Email: lee.knox@tx.usda.gov United States Army Corp of Engineers Stephen Brooks, Branch Chief Fort Worth District Phone: (817) 886-1730 Texas Commission for Environmental Quality Winona Henry, Region 3 Texas Pollutant Discharge Elimination System Compliance Coordinator Phone: (325) 698-9674
Total acreage managed by installation	5,937 acres (Dyess AFB—5,348 acres, Electronic Scoring/Emitter sites—69 acres, C-130 Drop Zone—520.8 acres)
Total acreage of wetlands	3.2 acres or 33.8 acres to include Waters of the United States
Total acreage of forested land	1,680 acres (mesquite and shrub oak woodlands)
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	No
Natural Resources Program Applicability (Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section NATURAL RESOURCES	☒ Fish and Wildlife Management ☒ Outdoor Recreation and Access to Natural Resources ☒ Conservation Law Enforcement ☒ Management of Threatened, Endangered, and Host Nation-Protected Species ☒ Water Resource Protection ☒ Wetland Protection

PROGRAM MANAGEMENT of the INRMP)	☒ Grounds Maintenance ☐ Forest Management ☒ Wildland Fire Management ☐ Agricultural Outleasing ☒ Integrated Pest Management Program ☒ Bird/Wildlife Aircraft Strike Hazard (BASH) ☐ Coastal Zone and Marine Resources Management ☒ Cultural Resources Protection ☒ Public Outreach ☒ Geographic Information Systems (GIS)

2.1 Installation Overview

2.1.1 Location and Area

Dyess AFB occupies 5,348 contiguous acres and is located in the north-central portion of Taylor County in Texas, just west of Abilene, south of United States (U.S.) Interstate 20, between the intersections of U.S. Highways 80 and 277, and Dub Wright Boulevard. The base forms part of the western boundary of the city of Abilene (Figure 2-1). Abilene is approximately 150 miles west of the Dallas-Fort Worth metropolitan area. The northwest and eastern perimeters of the base are primarily bordered by residential development and the remaining perimeters are adjacent to agricultural land. A total of 11 geographically separated units (GSUs) are leased and administered by Dyess AFB, but only the main base is addressed in this INRMP (Figure 2-2, Table 2-1). Currently, annual natural resource surveys are conducted at Snyder Electric Scoring Site and regularly re-occurring surveys are needed at all GSUs for sensitive species and invasive plant species. After completing those surveys, the INRMP should be updated with any results and management recommendations.

The base is located at geographical coordinates 32º 26´N, 99º 51´W. Elevation on the base ranges from 1,730 to 1,818 feet above mean sea level. The base is bisected by Little Elm Creek, a tributary of the Clear Fork of the Brazos River.

Farming and ranching are the primary land uses south and east of the base; however, significant development of wind energy has occurred in portions of the Callahan Divide.

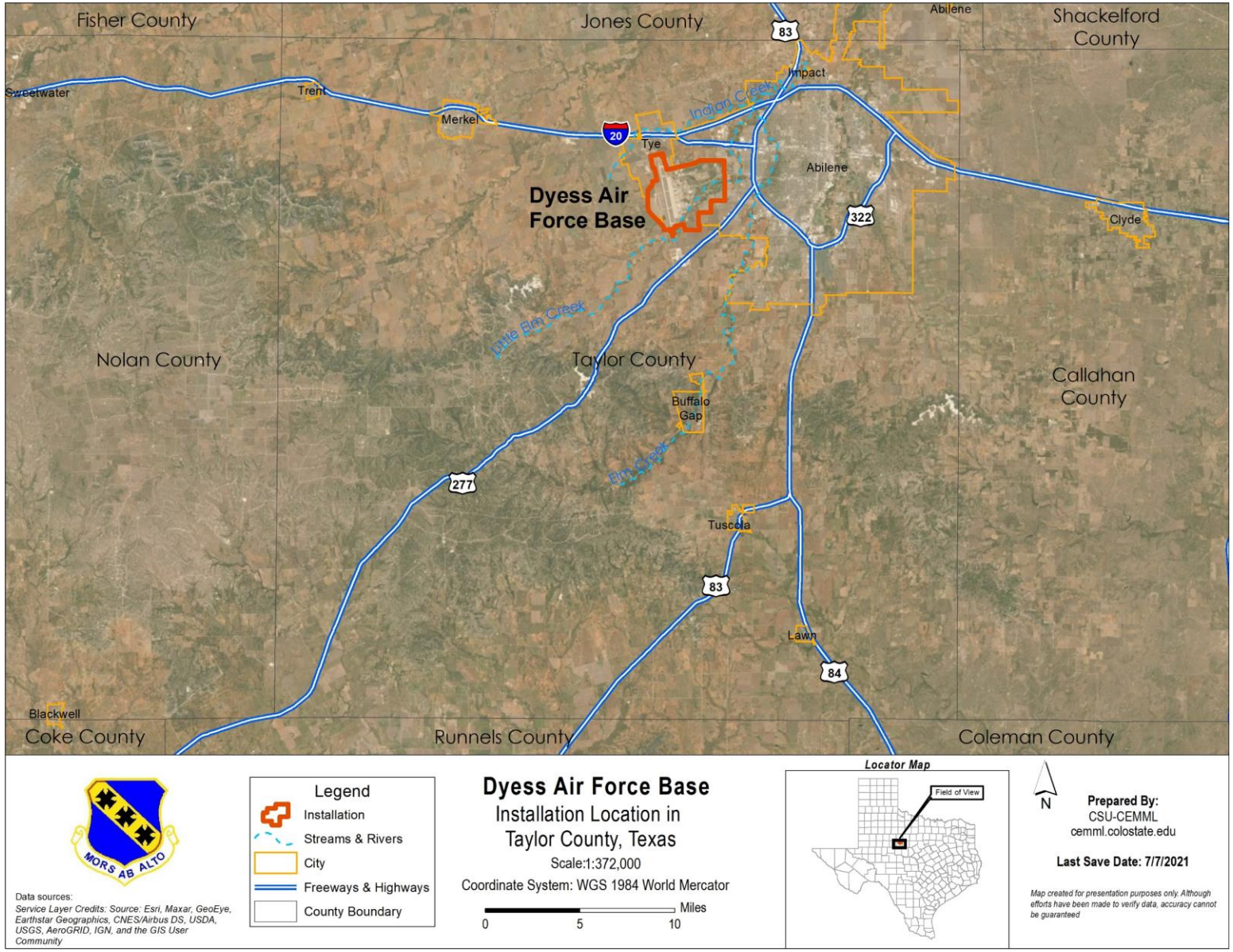

Figure 2-1. Location of Dyess Air Force Base within Taylor County, Texas.

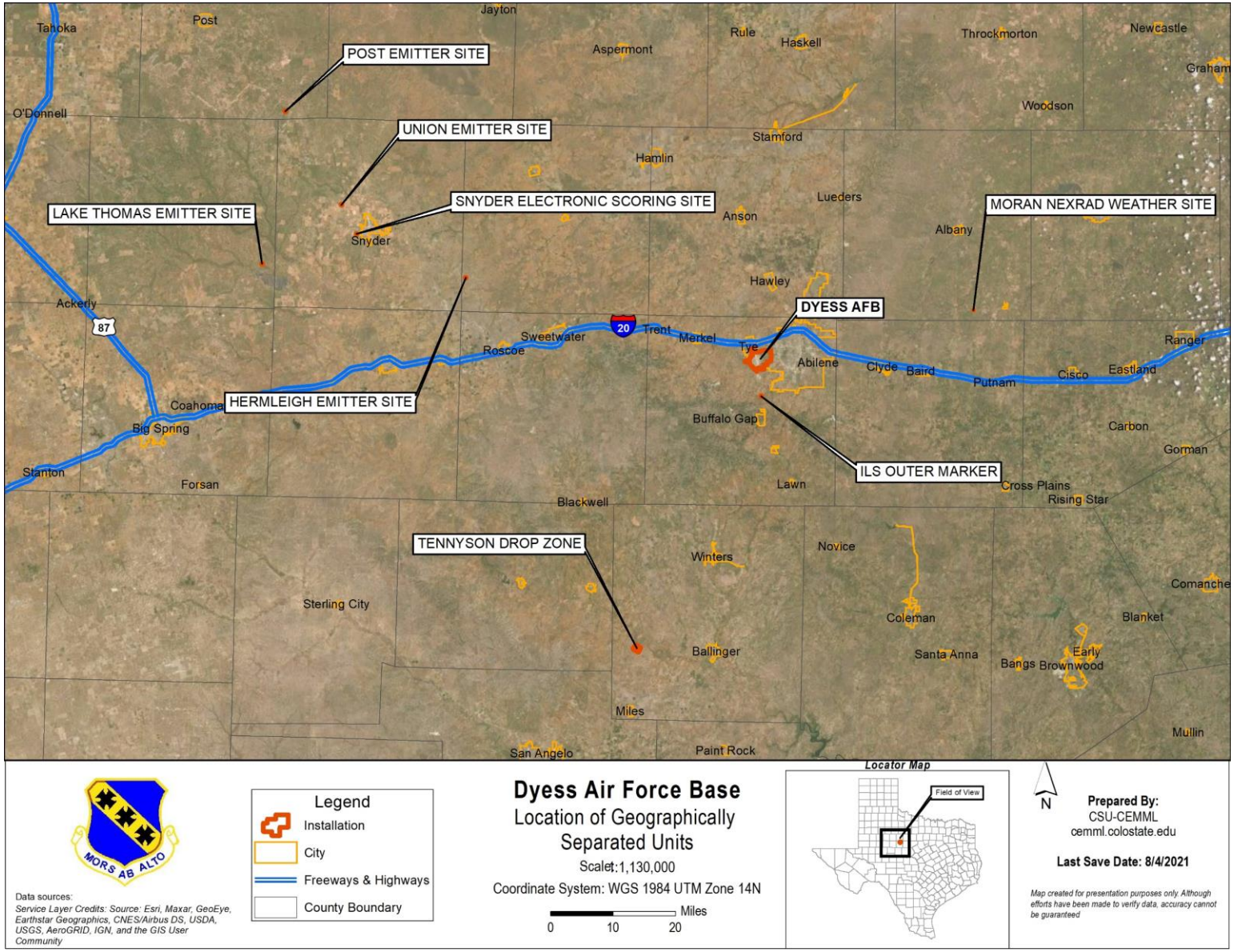

Figure 2-2. Locations of Dyess Air Force Base's geographically separated units.

Table 2-1. Locations and area descriptions of Dyess Air Force Base and its geographically separated units.

Base/GSU Name	Main Use/Mission	Acreage	Addressed in INRMP?	Describe Natural Resource Implications
Main Base	B-1 C-130J	5,365.51	Yes	Land Management
Dyess Communications Annex—Receiver	Communications	41.41	No	None
Hermleigh Emitter Site	Emitter Site	14.34	No	None
Instrument Landing System (ILS) Middle Marker	Air Field Approach Marker	0.13	No	None
ILS Outer Marker	Air Field Approach Marker	13.24	No	None
Lake Thomas	Emitter Site	14.95	No	None
Moran NEXRAD Weather Site	Weather Site	0.20		
Post Emitter Site	Emitter Site	14.95	No	None
Snyder Electronic Scoring Site (ESS)	ESS	9.74	No	None
Tennyson	C-130 Drop Zone	532.011	No	None
Union	Emitter Site	15.01	No	None

2.1.2 Installation History

2.1.2.1 Ecological History

Approximately 12,000 years ago, as the climate became warmer and drier, the North American grasslands developed into a rich and diverse ecosystem. Although driven by climatic factors, intense seasonal grazing by bison (*Bison* sp.) and other large mammals and periodic wildfires also were major factors in shaping grassland diversity (Texas Parks and Wildlife). Although there have been periods of human population expansion and decline, sometimes approaching near abandonment, humans have occupied the Great Plains physiographic province for at least 12,000 years (McNab et al. 2007). This immense Great Plains grasslands, which covered much of the nation's midsection, provided a forage base for populations of bison and pronghorn (*Antilocapra americana*), each of which numbered at least 50 million animals. Historical accounts indicate that the Mixed Prairie portion of this prairie ecosystem supported both bison and pronghorn. Associated fauna of this prairie ecosystem included many species of mammal, insect, bird, reptile, and amphibian.

The adoption of farming about 1,000 years ago, in combination with hunting and wild-plant gathering, eventually led to the appearance of settled villages located sporadically along perennial water courses. At about the beginning of this historical period, the settled village life of plains agriculturalists was supplanted by the re-appearance of groups equipped with horses and a heavier dependence on hunting that was supplemented with some farming. These relatively mobile groups included Apache and Comanche, with a later appearance of Kiowa.

Historical trails were important for the westward movement of Anglo settlers and the movement of cattle and other commodities. The advent of transcontinental railroads in the late 1800s contributed greatly to the slaughter of bison herds, after which hunting was never again an important subsistence pursuit in the region.

As settlement of the Rolling Plains began, many of the more Mixed Prairie sites with reasonably level terrain and deep, productive soils favorable for agriculture were tilled for cropland. Where the land was unsuitable for farming, the land with its native vegetation was used as range for domestic livestock. By 1900, the diversity, size, and natural productivity of most native mixed-grass prairie sites throughout the Rolling Plains had been drastically reduced by processes brought about by a speculative livestock industry and lack of wildfire. As the grass cover was removed, mesquite, juniper (*Juniperus* spp.), and prickly pear (*Opuntia* spp.), as well as other less desirable species, both herbaceous and woody, became invasive on the mismanaged rangelands.

For the past half century, a philosophy of stewardship and conservation, through both private and public ownership, has promoted restoration and rehabilitation efforts within the Rolling Plains. Although it is unlikely that this Mixed Prairie will ever be restored to its prehistorical species diversity and abundance, many areas with their representative plant and animal components are in a gradual process of recovery.

2.1.2.2 Installation History

Dyess AFB's current prosperity evolved from open Texas rangeland, largely through the efforts of the local citizens. Prior to the mid-1800s, the area abounded in bison herds and Indian scouting parties. Driving cattle to market ended with the establishment of the railroad in 1881 (Texas and Pacific), after which the area was farmed and ranched (Texas Handbook Online). The construction of defensive forts began in 1849 (Pool 1975, Webb 1952), the first line of which ran between Fort Worth and Eagle Pass; however, these proved inadequate, so a second line of forts was constructed farther west between 1850 and 1867. Of particular note is Fort Phantom Hill, which was built in 1851 about 14 miles north of present-day Abilene. In part, these forts also protected the Butterfield Stage Line that operated between September 1858 and February 1861 and ran to San Francisco.

In 1942 during World War II, pilot training operations began at the Tye Army Airfield. The airfield was operated as an extension of the mission of Camp Barkeley, which was located several miles to the south of Abilene and was home to over 60,000 military personnel. The airfield was closed in 1946. From 1947 to 1952, 1500 acres of the former airfield were used by the Texas State National Guard as a training facility, and it was eventually sold to the City of Abilene. Following the outbreak of the Korean conflict, the citizens of Abilene raised over three quarters of a million dollars to purchase 3,500 acres and, in 1952, the City offered that land along with the original 1,500 acres to the DoD for a new military base—Dyess AFB. Construction began the following year, and the first unit was activated in 1955. This unique level of civilian dedication to military support continues to grow each year.

In 1956, the first Strategic Air Command (SAC) aircraft arrived at Dyess AFB: B-47 bombers and KC-97 tankers. Subsequently, B-52s were added, but from 1984–1985, they were phased out at Dyess AFB. Then, in July 1985, the B-1 began arriving at the base. Other large, multi-engine aircraft currently assigned to Dyess AFB include C-130 troop/cargo carriers.

From 1961 to the present, troop-carrier activities have taken place at Dyess AFB, first under Tactical Air Command, then Military Airlift Command, and then under Air Mobility Command. From 1961 to 1965, there were maintenance facilities for numerous Atlas F missile launch silos located on the installation.

Following reorganization of Tactical Air Command and SAC, Dyess AFB became an Air Combat Command facility. Effective 1 October 2015, Dyess AFB transitioned to the USAF Global Strike Command to consolidate the entire USAF long-range strike capability under one unified command assigned to the 8th Air Force.

2.1.3 Military Missions

The 7th Bomb Wing (7 BW) mission statement is "Be the most respected and feared bomber force in the world...MORS AB ALTO!" The 7 BW mission is to provide accurate, timely, and proactive command and control integration in direct support of B-1 and C-130 Continental United States training and operations and deployed combat operations. Major units within the 7 BW include the BW Staff, including Wing Plans and Treaties, Inspector General, Protocol, Safety, Public Affairs, Comptroller, Staff Judge Advocate, and related personnel functions. The Operations Group includes all operational and training flying squadrons. In July 2017, the 317th Airlift Wing, formerly a group based on Dyess AFB, was activated. The 317th Airlift Wing consists of the 317th Maintenance Group and the 317th Operations Group. The Maintenance Group includes maintenance of aircraft, components, and equipment, as well as general operations and munitions. The Mission Support Group includes civil engineering (design and construction, environmental, fire, housing, operations, and explosive ordnance), communications, supply, transportation, security forces, and services. The Medical Group is comprised of administrative, hospital, dental, and bio- environmental squadrons.

Dyess AFB has a working population of 5,384 people: 4,783 active duty military personnel and 601 civilians.

Table 2-2. Listing of tenants and natural resources responsibility.

Tenant Organization	Natural Resources Responsibility
317th Airlift Wing/Air Mobility Command	317 OSS/Office of the Secretary of Defense—Tennyson Drop Zone
Armed Forces Reserve Center	N/A
77th Weapons Squadron	N/A
337th Test and Evaluations Squadron	N/A
Defense Reutilization	N/A
Defense Contract Management	N/A
Texas Air National Guard	N/A
Defense Commissary Agency	N/A
Air Force Audit Agency	N/A
U.S. Marine Detachment	N/A
Weapons School	N/A

2.1.4 Natural Resources Needed to Support the Military Mission

Physical support of the mission relates to land area required for quantity/distance arcs associated with the Weapons Storage Area (WSA) and the Explosive Ordnance Disposal area, surface danger zones associated with the small arms ranges and the grenade range, the Cantonment training area, vegetation screening of sensitive areas, prevention of soil erosion, and water-quality protection. Natural resources provide ecological functions necessary for sustaining life. Proper land stewardship will ensure the capture, storage, and redistribution of precipitation; conversion of solar energy into useable energy; and function to cycle this energy back into the biotic and physical environment.

2.1.5 Surrounding Communities

With a population of 125,182 (U.S. Census Bureau, 2020 Estimate), Abilene is the largest city in the region and the 28th largest city in Texas. Mirroring national trends, larger cities in Texas such as Abilene, are experiencing some degree of population growth. Abilene has experienced growth of 8,119 people since the 2010 census when the population was 117,063 (U.S. Census Bureau, 2010 Estimate). Abilene's population over the last decade has been relatively stable, with a growth rate of approximately six to seven percent. The general land-use character of Taylor County and the region is rural-agricultural, with the exceptions of the cities of Abilene and Tye and the town of Buffalo Gap.

In 2020, Taylor County had a population of 143,208 which was an increase of nine percent from the 2010 population of 131,506. Taylor County's population density is 155 residents per square mile and, with the exception of Abilene, is primarily rural.

The city of Tye and the town of Buffalo Gap have small populations. The city of Tye was established in the late 1800s and is located at the north end of Dyess AFB. The city's 2020 population was 1,176, representing a six percent decrease from the city's population in 2010. Much of the city is composed of manufactured, single-family housing; however, there is a growing commercial presence along Interstate 20. The town of Buffalo Gap has a very small population of 543 according to 2020 U.S. Census data, with urban growth primarily occurring along Buffalo Gap Road, which connects the town with the city of Abilene.

2.1.6 Local and Regional Natural Areas

Abilene State Park is located adjacent to Lake Abilene and is approximately 15 air miles southwest of Dyess AFB. There are no other designated natural areas, greenways, etc., in the immediate vicinity of Dyess AFB. The regions surrounding Dyess AFB consists of the urban/suburban areas of Abilene and Tye to the east and north and the primarily agricultural areas to the south and west. The base is currently working to acquire additional (owned or leased) lands or to purchase conservation easements through the Readiness and Environmental Protection Integration Program, which is used to preclude off-base encroachment and development by removing or avoiding land-use conflicts near installations that could limit or restrict the military's missions. Acquisition of additional lands surrounding Dyess AFB will increase safety by creating larger public setbacks and may benefit native species of wildlife and plants, depending on the nature of the lands acquired and the base's degree of management on them.

2.2 Physical Environment

2.2.1 Climate

The climate of Taylor County is classified as warm-temperate steppe. The county lies near the boundary between the humid climate of East Texas and the semiarid climate to the west (Conner 1976). The average annual temperature is 64 degrees Fahrenheit (°F), although the extremes have ranged from a low of -7 °F in January 1947 to a high of 108 °F in August 1943 (Table 2-3). The mean daily maximum for January, the coldest month of the year, is 54 °F and the mean daily minimum is 37 °F. The mean daily maximum for July, the warmest month of the year, is 94.3 °F and the mean daily minimum is 73 °F. Average rainfall for the area is 23.5 inches, with most of this occurring from April to June and September to October (Table 2-4). The annual amount of precipitation has ranged from 9.78 in 1956 to 48.77 inches in 1941.

Thunderstorms are a common source of rainfall. On average, Taylor County has 41 days per year when thunderstorms occur. Snow is not common in the area, although the mean annual total is 4.1 inches. The average growing season for the county is 225 days, with March 30 and November 10 being the average dates of last and first freezes, respectively (3D Environmental 1995).

Table 2-3. Temperature (based on 90 years of local records).

Month	Annual No. Days 32 °F[1] or Below	Maximum of Record (°F)	Minimum of Record (°F)	Mean (°F)
January	16	89	-7	45
February	9	86	3	48
March	5	96	9	55
April	1	99	27	64
May	0	106	35	72
June	0	106	47	80
July	0	106	57	83
August	0	108	53	83
September	0	103	41	76
October	1	98	31	66
November	5	92	15	53
December	13	86	9	46
Annual	50	108	-7	64

[1] °F = degrees Fahrenheit.

Table 2-4. Precipitation (based on 90 years of local records).

Month	Mean Monthly (Inches)	Maximum Monthly (Inches)	Minimum Monthly (Inches)	24-Hour Maximum (Inches)
Rainfall				
January	0.9	5.3	Trace	2.2
February	1.1	3.5	0.03	1.7
March	1.0	3.0	0.03	2.0
April	2.3	10.2	Trace	5.9
May	4.3	14.7	0.15	4.6
June	2.7	9.6	Trace	3.7
July	2.3	7.2	Trace	3.7
August	1.5	8.2	Trace	5.0
September	2.1	10.9	Trace	6.7
October	2.9	9.0	0.01	5.1
November	1.1	4.6	0.01	2.0

Table 2-4. Precipitation (based on 90 years of local records).

Month	Mean Monthly (Inches)	Maximum Monthly (Inches)	Minimum Monthly (Inches)	24-Hour Maximum (Inches)
December	1.3	3.3	Trace	2.3
Annual	23.50	14.7	Trace	6.7
Snowfall				
January	1.4	18.1	0	7.0
February	1.0	8.4	0	4.3
March	0.8	7.3	0	6.1
April	Trace	Trace	0	7.8
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
August	0	0	0	0
September	0	0	0	0
October	Trace	Trace	0	Trace
November	0.4	8.1	0	3.5
December	0.5	4.3	0	4.2
Annual	4.1	18.1	0	7.8

Prevailing winds are southerly and often persist for several days. Warm temperatures and brisk, dry winds promote a high rate of evaporation and diminish the effectiveness of precipitation. Dust storms are generally related to soil conditions north and west of Taylor County and are associated with a northwest wind.

2.2.1.1 Climate Projections

Colorado State University (CSU) Center for Environmental Management of Military Lands (CEMML) researchers generated site-specific climate projections for Dyess AFB under two future carbon emission scenarios: Representative Concentration Pathway (RCP) 4.5 (moderate-level emissions) and RCP 8.5 (high-level emissions). The researchers then used these projections to assess potential impacts of future climate on natural resources at the installation. Models used historical daily climate data recorded from 1980 through 2009 to represent average historical (also called baseline) conditions and generate climate projections. The historical daily climate data represent the 30-year historical reference point used by the Intergovernmental Panel on Climate Change (IPCC) to define climate change scenarios. Models used the RCP 4.5 and RCP 8.5 emission levels to produce two decadal time series of daily climate values for 2026–2035 and 2046–2055, represented hereafter as 2030 and 2050, respectively (CEMML 2019).

Historical data included average daily temperature, maximum and minimum daily temperatures, and daily precipitation. For each of these variables, researchers calculated a daily anomaly (the difference of a future climate compared to the historical climate) under each emission scenario (RCP 4.5 and RCP 8.5) for both timeframes (2030 and 2050). Daily data were then averaged within both 10-year periods for each variable

and emission scenario to produce an annual average temperature (TAVE), annual average maximum (TMAX) and minimum (TMIN) temperatures, and annual average precipitation (PRECIP).

The climate assessment was based primarily on publicly available data and data provided by the Air Force Civil Engineer Center ([AFCEC] CEMML 2019). Climate projections were based on recent global climate model simulations developed for the IPCC Fifth Assessment Report, the IPCC Coupled Model Intercomparison Project Phase 5, and the U.S. National Center for Atmospheric Research Community Climate System Model ([NCAR CCSM] Hibbard et al. 2007; Moss et al. 2008, 2010; Gent et al. 2011; Hurrell et al. 2013).

2.2.1.2 Climate Model Results

The model results below depict climate projections for the two emissions scenarios and timeframes. Within each of those scenarios and for each climate variable projected, there are various sources of uncertainty related to our knowledge of the processes involved. For instance, there is a range of possibilities for precipitation levels that depends on how the ocean and atmosphere interact as conditions change, something that is not yet not fully understood but known to be very important. The four scenarios demonstrate the differences that could result from changes in emissions and different amounts of time.

Climate projections for Dyess AFB (Table 2-5) suggest minimum and maximum temperatures will increase over time under both emission scenarios (RCP 4.5 and RCP 8.5). For the decade centered around 2030, both of the scenarios project a similar degree of increase in TAVE of between 2.1 ºF (1.2 ºC) and 2.9 ºF (1.6 ºC) over the historical average. The two emission-scenario projections show greater warming by 2050, with RCP 4.5 projecting a warming of 3.3 ºF (1.8 ºC); RCP 8.5 projects a slightly greater warming of 5.0 ºF (2.8 ºC) for this period. HOTDAYS (the average number of days per year exceeding 90 ºF) increases considerably under all four scenarios, particularly under the RCP 8.5 2050 scenario, which is projected to have an annual average of 143 days over 90 ºF, as opposed to the historical average of 97 HOTDAYS.

Table 2-5. Summary of climate projection data.

Variable[1]	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	25.2	30.1	30.1	27.2	28.2
TMIN (°F)	51.9	53.9	54.6	54.5	56.9
TMAX (°F)	77.3	79.5	81.1	80.5	82.3
TAVE (°F)	64.6	66.7	67.9	67.5	69.6
GDD (°F)	6,246	6,769	7,005	6,915	7,332
HOTDAYS	97.2	122.0	131.1	125.4	142.8
WETDAYS	0.5	0.6	0.3	0.1	0.3

[1] TAVE = annual average temperature (ºF); TMAX = annual average maximum temperature (ºF); TMIN = annual average minimum temperatures (ºF); PRECIP = average annual precipitation (inches); GDD = average annual accumulated growing degree days with a base temperature of 50 ºF; HOTDAYS = average annual number of days with temperatures exceeding 90 ºF; WETDAYS = average annual number of days with precipitation exceeding 2 inches.

PRECIP varies between emission scenarios and over time due to larger interconnected ocean-atmosphere dynamics associated with the NCAR CCSM model. For 2030, the RCP 4.5 scenario projects a moderate increase in PRECIP of 19%, whereas RCP 8.5 shows an increase of 8%. For 2050, RCP 4.5 projects an increase in PRECIP of 19%, whereas RCP 8.5 projects an increase of 12%.

Understanding changes in total precipitation for multi-day precipitation events is helpful for evaluating precipitation patterns in addition to assessing annual averages. Three-day storm events (design storms) were generated from projected precipitation data based on RCP 4.5 and 8.5 emission scenarios for the 2030 and 2050 timeframes (Table 2-6). Historical precipitation data were used to calculate a baseline storm event for the year 2000 for comparison. The design storms indicate a decrease in total precipitation in three of the scenarios, with only the short-term, moderate emission scenario projecting an increase in three-day storm precipitation. These analyses focus on the total amount of precipitation accumulating for a modeled three-day storm event. They do not model possible changes in intensity between the baseline event and future scenarios, nor was the potential for flash flooding analyzed here, but more intense precipitation events can exceed the infiltration capacity of the soil, leading to an increased potential for flash flooding.

Table 2-6. Design storm precipitation data.

Design Storm		Baseline	RCP 4.5		RCP 8.5	
		2000	2030	2050	2030	2050
Precipitation (inches)	Day 1	1.6	1.6	1.6	1.1	1.3
	Day 2	2.5	2.7	1.9	1.6	1.9
	Day 3	2.0	2.1	1.0	1.0	1.4
	Total	6.1	6.4	4.5	3.7	4.6
Percent change from baseline			5	-26	-39	-25

2.2.2 Landforms

The elevation of the Dyess AFB runway is 1,789 feet above mean sea level. The base lands are nearly level to gently sloping upland flats, with slopes ranging from 0 to 3 degrees (USAF 1986). One point of relief located north of the flight line overlooks the airfield toward the south and west.

Dyess AFB is influenced by hydrological and meteorological effects of the Callahan Divide located approximately four miles to the southwest. The Callahan Divide is a range of hills extending twenty-six miles west to southeast through Taylor and Callahan counties. This divide separates the Brazos River and the Colorado River watersheds (the center point of the range is 32° 18'N, 99° 51'W). Elevations of the Callahan Divide vary from a low of 1,898 feet above mean sea level at Buffalo Gap to 2,411 at the western end of the Callahan Divide, two miles south of Round Top Mountain (Texas State Historical Association 2021).

2.2.3 Geology and Soils

2.2.3.1 Geomorphology

Dyess AFB is located in the Rolling Plains Section of the Central Lowlands geomorphic province. Landforms originated from platform uplift of continental sediments deposited previously in a shallow, inland sea, followed by a long period of erosion. These processes resulted in a moderately dissected

landscape. About 80 percent of the Rolling Plains Section is equally divided between irregular plains and tablelands. Elevation ranges from 1,640 to 2,950 feet (500–900 meters) and local relief in most of the Section ranges from 100 to 300 feet. There are smaller areas in which the local relief ranges from 300 to 500 feet (McNab et al. 2007).

2.2.3.2 Lithography and Stratigraphy

Rocks were formed during the Paleozoic and Mesozoic Eras. Geologic strata comprise about equal amounts of Permian marine deposits and Triassic continental deposits (sandstone). There is also a small area of Permian continental deposits (sandstone, shale, and limestone; McNab et al. 2007).

2.2.3.3 Local Geology

Primary shallow geological deposits underlying the near surface material are quaternary alluvium (sedimentary build-ups of silts, sands, and gravel over thousands of years). Much of the base overlays ancient streambed channels and tributaries of Little Elm Creek. Bedrock under the base consists of the Upper Permian Vale Formation (valley) of the Clear Fork Group. This is a broad band of relatively flat-lying red shale with thin, scattered, lenticular red and gray sandstone in the lower sections. Bedrock is 100 to 200 feet thick and generally slopes toward the northeast. At any given point, the actual directional flow of groundwater could be north, south, east, or west. Flow direction of surface water is readily discernible and controlled by man-made ditches and channels. Surface water from the industrial portion of the base sheet flows off the flight line and other areas to be captured by the stormwater drains and diversion ditches channeled to flow into Little Elm Creek, which in turn flows into Elm Creek before emptying into Lake Fort Phantom Hill. The lake, which is located 10 miles northeast of Abilene, is a principle source of potable water supply for Abilene and Dyess AFB.

The base is underlain by the Permian Clear Fork Group and Quaternary Alluvium. The Clear Fork Group mostly consists of silty mudstones, thin to very thinly bedded, with some blue-gray shale near the base and a few fragments of fossil plants. The Alluvium consists of floodplain deposits that form low terraces and bedrock located in stream channels. Alluvial thickness is up to 25 feet (TPWD 1994).

2.2.3.4 Soils

Dyess AFB soils are primarily members of the Sagerton-Rowena-Rotan association (Figure 2-3), which are deep, noncalcareous to calcareous clay loams (SCS 1976). This association occurs on lands that are nearly level to gently sloping and comprises up to 45 percent of the soils in Taylor County. Sagerton soils are deep, nearly level to gently sloping, well-drained, loamy soils that formed in calcareous loamy sediment. At Dyess AFB, these occur on broad uplands with slopes of 0 to 1 percent, or as urban complexes with slopes of 0 to 3 percent. Rowena soils consist of deep, flat to gently sloping, well-drained, loamy soils that formed in calcareous clayey to loamy sediments. The Rowena soil that occurs on base is an urban complex with 0 to 1 percent slopes. Rotan soils are deep, nearly level to gently sloping, well-drained soils of uplands. They were formed in calcareous sediment. Slopes range from 0 to 3 percent.

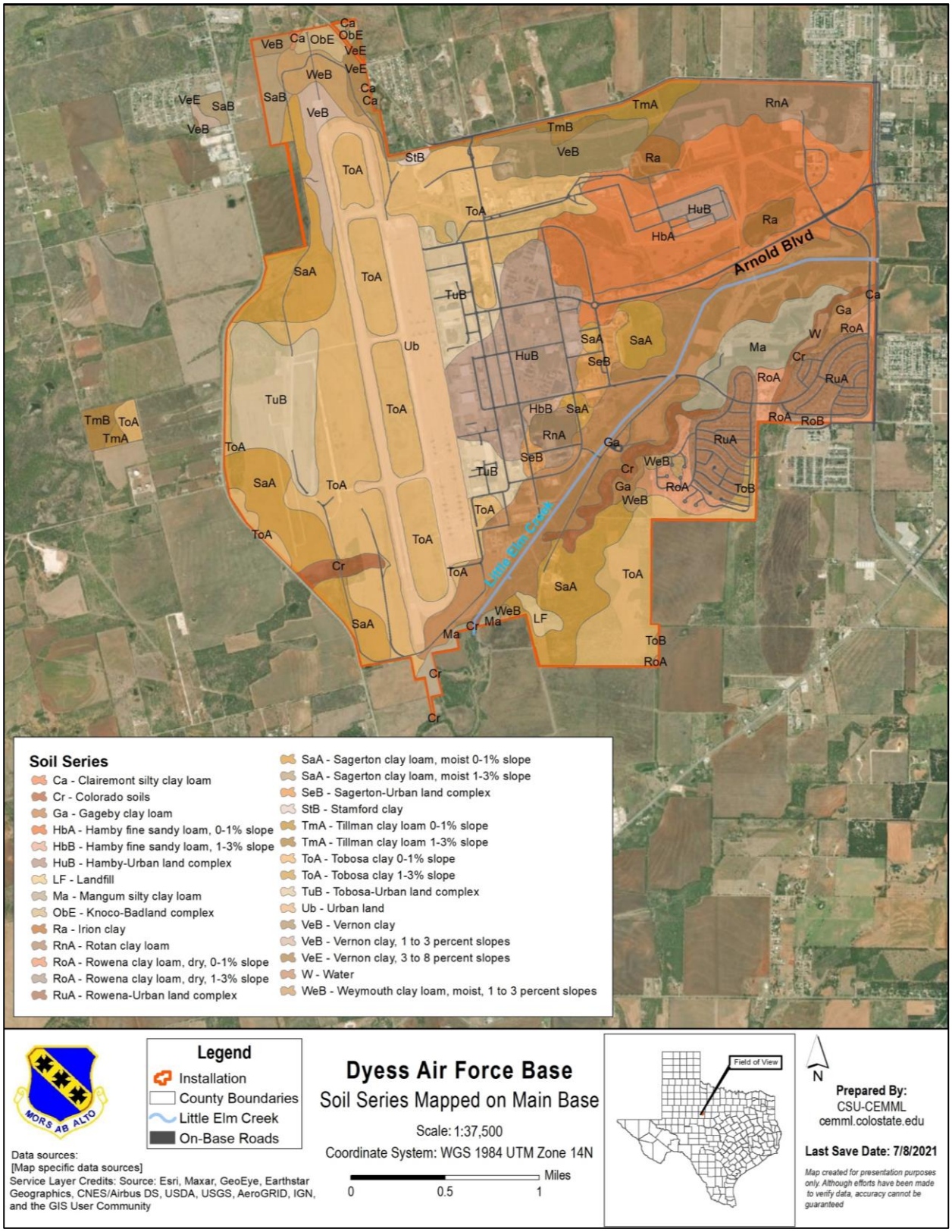

Figure 2-3. Soil series mapped on the main base of Dyess Air Force Base.

Other soil series found on base include Gageby, Hamby, Mangum, Randall, Tobosa, and Vernon. The Gageby series soils are deep, nearly level, well-drained, loam soils on bottomlands. They typically occur on the intermittent floodplain associated with Little Elm Creek. Hamby soils are deep, nearly level to gently sloping, well-drained, loamy and sandy soils of uplands with slopes of 0 to 3 percent. Mangum soils consist of deep, nearly level, well to moderately-drained clayey soils of floodplains. The soils were formed in clayey alluvium. Mangum soils on base are confined to the floodplain of Little Elm Creek. Randall soils occur in the bottoms of enclosed depressions and intermittent lakes or playas. They are deep, nearly level, and poorly-drained. Tobosa soils consist of deep, nearly level to gently sloping, well-drained clayey soils on uplands. At Dyess AFB these soils are associated with concave areas of uplands with 0 to 15 percent slopes, or metropolitan areas with 0 to 3 percent slopes. Vernon soils are moderately deep, gently to strongly sloping, well-drained, clayey soils on uplands. They formed in calcareous clayey shale. The Vernon soil on base occurs on convex upland ridges with slopes of 1–3% (TPWD 1994, SCS 1976).

Randall clay is classified by the United States Department of Agriculture, Soil Conservation Service (SCS) (1993) as a Hydric Soils Criteria Code 3. Rotan clay loam, Rowena clay loam, and Tobosa clay inclusions also are classified as a Hydric Soils Criteria Code 3 by the SCS ponding criteria (SCS 1993). The local landforms are depressions that frequently contain ponded water for long or very long duration during the growing season (SCS 1976, 1993). The wetlands delineation report (USAF 1995) indicated that areas of Colorado, Gageby, and Weymouth soils also exhibited properties of hydric soils.

2.2.4 Hydrology

The portion of the Little Elm Creek watershed studied during the Dyess AFB 100-year floodplain survey stretches from its headwaters in the Callahan Divide area to a point 1,100 feet east of Dyess AFB that corresponds to the confluence of the Little Elm Creek main channel and an unnamed tributary that drains the golf course and base housing (Figure 2-4). The Callahan Divide is a steep escarpment that marks the border between the Edwards Plateau, which drains to the Colorado River, and the Central Rolling Red Plains, which drain to the Clear Fork of the Brazos River. Waters from the Little Elm Creek, after joining Elm Creek, flow to the northeast and eventually flow into the Clear Fork of the Brazos River after passing through Lake Fort Phantom located to the north of Abilene (Westin 1995). The Little Elm Creek watershed drains 55.9 square miles (35,709.8 acres).

An unnamed creek has been channelized and impounded to create Lake Totten between the golf course and base housing areas. Ponds of anthropogenic origin, channelized drainage ways, and depressional areas also occur within the study area, which encompassed the whole base (United States Army Corps of Engineers [USACE] 1995).

Lake Totten is a shallow, man-made recreational water body and has a surface area of approximately 10 acres when full. Runoff from housing and a channelized, un-named tributary feed the lake from the southeast. When the lake is full, water exits over a spillway at the east end.

Two storage ponds have been constructed to supply the effluent irrigation system. One located in the central portion of the golf course covers roughly 4.5 acres and has a capacity of 9 million gallons. The second is located east of the hospital and south of the picnic grounds and covers approximately 2.75 acres. This pond has a capacity of nearly 13 million gallons. Water levels are maintained at a fairly constant level via a pipeline from the city of Abilene.

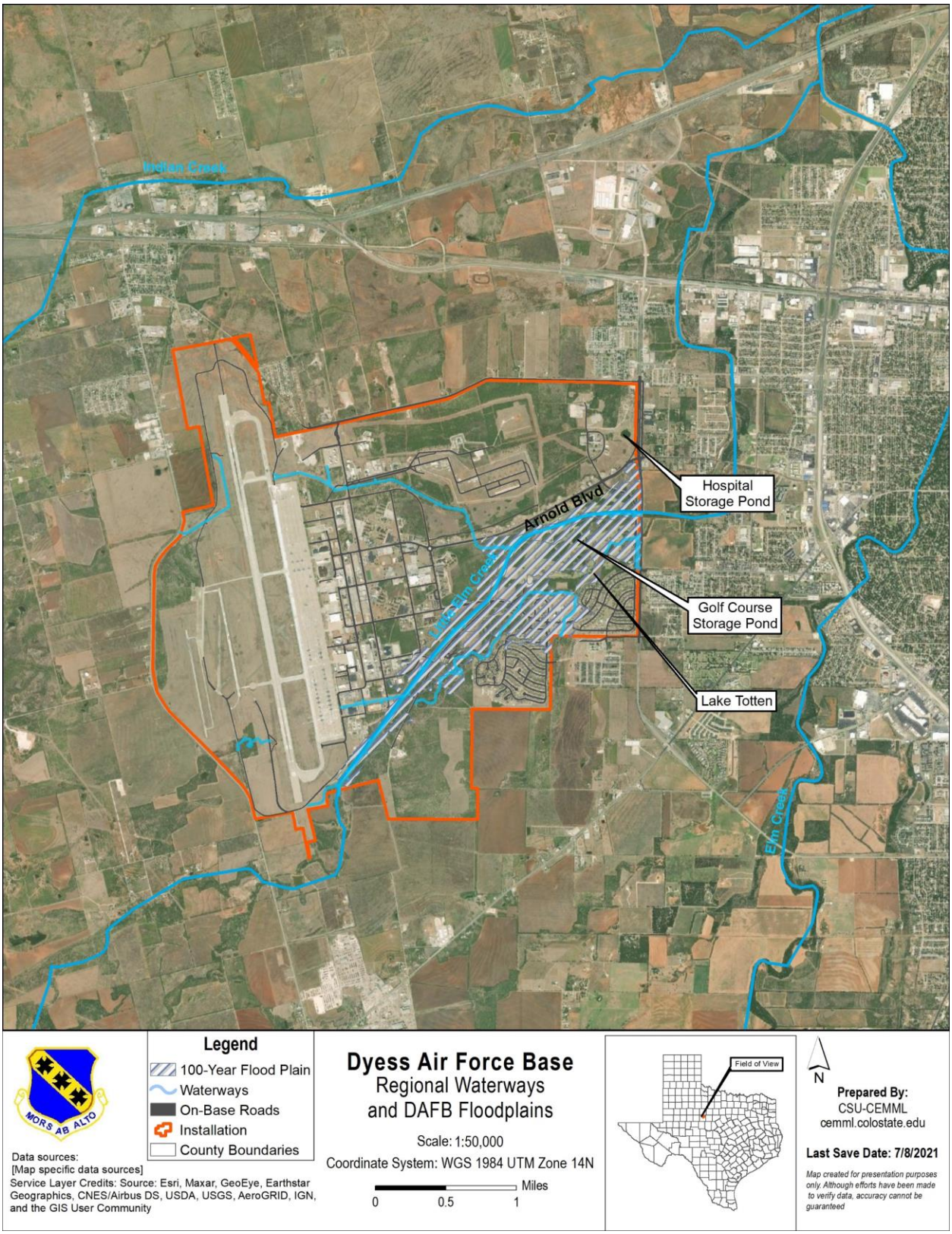

Figure 2-4. Regional waterways, floodplains, and water storage on Dyess Air Force Base.

2.2.4.1 Stream Channel Modeling

Modeling of stream channel overflow (or flood modeling) was conducted for Dyess AFB to examine the extent of flooding along Little Elm Creek associated with climate projections. Flood modeling did not consider flooding of independent surface bodies, stormwater systems, or surface ponding. Flood modeling was conducted using local watershed characteristics and the design storms generated from climate projection data (Table 2-6). The projected design storms do not represent extreme weather events (e.g., hurricanes, extraordinary storm fronts).

Inundation projections were influenced by four variable inputs: (1) variation between design storms in total precipitation, (2) variation in the daily distribution of precipitation over the three-day period, (3) land-cover changes over the watershed area used in hydrologic modeling, and (4) land-cover changes within the installation used in hydraulic modeling.

Projected inundation associated with each climate scenario and the relative change from baseline conditions are summarized in Table 2-7. The spatial extent of projected flooding is depicted in a series of maps included in the Hydrology Appendix of the CEMML (2019) climate change report. Projected changes in stream channel overflow can be used to assess potential flooding vulnerabilities among species, habitats, military mission, and both built and natural infrastructure. Flood modeling projected decreased inundation area along Little Elm Creek associated with the decreased precipitation amounts for the modeled storms. Nonetheless, roads and bridges that cross Little Elm Creek and low-lying areas adjacent to the drainage (such as along the Mesquite Grove Golf Course) still may be vulnerable to inundation. All areas at risk for flooding fall within the 100-year floodplain in all scenarios; however, the existing challenges associated with maintaining drainage through the Dyess AFB stormwater system, including the canals that have become choked with vegetation, may continue under these precipitation patterns. Maintaining the channelized streams and ongoing monitoring of stormwater flow will be required in the long term.

Table 2-7. Projected inundation from stream channel overflow.

	Baseline	**RCP 4.5**		**RCP 8.5**	
	2000	**2030**	**2050**	**2030**	**2050**
Projected inundation (acres)	335	344	120	100	120
Change in inundation area from baseline (acres)		9	-215	-235	-215
Percent change from baseline		2.6	-64.1	-70.1	-64.2

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

The National Hierarchical Framework of Ecological Units (also known as Bailey's Ecoregions) is a regionalization classification and mapping system that links soils, physiography, and habitat types to stratify

the landscape into progressively smaller areas. North America is divided into a hierarchy of domains, divisions, provinces, and sections based on climate, vegetation, and topography.

The ecosystem classification of Dyess AFB is Dry (Domain), Tropical/Subtropical Steppe (Division), and Southwest Plateau and Plains Dry Steppe and Shrub (Province). The base is within the Rolling Plains (315C) Section of the Central Lowlands geomorphic province, and the Kansan biotic province. Subsection classification is the Mesquite Plains.

According to Conner (1976), there are six different range sites on Dyess AFB characterized by their underlying soils, including Clay Loam, Clay Flat, Shallow Clay, Clayey Bottomland, Loamy Bottomland, and Sandy Loam. The potential natural vegetation of these sites includes several grassland types typical of the Rolling Plains Natural Region (LBJ School of Public Affairs 1976). Under ideal conditions, soils of the Clay Loam, Shallow Clay, and Clayey Bottomland range sites would support mid-height grassland of the Sideoats Grama Series defined by the Texas Natural Heritage Program (1992). Sandy Loam and Loamy Bottomland range sites would support mid- to tall-grass grasslands of the Little Bluestem-Indiangrass Series. In Loamy Bottomland situations, the grassland might form a mosaic with Sugarberry-Elm Series deciduous woodlands. Soils of the Clay Flat range site would support a shortgrass to mid-height grass grassland of the Tobosa Series.

During the climate change analysis, using the United States Geological Survey (USGS) National Gap Analysis Project (GAP) Land Cover 2011 classification, five primary natural ecosystems were identified on Dyess AFB (CEMML 2019). These five ecosystems are mesquite woodland, shrubland, prairie & mesquite savannah, riparian, and open water. The area of these natural ecosystems as well as developed land and barren land areas are summarized in Table 2-8.

Table 2-8. Ecosystem coverage by area.

Ecosystem Type	Area (acres)	Coverage (percent)
Mesquite Woodland	1308.7	24.4
Shrubland	716.6	13.4
Prairie & Mesquite Savannah	369.4	6.9
Riparian	75.1	1.4
Open Water	6.2	0.1
Developed and Barren Land	2887.4	53.8

2.3.2 Vegetation

2.3.2.1 Historical Vegetation Cover

The topography and vegetation of the Rolling Plains region of Texas are diverse. Terrain and plant communities vary from the relatively flat midgrass areas of sideoats grama (*Bouteloua curtipendula*) to the rough broken slopes supporting a redberry juniper (*Juniperus pinchotii*)-midgrass or Mohr shin oak (*Quercus mohriana*). Gently rolling hills support a little bluestem-sideoats grama series, whereas the major drainage and floodplains of the Red, Brazos, and Colorado Rivers may support a mixture of tall and midgrasses within a deciduous hardwood corridor. On many sites, the presence of sideoats grama and/or little bluestem (*Schizachyrium scoparium*) best characterize the mixed prairie on the Rolling Plains. Other plants that are widespread throughout the region include mesquite, lotebush (*Ziziphus obtusifolia*), prickly

pear, Texas grama (*Bouteloua rigidiseta*), Texas wintergrass (*Nassella leucotricha*), silver bluestem (*Bothriochloa laguroides*), vine mesquite (*Hopia obtusa*), and Arizona cottontop (*Digitaria californica*). A large and diverse component of forbs and legumes, as well as other grasses and woody plants, are often found in association with the dominant grasses.

Approximately two-thirds of the Rolling Plains is still in rangeland. Cattle are the primary livestock, most of which are grazed on large ranches as cow-calf operations. Although the original prairie vegetation included tall- and mid-height grasses, grazing pressure over time has led to the increase of numerous introduced grasses, forbs, shrubs, and small trees. For example, mesquite is a common invader on all soils of the Rolling Plains (Gould 1975). Mesquite-invaded grasslandis the primary natural resource challenge at Dyess AFB, which is working to manage them through the use of rotational burning.

Since Taylor County lies near the boundary of two climatic zones, this also affects the local flora and fauna. The area has been referred to as the Kansan biotic province (Blair 1950) with forest fauna to the east and grassland fauna to the west. Within this province, the Abilene area is subdivided into the Mesquite Plains district, which is characterized by open stands of mesquite and a few other shrubs with a ground cover of various grass species.

Prior to colonization, the primary ecological forces in the Texas prairies were fire and bison, both mediated by Native peoples' management. At one time, upwards of 30 million bison roamed the North American plains, including Texas (Flores 1991). Their grazing, wallowing, and passage over the land worked in tandem with fires ignited by lightning and people to maintain vast expanses of grasslands and savannah by supporting fast nutrient cycling, suppressing seedling shrub growth, and favoring high biodiversity through a preference for grazing grasses over forbs (Knapp et al. 1999). Bison prefer to graze in recently burned sites, which likely compounded the effects of fire and bison activities to suppress shrub encroachment and stimulate grass growth (Allred et al. 2011).

The resulting, post-colonial Rolling Hills landscape of dense mesquite thickets interspersed with occasional remnants of shortgrass and mid-height prairies developed in the absence of these twin disturbances as fires were suppressed, bison were eradicated, and domestic cattle became the dominant grazers. Overgrazing by cattle is often cited as a primary driver of mesquite encroachment because cattle are restricted in their movements by fencing; thus, they can target grazing-tolerant grasses to the point of suppressing them and allowing shrub encroachment, particularly in the absence of fire which would kill seedling mesquite and Ashe juniper (*Juniperus ashei*) (Stambaugh et al. 2014). In addition, cattle readily consume mesquite seedpods, dispersing and depositing them in a nutrient-rich environment in which they can readily become established (Ansley and Hart 2012).

2.3.2.2 Current Vegetative Cover

Biological information included in this chapter of the INRMP was summarized from the following studies.

- In 1995, Dyess AFB retained the TPWD to conduct a biological survey to inventory plants and animals that exist or have potential to occur at Dyess AFB, including species with special legal or biological status, and described the various range sites and vegetative communities present.
- In 2003, the United States Army Research and Development Center (USARDC) conducted a vegetation analysis of the diversion ditches on the installation.
- In spring 2004, Turner Biological, Inc., conducted a special-status habitat inventory of Dyess AFB and a modified point-count survey of neo-tropical migratory birds.
- In 2004, the Natural Resource Conservation Service (NRCS) conducted a comprehensive vegetation inventory along permanent survey transects.

- In 2005, a comprehensive invasive species inventory was initiated.
- In spring 2005, a modified point-count of neo-tropical migrants was accomplished.
- Mesquite habitats were aged by using historical aerial photographs on file in the natural resources office.
- Vegetation maps completed in 2019 using the National Vegetation Classification Standard (Appendix D- *Vegetation Maps*)

The current Dyess AFB plant checklist includes 344 species representing 76 families and 224 genera that have been identified on base. The vegetation checklist is broken down into three lists that include 65 grass and 7 sedge/rush species, 50 woody and vine species, and 222 forb species. The honey mesquite (*Prosopis glandulosa*)/Texas wintergrass association is widely distributed and is dominant on upland clay soils. Mesquite is a deciduous, thorny shrub or small tree with a high degree of variation in growth form. Allowed to mature naturally, the tree will reach heights of 20–30 feet with an open crown. If the aboveground growth is damaged or removed, dormant buds located on the underground stem initiate new growth, resulting in a many-stemmed bush or small tree, often 10–15 feet tall. Shade-tolerant Texas wintergrass, a cool season bunchgrass, remains viable throughout the mild Texas winters, producing seed and going dormant during hot, dry periods. More permeable sandy loam sites support a more diverse composition of native grasses/forbs than heavier clay sites.

Grassland Species

Local grasslands are composed of short- to mid-height grasses, including Texas wintergrass, perennial threeawn (*Aristida purpurea*), sand dropseed (*Sporobolus cryptandrus*), white tridens (*Tridens albescens*), Texas grama, silver bluestem, Arizona cottontop, buffalograss (*Bouteloua dactyloides*), plains bristlegrass (*Setaria leucopila*), hooded windmillgrass (*Chloris cucullata*), sideoats grama, and vine mesquite. Intermixed with these dominant grasses is a diverse assemblage of native forb species, which include western ragweed (*Ambrosia psilostachya),* western yarrow (*Achillea millefolium*), lazy daisy (*Aphanostephus* sp.), Texas thistle (*Cirsium texanum*), Indian blanket (*Gaillardia pulchella*), gray goldenaster (*Heterotheca canescens*), prairie coneflower (*Ratibida columnifera*), greenthread (*Thelesperma filifolium*), peppergrass (*Lepidium austrinum*), lambsquarters (*Chenopodium album*), bluets (*Stenaria nigricans*), verbena (*Glandularia bipinnatifida*), and silverleaf nightshade (*Solanum elaeagnifolium*). Redberry and Ashe juniper are sparsely scattered within the mesquite grasslands in the northeastern portion of the base. Lotebush, prickly pear, tasajillo (*Cylindropuntia leptocaulis*), and yucca (*Yucca* spp.) may be present to a minor extent. A complete list of grass species is located in Table 2-9.

Table 2-9. Graminoid (grasses and sedges) species documented on Dyess Air Force Base.

Genus	Species	Common Name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Grasses (Poaceae)							
Andropogon	*glomeratus*	Bushy bluestem		X			
Aristida	*dichomata*	Poverty Grass			X		
Aristida	*purpurea*	Perennial threeawn		X			X
Arundo	*donax*	Giant Reed[4]	X				
Avena	*fatua*	Wild oats[5]	X	X			
Bothriochloa	*barbinodis*	Cane Bluestem					X
Bothriochloa	*ischaemum*	King Ranch bluestem[5]		X			X
Bothriochloa	*laguroides*	Silver bluestem	X	X			X
Bouteloua	*curtipendula*	Sideoats grama		X			
Bouteloua	*rigidiseta*	Texas grama	X	X			X
Bouteloua	*trifida*	Red grama		X			
Bromus	*catharticus*	Rescuegrass[5]	X	X			X
Bromus	*japonicus*	Japanese brome[5]	X	X			X
Bouteloua	*dactyloides*	Buffalograss	X	X	X	X	X
Cenchrus	*spinifex* (*incertus*)	Field sandbur	X	X			X
Chloris	*cucullata*	Hooded windmillgrass	X	X			X
Chloris	*verticillata*	Tumble windmillgrass	X	X			X
Cynodon	*dactylon*	Bermudagrass[5]	X	X	X	X	
Digitaria	*californica*	Arizona cottontop		X			
Digitaria	*cognata*	Fall witchgrass		X			
Digitaria	*sanaguinalis*	Crabgrass[5]		X			
Echinochloa	*colona*	Jungle Rice				X	
Echinochloa	*crus-galli*	Barnyardgrass[5]		X	X		
Echinochloa	*crus-pavonis*	Gulf cockspur grass[5]				X	
Elymus	*canadensis*	Canada wildrye	X	X		X	X
Elymus	*virginicus*	Virginia wildrye	X	X			
Eragrostis	*cilianensis*	Stinkgrass		X			

Table 2-9. Graminoid (grasses and sedges) species documented on Dyess Air Force Base.

Genus	Species	Common Name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Eragrostis	*curvula*	Weeping Love Grass[5]			X		
Eragrostis	*intermedia*	Plains lovegrass		X			
Eragrostis	*secundiflora*	Red lovegrass		X			X
Eragrostis	*tricoides*	Sand lovegrass[5]		X			
Eragrostis	spp.	Lovegrass sp.					X
Erioneuron	*pilosum*	Hairy tridens		X	X		
Pleuraphis	*mutica*	Tobosa		X			
Elymus	*elymoides*	Squirreltail		X			
Hordeum	*pusillum*	Little barley	X	X			X
Leptochloa	*dubia*	Green sprangletop		X			
Leptochloa	*fusca*	Mexican Sprangletop				X	
Limnodea	*arkansana*	Ozarkgrass		X			
Nassella (Stipa)	*leucotricha*	Texas wintergrass	X	X			X
Panicum	*capillare*	Witchgrass		X			
Panicum	*coloratum*	Kleingrass[5]	X	X			
Panicum	*hallii* var. *filipes*	Filly panicum				X	
Panicum	*miliaceum*	Broomcorn millet[5]	X				
Hopia	*obtusa*	Vine mesquite		X		X	
Panicum	*oligosanthes*	Scribners panicum					
Panicum	*virgatum*	Switchgrass		X			
Pascopyrum	*smithii*	Western wheatgrass		X			
Paspalum	*dilatatum*	Dallisgrass[5]	X	X			
Paspalum	*distichum* var. *distichum*	Knotgrass				X	
Paspalum	*setaceum*	Thin paspalum		X			
Phalaris	*caroliniana*	Wild Canary Grass	X			X	
Phleum	*pratense*	Timothy[5]		X			
Poa	*arachnifera*	Texas bluegrass		X			
Polypogon	*monspeliensis*	Rabbit's Foot[5]	X			X	
Schedonnardu	*paniculatus*	Tumblegrass		X			
Schizachyrium	*scoparium*	Little bluestem		X			X
Setaria	*leucopila*	Plains bristlegrass	X	X			X

Table 2-9. Graminoid (grasses and sedges) species documented on Dyess Air Force Base.

Genus	Species	Common Name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Setaria	*pumila*	Yellow foxtail		X			
Setaria	*reverchonii*	Reverchon's bristlegrass	X	X			X
Sorghum	*halapense*	Johnsongrass[5]	X	X	X	X	X
Sporobolus	*drummondii*	Meadow dropseed		X			
Sprorobolus	*cryptandrus*	Sand dropseed	X	X			
Tridens	*albescens*	White tridens	X	X		X	
Tridens	*flavus*	Purpletop					X
Tridens	*muticus* var. (*elongatus*)	Rough tridens		X			
Sedges (Cyperaceae)							
Bolboschoenus	*maritimus*	Salt-Marsh Bulrush				X	
Carex	*tetrastachya*	Britton's Sedge				X	
Cyperus	spp.	Sedges					
Cyperus	*erythrorhizos*	Red-Foot				X	
Cyperus	*esculentus*	Chufa				X	
Eleocharis	*palustris* (*macrostachya*)	Common Spike-Rush				X	
Eleocharis	*quadragulata*	Square-Stem Spike-Rush					
Juncus	*torreyi*	Rush				X	
Schoenoplectus	*acutus*	Hard-Stem Bulrush				X	
Schoenoplectus	*americanus*	Chairmaker's Bulrush					

[1] Natural Resources Conservation Service.
[2] United States Army Corps of Engineers.
[3] Texas Natural Heritage Program.
[4] Noxious species.
[5] Nonnative species.

Woody Species

A summary of trees, shrubs, and woody vines identified for Dyess AFB are shown in Table 2-10. Checklists from the 2005 Invasive Plan Survey, the 2004 NRCS Survey, 2003 Army Engineers Survey (Fischer et. al. 2003), 1995 USACE Wetlands Survey (USACE 1995), and 1994 survey conducted by the Texas Natural Heritage Program ([TNHP] TPWD 1994). Nomenclature has been updated to reflect Shinners & Mahler's

Flora of North Central Texas (Diggs et al. 1999). Species not included in either Shinners & Mahler's, or Mahler's Flora of Taylor County (Mahler 1973) are indicated by "*" in the Species column of Table 2-10.

Forb Species

A summary of forb species identified for Dyess AFB is presented in Table 2-11. In addition to species noted in this study, checklists from the 2004 NRCS Survey, 2003 Army Engineers Survey (Fischer et al. 2003), 1995 USACE Wetlands Survey (USACE 1995), and 1994 survey conducted by the Texas Natural Heritage Program (TPWD 1994). Nomenclature has been updated to reflect Shinners & Mahler's Flora of North Central Texas (Diggs et al. 1999). In the Species column of Table 2-11, species not included in either Shinners & Mahler's, or Mahler's Flora of Taylor County (Mahler 1973) are indicated by "*" and species identified from Mahler's Flora of Taylor County are indicated by "**".

Table 2-10. Woody species documented on Dyess Air Force Base.

Genus	Species[1]	Common Name1	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Yuccas (Agavaceae)							
Yucca	*glauca*	Soapweed yucca			X		
Yucca	*constricta*	Buckley's yucca[4]					X
Yucca	*treculeana*	Spanish Dagger[4]					
Yucca	spp.	Yucca	X	X			
Sumacs (Anacardiaceae)							
Rhus	*microphylla*	Littleleaf sumac	X	X			
Toxicodendron	*pubescens*	Poison oak		X			
Sunflowers (Asteraceae)							
Artemisia	*filifolia*	Sand sagebrush			X		X
Baccharis	*neglecta*	Roosevelt weed					
Baccharis	*salicina*	Willow baccharis		X			
Barberry (Berberidaceae)							
Mahonia	*trifoliolata*	Algerita	X	X			
Bignonias (Bignoniaceae)							
Campsis	*radicans*	Trumpet-creeper[5]	X				
Cacti (Cactaceae)							
Echinocactus	*texensis*	Horsecrippler		X			
Mammillaria	*heyderi*	Nipple cactus		X			
Opuntia	spp.	Prickly pear	X	X			
Cylindropuntia	*leptocaulis*	Tasajillo					X
Opuntia	*lindheimeri*	Texas prickly pear			X		X

Table 2-10. Woody species documented on Dyess Air Force Base.

Genus	Species[1]	Common Name1	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Opuntia	*macrorhiza*	Plains prickly pear					X
Staff-trees (Celastraceae)							
Euonymus	*atropurpureus*	Spindletree[6]	X				
Cypresses (Cupressaceae)							
Juniperus	*ashei*	Ashe juniper	X	X			
Juniperus	*pinchotii*	Redberry juniper		X			X
Ephedras (Ephedraceae)							
Ephedra	*antisyphilitica*	Ephedra		X			
Ephedra	*pedunculata* (?)	Vine joint fir[4]	X				
Peas (Fabaceae)							
Acaciella	*angustissima*	Prairie Acacia			X		
Vachellia	*farnesiana*	Huisache			X		
Senegalia	*greggii*	Catclaw acacia		X			
Vachellia	*rigidula** [8]	Blackbrush acacia[4]			X		
Acacia	*roemeriana*	Roemer's acacia					X
Albizia	*julibrissin*	Mimosa[7]		X			
Mimosa	*aculeaticarpa* var.	Catclaw Mimosa					X
Mimosa	*nuttallii*	Nuttall's sensitive-		X	X		
Prosopis	*glandulosa*	Honey mesquite	X	X	X		X
Walnuts (Juglandaceae)							
Carya	*illinoinsis*	Pecan			X		
Moonseeds (Menispermaceae)							
Menispermum	*canadense*	Moonseed vine		X			
Mulberries (Moraceae)							
Morus	spp.	Mulberry		X			
Olives (Oleaceae)							
Fraxinus	*pennsylvanica*	Green ash	X				
Menodora	*heterophylla*	Redbud menodora					X
Pines (Pinaceae)							
Pinus	*brutia* var. *eldarica*	Mondel pine					
Buttercups (Ranunculaceae)							
Clematis	*drummondii*	Old man's beard	X	X			X
Clematis	*pitcheri*	Purple leather flower		X			
Clematis	*texensis*	Scarlet clematis[4]	X				

Table 2-10. Woody species documented on Dyess Air Force Base.

Genus	Species[1]	Common Name1	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Coffeeberries (Rhamnaceae)							
Condalia	*hookeri*	Bluewood[4]	X				
Ziziphus	*obtusifolia*	Lotebush	X	X			X
Roses (Rosacea)							
Photinia	X *fraseri*	Red-tip photinia					
Coffees (Rubiaceae)							
Cephalanthus	*occidentalis*	Buttonbush[5]	X				X
Citrus (Rutaceae)							
Zanthoxylum	*fagara*	Lime pricklyash		X			
Willows (Salicaceae)							
Salix	spp.	Willow	X	X			
Salix	*nigra*	Black willow		X	X		
Populus	*deltoides*	Eastern cottonwood					
Soapberries (Sapindaceae)							
Cardiospermum	*corindum*	Balloon vine					
Sapindus	*saponaria* var. *drummondii*	Soapberry[5]	X	X			X
Sapotes (Sapotaceae)							
Sideroxylon	*lanuginosum*	Bumelia	X	X			X
Greenbriars (Smilacaceae)							
Smilax	spp.	Greenbriar	X	X			
Nightshades (Solanaceae)							
Lycium	*berlandieri*	Wolfberry		X			X
Tamarisks (Tamaricaceae)							
Tamarix	spp.	Saltcedar[6]	X	X	X		
Elms (Ulmaceae)							
Celtis	*laevigata* var.	Hackberry	X	X			X
Ulmus	*americana*	Elm		X			X
Mistletoes (Viscaceae)							
Phoradendron	*tomentosum*	Mistletoe[5]	X	X			X
Grapes (Vitaceae)							
Cissus	*incisa*	Ivy treebine[5]	X	X			X

[1] Natural Resources Conservation Service.

[2] United States Army Corps of Engineers.

[3] Texas Natural Heritage Program.
[4] Species is endemic to Texas.
[5] Species can be toxic to humans.
[6] Listed by the Texas Department of Agriculture or Texas Parks and Wildlife Department as a noxious species.
[7] Nonnative species.
[8] Species not included in either Shinners & Mahler's or Mahler's Flora of Taylor County (Mahler 1973).

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Acanthus (Acanthaceae)							
Dyschoriste	*linearis*	Narrow-leaf	X				
Justica	*americana*	American water willow					
Siphonoglossa	*pilosella*	Tube-tongue		X	X		
Water Plantains (Alismataceae)							
Echinodorus	*berteroi*	Burhead	X			X	
Sagittaria	*lancifolia*	Bull tongue arrowhead					
Amaranths (Amaranthaceae)							
Amaranthus	*acanthochiton*	Greenstripe		X			
Amaranthus	spp.	Pigweed	X	X			
Amaranthus	*blitoides*	Postrate pigweed	X	X			
Amaranthus	*palmeri*	Carelessweed		X		X	
Amaranthus	*hybridus*		X				
Carrots (Apiaceae)							
Ammoselinum	*popei*	Pope sandparsley					X
Bifora	*americana*	Prairie bishop	X		X		
Daucus	*pusillus*	Wild carrot	X	X			X
Spermolepis	*echinata*	Bristly scaleseed					X
Torilis	*arvensis*	Beggars lice[4]		X			
Milkweeds (Asclepiadaceae)							
Asclepias	*asperula*	Antelopehorn	X	X			X
Asclepias	*engelmanniana*	Narrowleaf	X	X	X		
Asclepias	*oenotheroides*	Hierba de zizotes					X
Asclepias	spp.	Milkweed		X			
Sunflowers (Asteraceae)							
Achillea	*millefolium*	Western yarrow	X	X			

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Amblyolepis	*setigera*	Huisache daisy		X	X		
Ambrosia	*confertiflora*	Field ragweed					X
Ambrosia	*psilostachya*	Western ragweed	X	X	X		X
Ambrosia	*trifida*	Giant ragweed	X	X			
Aphanostephus	*ramosissimus*	Lazy daisy					X
Aphanostephus	*skirrhobasis*	Lazy daisy	X	X			
Artemisia	*campestris caudata*	Wormwood					X
Artemisia	*ludoviciana*	Mexican sagewort		X			
Aster	spp.						X
Aster	*ericoides*	Heath aster		X			
Symphyotrichum	*subulatum*	White aster		X	X	X	
Berlandiera	*lyrata*	Green-eyes					X
Centaurea	*americana*	Basketflower		X			
Centaurea	*melitensis*	Malta star thistle[4]		X			
Cirsium	*ochrocentrum*	Yellow spine thistle		X			X
Cirsium	*texanum*	Texas thistle	X	X	X		X
Cirsium	*undulatum*	Wavy-leaf thistle	X				X
Conyza	*bonariensis** [9]	Hairy fleebane		X			
Conyza	*canadensis*	Horse-tail conyza	X			X	X
Coreopsis	*wrightii (basalis)*	Coreopsis			X		
Coreopsis	*tinctoria*	Golden tickseed	X	X	X	X	
Englemannia	*pinnatifida*	Englemann's daisy	X	X			X
Erigeron	*modestus*	Plains fleabane					X
Evax	*prolifera*	Bighead pygmycudweed					X
Evax	*verna*	Rabbit's tobacco	X	X			X
Gaillardia	*pinnatifida** [9]	Yellow gaillardia			X		
Gaillardia	*pulchella*	Indian blanket	X	X	X		X
Gaillardia	*suavis*	Fragrant guellarea	X	X	X		
Grindelia	*papposa*	Saw-leaf daisy	X	X	X		X
Amphiachyris	*dracunculoides*	Prairie broomweed[5]	X	X		X	X
Gutierrezia	*sarothrae*	Broom snakeweed	X	X	X		
Helenium	*amarum*	Yellow bitterweed		X			X

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Helenium	*microcephalum*	Small-head	X				
Helenium	*flexuosum** [9]	Sneezeweed				X	
Helenium	*quadridentatum** [9]	Sneezeweed		X			
Helianthus	*annuus*	Annual sunflower	X	X	X		
Helianthus	*ciliaris*	Blue-weed	X				
Helianthus	*maximiliani*	Maximillian		X		X	
Heterotheca	*canescens*	Gray goldenaster		X			
Heterotheca	*stenophylla*	Stiffleaf false goldenaster	X				X
Heterotheca	*subaxillaris*	Camphor daisy					X
Hymenopappus	*scabiosaeus*	Wooly white	X	X			X
Hymenoxis	*odorata*	Poison bitterweed	X				
Iva	*annua** [9]	Marsh elder				X	
Iva	*frutescens*	Sump-weed				X	
Lactuca	spp.						X
Lactuca	*serriola*	Prickly lettuce[4]	X				
Liatris	*punctata** [9]	Dotted gayfeather	X	X			X
Lindheimera	*texana*	Texas yellow star	X	X			X
Lygodesmia	*texana*	Skeleton plant		X			
Machaeranthera	*pinnatifida*	Spiny aster	X	X			X
Melampodium	*leucanthum*	Rockdaisy	X	X			
Packera	*glabella*	Butterweed				X	
Parthenium	*hysterophorus*	False ragweed					X
Pyrrhopappus	*pauciflorus*	Small-flower desert-chicory					X
Pluchea	*odorata*	Marsh fleabane				X	
Ratibida	*columnifera*	Prairie coneflower	X	X	X		X
Senecio	*longilobus*** [10]	Threadleaf	X				X
Solidago	spp.	Golden rod		X			
Sonchus	*asper*	Sow thistle[4]		X			X
Taraxacum	*officinale*	Dandelion[4]		X			X
Tetraneuris	*scaposa*	Plains yellow daisy		X			
Thelesperma	*filifolium*	Greenthread	X	X			X

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Tragopogon	spp.	Salsify					X
Tragopogon	*dubius*	Goats beard	X	X			
Verbesina	*encelioides*	Cowpen daisy		X			
Vernonia	*baldwinii*	Western ironweed			X		
Vernonia	*marginata*	Plains ironweed	X				
Xanthisma	*texanum*	Sleepy daisy	X	X			X
Xanthium	*strumarium*	Abrojo				X	X
Borages (Boraginaceae)							
Lappula	*occidentalis* var. *cupulata*	Western sticktight		X			X
Mustards (Brassicaceae)							
Descurainia	*pinnata*	Tansy mustard[5]		X			X
Draba	*platycarpa*	Whitlow-wort					X
Lepidium	*austrinum*	Peppergrass	X	X			
Lepidium	*oblongum*	Cutleaf pepperweed					X
Lesquerella	*argyraea*	Silver bladderpod		X			
Lesquerella	*gordonii*	Gordon bladderpod					X
*Nerisyrenia** [9]	*camporum** [9]	Messa greggia			X		
Rapistrum	*rugosum*	Ball mustard[6]	X				
Sysmbrium	*altissimum*	Tumble mustard				X	
Harebells (Campanulaceae)							
Triodanis	*perfoliata*	Venus looking glass		X			
Pinks (Caryophyllaceae)							
Loeflingia	*squarrosa*	Spreading loeflingia					X
Silene	*antirrhina*	Sticky catchfly					X
Goosefoots (Chenopodiaceae)							
Chenopodium	*album*	Common lambsquarters[4]	X	X			
Chenopodium	*berlanderi*	Berlandier					X
Chenopodium	*leptophyllum*	Narrowleaf		X			
Bassia	*scoparia*	Kochia[4]	X	X			
Salsola	*tragus*	Russian thistle[4]	X	X			
Dayflowers (Commelineaceae)							

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Commelina	*erecta*	Dayflower		X			
Morning Glories (Convolvulaceae)							
Convolvulus	*arvensis*	Field bindweed[6]	X				
Convolvulus	*equitans*	Texas bindweed	X	X	X		X
Evolvulus	*sericeus*	White evolvulus		X			
Squashes (Cucurbitaceae)							
Cucurbita	*foetidissima*	Stinkgourd	X	X			
Dodders (Cuscutaceae)							
Cuscuta	*cuspidata*	Dodder	X				
Spurges (Euphorbiaceae)							
Acalypha	*virginica*	Mercury		X			
Chamaesyce	*albomarginata*	White-margined	X				X
Chamaesyce	*lata*	Hoary euphorbia	X				
Chamaesyce	*serpens*	Mat euphorbia				X	
Croton	*pottsii** [9]	Potts croton					X
Croton	*texensis*	Doveweed[5]	X	X			
Euphorbia	*marginata*	Snow on the mountain[5]		X			
Euphorbia	*spathulata*	Warty spurge					X
Tragia	*ramosa*	Catnip noseburn[5]	X				
Peas (Fabaceae)							
Astragalus	*nuttallianus*	Nuttal's milkvetch		X			X
Baptisia	spp.	Wild indigo		X			
Dalea	*aurea*	Golden dalea		X			
Dalea	*enneandra*	Big-top dalea		X			X
Dalea	*multiflora*	Round-head dalea	X				
Dalea	*purpurea*	Purple prairie clover		X			
Desmanthus	*illinoensis*	Illinois bundleflower	X	X	X	X	X
Desmanthus	*velutinus*	Velvet bundleflower		X			
Hoffmanseggia	*glauca*	Hog potato	X	X	X		
Lespedeza	*stuevei*	Tall bushclover		X			
Medicago	*minima*	Bur clover[4]	X	X			X
Medicago	*polymorpha*	Bur-clover[4]					X

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Melilotus	*albus*	White sweet clover[4]	X	X			
Melilotus	*indicus*	Sour clover[4]		X			
Melilotus	*officinalis*	Yellow sweetclover					X
Mimosa	*nuttallii*	Nuttall's sensitive briar			X		X
Mimosa	*roemeriana*	Catclaw sensitive briar	X	X			
Neptunia	*lutea*	Yellow puff	X	X	X		
Pediomelum	*reverchoni*	Rock scurf pea	X				
Senna	*pumilio*	Dwarf senna		X			X
Fumitories (Fumariaceae)							
Corydalis	*micrantha*	Southern corydalis				X	
Geraniums (Geraniaceae)							
Erodium	*cicutarium*	Filaree[4]	X				X
Erodium	*texanum*	Texas storksbill	X	X		X	X
Frog's Bits (Hydrocharitaceae)							
Najas	*guadalupensis*	Southern waternymph					
Vallisneria	*americana*	Water celery					
Waterleafs (Hydrophyllaceae)							
Nama	*hispidum*	Sand bells	X	X			X
Kramerias (Krameraceae)							
Krameria	*lanceolata*	Trailing ratany	X	X			
Mints (Lamiaceae)							
Lamium	*amplexicaule*	Henbit[4]		X			X
Monarda	*citriodora*	Horsemint	X	X			
Salvia	*reflexa*	Lance-leaf sage		X			
Scutellaria	*drummondii*	Drummond's skullcap[5]	X				
Scutellaria	spp.	Skullcap		X			
Teucrium	*Cubense* var. *laevigatum*	Annual germander[7]			X		
Teucrium	*laciniatum*	Cutleaf germander		X			X
Lilies (Liliaceae)							
Cooperia	*drummondii*	Rain-lily			X		
Flaxes (Linaceae)							
Linum	*hudsonioides*	Yellow flax		X			

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Linum	*pratense*	Meadow flax		X			X
Linum	*rigidum*	Yellow flax[5]			X		
Stickleafs (Loasaceae)							
Mentzelia	*reverchonii*	Prairie stickleaf	X				
Mentzelia	*oligosperma*	Stick leaf			X		
Loosestrifes (Lythraceae)							
Ammannia	*coccinea*	Tooth cup				X	
Mallows (Malvaceae)							
Malva	spp.	Cheeseweed	X				
Malva	*leprosa*	Scurfy sida				X	
Rhynchosida	*physocalyx*	Beaked sida	X				
Sida	spp.	Sida		X			
Moonseeds (Menispermaceae)							
Cocculus	*carolinus*	Carolina moonseed	X				X
Menispermum	*canadense*	Moonseed vine[5]	X	X			
Carpetweeds (Molluginaceae)							
Mollugo	*verticilliata*	Carpetweed[4]					X
Four-o-clocks (Nyctaginaceae)							
Acleisanthes	*longiflora*	Angel trumpets	X	X	X		X
*Allionia** [9]	*incarnata*	Trailing four-o-clock			X		
Mirabilis	*linearis*	Umbrellawort		X			
Water Lilies (Nymphaeaceae)							
Nuphar	*advena*	Yellow pond lily					
Nymphaea	*odorata*	American white water lily					
Evening Primroses (Onagraceae)							
Calylophus	*hartwegii*	Sundrops					X
Oenothera	*lindheimeri*	White gaura			X		
Gaura	*longiflora*	Tall guara	X				
Gaura	*parviflora*	Lizardtail gaura					X
Gaura	*sinuata*	Wavy leaf gaura	X				
Gaura	spp.	Gaura spp.		X			X

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Gaura	*suffulta*	Bee-blossom			X		
Gaura	*villosa*	Velvet gaura		X			
Ludwigia	*peploides*	Water primrose	X				
Oenothera	*laciniata*	Cutleaf evening primrose		X			X
Oenothera	*speciosa*	Showy primrose		X	X		X
Wood Sorrels (Oxalidaceae)							
Oxalis	*stricta*	Yellow woodsorrel		X			X
Poppies (Papaveraceae)							
Argemone	*polyanthemos*	Prickly poppy	X	X			
Sesames (Pedaliaceae)							
Proboscidea	*louisianica*	Devils claw	X	X		X	
Pokeweeds (Phytolacaceae)							
Rivina	*humilis*	Pigeon berry[5]	X			X	
Plantains (Plantaginaceae)							
Plantago	*helleri*	Heller plantain					X
Plantago	*patagonica*	Bristlebract plantain					X
Plantago	*rhodosperma*	Redseed plantain					X
Plantago	spp.	Plantain		X			
Plantago	*wrightiana*	Wright's plantain	X				X
Phloxes (Polemoniaceae)							
Ipomopsis	*rubra*	Standing cypress		X			
Milkworts (Polygalaceae)							
Plolygala	*linheimeri* var. *parviflora*	Milkwort	X				
Buckwheats (Polygonaceae)							
Eriogonum	*longifolium*	Long-leaf wild buckwheat	X				
Polygonum	*amphibium* var. *eemersum*	Water smartweed				X	
Polygonum	*lapathifolium*	Willow smartweed				X	
Polygonum	*pennsylvanicum*	Pink smartweed				X	
Persicaria	*maculosa*	Lady's thumb[4]		X			
Polygonum	*striatulum** [9]	Striped knotweed				X	

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Rumex	*acetosella*	Red sorrel[4]	X	X			
Rumex	*altissimus*	Pale dock	X			X	
Rumex	*crispus*	Curly dock[4]	X	X		X	
Rumex	*hymenosepalus*	Tanner's dock			X		
Rumex	spp.						X
Pickerel-weeds (Pontederiaceae)							
Heteranthera	*dubia*	Grass-leaf mud-plantain					
Purslanes (Portulacaceae)							
Portulaca	*oleracea*	Common purslane		X			
Pondweeds (Potamogetonaceae)							
Potamogeton	*illinoensis*	Illinois pondweed					
Potamogeton	*nodosus*	Longleaf pondweed					
Stuckenia	*pectinate*	Sago pondweed					
Buttercups (Ranunculaceae)							
Anemone	*berlandieri*	Ten-petal anemone					X
Delphinium	*virescens*	White-prairie					X
Myosurus	*minimus*	Tiny mousetail				X	
Ranunculus	*sceleratus*	Blister crowfoot[5]					X
Bedstraws (Rubiaceae)							
Galium	*virgatum*	Southwest bedstraw					X
Stenaria	*nigricans*	Bluets	X	X			X
Figworts (Scrophulariaceae)							
Bacopa	spp.	Water hyssop[8]					
Castilleja	*purpurea* var. *citrina*	Prairie Indian paintbrush		X			
Nuttallanthus	*canadensis*	Canada toadflax					X
Nightshades (Solanaceae)							
Chamaesarcha	spp.						X
Physalis	spp.	Groundcherry		X			
Physalis	*heterophylla*	Clammy groundcherry[5]	X				
Quincula	*lobata*	Purple groundcherry					X
Solanum	*carolinense*	Carolina horsenettle[5]		X			

Table 2-11. Forb and herbaceous species documented on Dyess AFB.

Genus	Species	Common name	2005 Invasive Plant Survey	2004 NRCS[1] Survey	2003 Army Engineers Survey	1995 USACE[2] Wetlands Survey	1994 TNHP[3]
Solanum	*dimidiatum*	Horse nettle[5]	X				X
Solanum	*elaeagnifolium*	Silverleaf nighshade[5]	X	X	X		X
Solanum	*rostratum*	Buffalobur[5]		X	X		
Cattails (Typhaceae)							
Typha	*domingensis*	Southern cattail					X
Typha	*latifolia*	Broadleaf cattail	X	X	X		
Nettles (Urticaceae)							
Parietaria	*pensylvanica*	Cucumber weed					X
Urtica	*chamaedryoides*	Stinging nettle[5]		X			
Verbenaceae							
Glandularia	*bipinnatifida*	Verbena	X	X			X
Glandularia	*pumila*	Pink vervain					X
Phyla	*cuneifolia*	Wedge-leaf fogfruit	X				
Phyla	*lanceolata*	Lanceleaf fog fruit				X	
Phyla	*nodiflora*	Turkey tangle fogfruit	X				
Verbena	*halei*	Texas vervain	X	X	X		X
Verbena	*plicata*	Fan-leaf vervain					X

[1] Natural Resources Conservation Service.
[2] United States Army Corps of Engineers.
[3] Texas Natural Heritage Program.
[4] Nonnative species.
[5] Species can be toxic to humans.
[6] Listed by Texas Department of Agriculture or Texas Parks and Wildlife as a noxious species.
[7] Species is endemic to Texas.
[8] Species not detected in surveys but planted at Lake Totten.
[9] Species not included in either Shinners & Mahler's or Mahler's Flora of Taylor County (Mahler 1973).
[10] Species identified from Mahler's Flora of Taylor County.

Woodlands

The deciduous woodlands are mature mesquite, which grow in dense even-aged stands. Understory species include prickly pear, lotebush, catclaw acacia (*Senegalia greggii*), littleleaf sumac (*Rhus microphylla),* tasajillo, horsecrippler (*Echinocactus texensis*), lime pricklyash (*Zanthoxylum fagara),* ephedra (*Ephedra*

antisyphilitica), prairie broomweed (*Amphiachyris dracunculoides*), western ragweed, western sticktight (*Lappula occidentalis* var. *cupulata*), old man's beard (*Clematis drummondii*), western yarrow, common lambsquarters, cutleaf germander (*Teucrium laciniatum*), dwarf senna (*Senna pumilio*), sida (*Sida* spp.), silverleaf nightshade, sow thistle (*Sonchus asper*), Texas thistle, tube-tongue (*Siphonoglossa pilosella*), and verbena. Common grass species include Texas wintergrass, rescuegrass (*Bromus catharticus*), sand dropseed, silver bluestem, and white tridens.

Riparian Vegetation

Riparian systems are found in transition zones between aquatic and upland ecosystems. They include vegetation along historical and channelized streambeds and drainages associated with Little Elm Creek and its tributaries. In their undisturbed condition, the dominant vegetation in these areas is tolerant of and adapted to periodic flooding or soil saturation. Riparian systems occur entirely within the 100-year floodplain of streams and rivers. Most riparian plant species, however, require flooding more frequently than once every 100 years. The highest-quality natural riparian area is the historical Little Elm Creek channel located southeast of the present stormwater system. Soils are mapped as Gageby clay loam. These soils are deep, nearly level to gently sloping, well-drained, neutral, reddish brown, fine sandy loam Cumulic Haplustolls assigned to the Loamy Bottomland range site (Conner 1976); however, it seems likely that these soils have been altered considerably by the re-routing and channeling of Little Elm Creek and other construction. Vegetation is mesquite woodland displaying a bit more diversity than most examples encountered on Dyess AFB. Mesquite is joined in the tall shrub stratum by netleaf hackberry (*Celtis laevigata* var. *reticulata*) and chittumwood (*Sideroxylon lanuginosum*), whereas in the short shrub stratum lotebush, prickly pear, and tasajillo are common. Downslope a foot or so, along the remnants of the old creek channel, western soapberry (*Sapindus saponaria var. drummondii*) and buttonbush (*Cephalanthus occidentalis)* give some hint of the sort of riparian woodland that once occupied the area.

The slopes of the channelized Little Elm Creek have been maintained by mowing in the past. Vegetation in the lower extent includes cattail (*Typha* sp.), Illinois bundleflower (*Desmanthus illinoensis*), wild canary grass (*Phalaris caroliniana*), knotgrass (*Paspalum distichum* var. *distichum*), rabbit's foot grass (*Polypogon monspeliensis*), bermudagrass (*Cynodon dactylon*), white sweet clover (*Melilotus albus*), Britton's sedge (*Carex tetrastachya*), rush (*Juncus torreyi*), hard-stem bulrush (*Schoenoplectus acutus*), salt-marsh bulrush (*Bolboschoenus maritimus*), common spike-rush (*Eleocharis palustris*), chufa (*Cyperus esculentus*), red-foot (*Cyperus erythrorhizos*), fogfruit (*Phyla* sp.), smartweed *(Polygonum* sp.), curly dock (*Rumex crispus*), pale dock (*Rumex altissimus*), black willow (*Salix nigra*), and buttonbush.

In 2020, CSU/CEMML mapped the vegetation of Dyess AFB using the National Vegetation Classification (NVC). NVC is a nationwide standardized methodology for classifying and naming vegetation at various scales. At the highest, coarsest scale, the NVC groups vegetation by general dominant growth forms and global macro-ecology drivers, such as latitude and altitude. As the scale decreases through the hierarchy, biogeographic factors, such as regional species and ecological differences, become important, with the final levels of Alliance and Association being determined by specific groupings of species and local environmental conditions. On Dyess AFB, a major vegetation type is the Honey Mesquite Ruderal Scrub Alliance, which is nested in the following hierarchy: Class—Shrub and Herb Vegetation; Subclass—Temperate and Boreal Grassland and Shrubland; Formation—Temperate Grassland and Shrubland; Division—Central North American Grassland and Shrubland; Macrogroup—Great Plains Ruderal Grassland and Shrubland; and Group—Great Plains Comanchian Ruderal Grassland and Shrubland.

At the level of Alliance, the assessment found a total of 14 vegetation types (Figure 2-5). The types covering the most area were the Warm-Season Open Lawn Cultural Subgroup (the primary vegetation type found on the airfield), Urban Land Cover, and the Honey Mesquite alliance mentioned above.

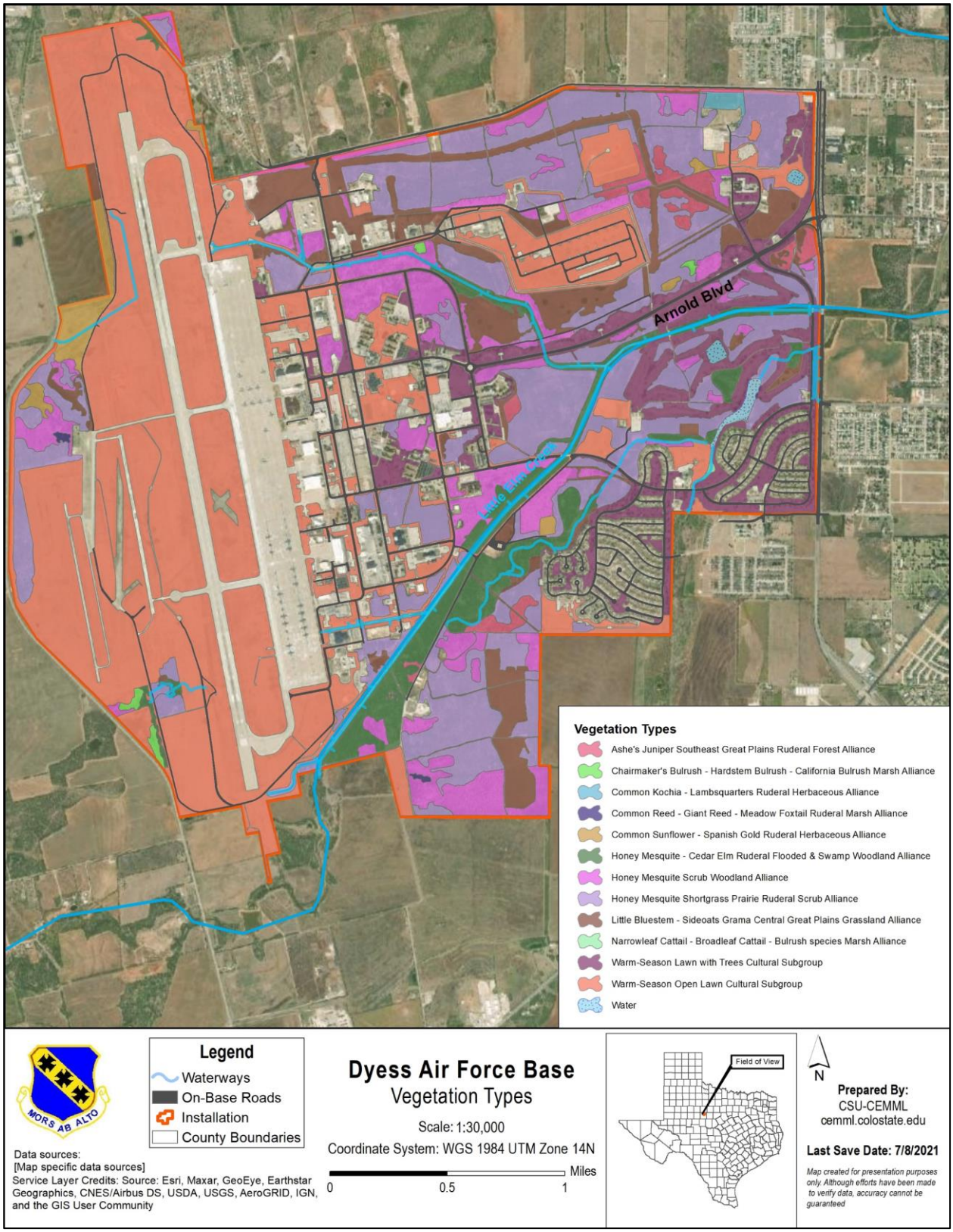

Figure 2-5. Vegetation communities mapped on Dyess Air Force Base.

2.3.2.3 Future Vegetation Cover

According to the USGS National GAP Analysis Land Cover 2011 classification, the dominant ecosystems present at Dyess AFB are mesquite woodland (24.4%) and shrubland (13.4%) (CEMML 2019). Slight changes in temperature and precipitation can substantially alter the composition, distribution, and abundance of species in these ecosystems, and the products and services they provide. The extent of these changes also will depend on changes in precipitation, drought frequency, and fire regime. Moreover, losses in vegetative cover coupled with increases in precipitation intensity and climate-induced reductions in soil aggregate stability could dramatically increase potential erosion rates. Soil aggregate stability is related to the ability of soil particles to withstand exposure to raindrops or surface flow of water. Desirable aggregates are stable against the force of raindrops and allow percolation of surface flow, whereas disturbed soils (from loss of vegetation, burning, loss of microbial activity, etc.) may release individual particles that can seal the surface and clog pores, reducing infiltration and increasing harmful sheet flow and erosion.

In general, woodland areas are susceptible to climate change. There is a temperature below which the equilibrium state of the ecosystem appears constant but above which the equilibrium of this vegetation cover declines steadily. The mesquite canopy exerts a profound influence on neighboring vegetation, soils, sub-canopy microclimate, wildlife, and insect populations. High densities of mesquite (more than 25% canopy cover) suppress grass growth and may reduce understory species diversity (Texas Natural Resources Server n.d.).

Climate changes in shrubland and prairie bioregions include increased seasonal, annual, minimum, and maximum temperatures and changes in precipitation patterns. Because these ecosystems are relatively dry with strong seasonal climate patterns, they are sensitive to these climatic changes and vulnerable to shifts in climatic regime.

Rising temperatures under various climate change scenarios likely will enhance soil decomposition for both mesquite woodland and shrubland. Together with reductions in rainfall, this also may reduce plant productivity over large areas.

Dyess AFB currently plans to dramatically alter the current nature of the vegetation on base through rotational burning to convert dense, low-diversity mesquite thickets into biodiverse shortgrass and mid-height prairies. The gain in prairie/grassland vegetation will benefit a range of plant and animal species, and ongoing careful management and monitoring should be emphasized to ensure that these sites are resilient as temperatures increase and precipitation patterns become more erratic.

2.3.2.4 Turf and Landscaped Areas

Of the total acreage occupied by Dyess AFB, 2,645 acres are maintained grounds subject to mowing and scheduled landscape maintenance. Of those maintained acres, 1,645 acres are maintained near the runway, drop zones, flight safety clear zones, firebreaks, and secure weapons storage areas. Approximately 1,000 acres consist of turf and landscaped areas, including the golf course, Airplane Park, picnic grounds, industrial and administrative facilities, base housing, and the hospital. The predominant turf grass is bermudagrass, shrubs are usually red-tip photinia (*Photinia* x *fraseri*) and holly (*Ilex* sp.), whereas trees are most often Afghan pine (*Pinus brutia* var. *eldarica*), live oaks (*Quercus* spp.), red oaks, pecan (*Carya illinoinsis*), bur oaks, green ash (*Fraxinus pennsylvanica*), mesquite, and desert willow (*Chilopsis* sp.).

2.3.3 Fish and Wildlife

2.3.3.1 Reptiles and Amphibians

Low habitat diversity and availability preclude a high diversity and abundance of reptiles and amphibians. Species that inhabit a relatively wide niche, such as red-eared sliders (*Trachemys scripta*), pallid spiny softshell turtle (*Apalone spiniferus*), and bullfrogs (*Rana catesbeiana*) are abundant. Other species observed historically include the common snapping turtle (*Chelydra serpentina*), diamondback water snake (*Nerodia rhombifer rhombifer*), western diamondback rattlesnake (*Crotalus atrox*), bullsnake (*Pituophis melanoleucus sayi*), Kansas glossy snake (*Arizona elegans elegans*), and the Texas rat snake (*Elaphe obsolete lindheimeri*). A 2005/2006 amphibian and reptile survey updated the herpetofaunal checklist, and updated surveys are again needed for this taxonomic group. After surveys have been completed, the INRMP should be updated with any new information.

A list of reptiles and amphibians potentially occurring on Dyess AFB (Taylor Co.), based on historical records (Lee 1996, TPWD 1994, Dixon 1987) and current records (TPWD 2021), is presented in Table 2-12. The State Conservation Status Rank and Global Conservation Status Rank of protected species, according to TPWD (2020), based on NatureServe's conservation status system (see Ranking Key below), are indicated in the Status column, and species actually observed on Dyess AFB are listed in the Observed column.

Table 2-12. List of reptiles and amphibians. Status ranks are defined in Table 2-13.

Common Name[1]	Scientific Name[1]	Status	Observed
Amphibia: Frogs—Anura			
New Mexico spadefoot	*Scaphiopus multiplicatus*		
Couch's spadefoot	*Scaphiopus couchi*		
Great Plains narrowmouth toad	*Gastrophryne olivacea*		
Bullfrog	*Rana catesbeiana*		X
Plains leopard frog	*Rana blairi*		X
Eastern green toad	*Bufo debilis*		
Red spotted toad	*Bufo punctatus*		
Texas toad	*Bufo speciosus*		
Spotted chorus frog	*Pseudacris clarki*		
Woodhouse's toad	*Anaxyrus woodhousii*	G5/SU	
Salamander: Urodela			
Tiger salamander	*Ambystoma tigrinum*	G5/S5	
Reptilia: Turtles—Chelonia			
Pallid spiny softshell	*Apalone spiniferus*		X
Common snapping turtle	*Chelydra serpentina*		X
Yellow mud turtle	*Kinosternon flavescens*		
Western box turtle	*Terrapene ornata*	G5/S3	X
Red-eared Slider	*Trachemys scripta*		X
Lizards: Sauria			

Table 2-12. List of reptiles and amphibians. Status ranks are defined in Table 2-13.

Common Name[1]	Scientific Name[1]	Status	Observed
Texas spotted whiptail	*Cnemidophorus gularis*		X
Six-lined racerunner	*Cnemidophoruss exlineatus*		
Ground skink	*Scincella lateralis*		
Short-lined skink	*Eumeces tetragrammus brevilineatus*		
Texas horned lizard	*Phrynosoma cornutum*	G4G5/S3	X
Texas earless lizard	*Cophosaurus texanus*		X
Northern earless lizard	*Holbrookia maculata*		
Eastern collared lizard	*Crotaphytus collaris*		
Texas spiny lizard	*Sceloporus olivaceus*		X
Southern prairie lizard	*Sceloporus undulatus*		
Snakes: Serpentes			
Plains blind snake	*Leptotyphlops dulcis*		X
Western rattlesnake	*Crotalus viridis*	G5/S5	
Western diamondback rattlesnake	*Crotalus atrox*		X
Timber (canebrake) rattlesnake	*Crotalus horridus*	G4/S4	
Broad-banded copperhead	*Agkistrodon contortrix laticinctus*		
Bullsnake	*Pituophis melanoleucus sayi*		X
Texas longnose snake	*Rhinocheilus lecontei*		
Texas brown snake	*Storeria dekayi*		
Texas patchnose snake	*Salvadora grahamiae*		
Flathead snake	*Tantilla gracilis*		
Plains blackhead snake	*Tantilla nigriceps fumiceps*		
Rough earth snake	*Virginia striatula*		
Texas lined snake	*Tropidoclonion lineatum*		
Redstripe ribbon snake	*Thamnophis proximus rubrilineatus*		
Checkered garter snake	*Thamnophis marcianus marcianus*		
Texas garter snake	*Thamnophis sirtalis annectens*	G5T4/S1	
Kansas glossy snake	*Arizona elegans elegans*		X
Western rough green snake	*Opheodrys aestivus mejalis*		
Western hognose snake	*Heterodon nasicus*	G5/S4	
Dusty hognose snake	*Heterodon nasicus gloydi*		
Eastern hognose snake	*Heterodon platyrhinos*		
Graham's crayfish snake	*Regina grahami*		
Diamondback water snake	*Nerodia rhombifer rhombifer*		X
Blotched water snake	*Nerodia erythrogaster transversa*		X
Great plains rat snake	*Elaphe guttata emoryi*		
Texas rat snake	*Elaphe obsoleta lindheimeri*		X

Table 2-12. List of reptiles and amphibians. Status ranks are defined in Table 2-13.

Common Name[1]	Scientific Name[1]	Status	Observed
Western ground snake	*Sonora semiannulata*		
Texas night snake	*Hypsiglena torquata jani*		
Praire ringneck snake	*Diadophis punctatus arnyi*		
Eastern yellowbelly racer	*Coluber constrictor flaviventris*		
Western coachwhip	*Masticophis flagellum testaceus*		X
Desert kingsnake	*Lampropeltis getulus splendida*		X

[1] Common and scientific names follow Collins (1990).

Table 2-13. Ranking status key.

NatureServe Global (G) Conservation Status Rank	
GX	Presumed Extinct—Not located despite intensive searches and virtually no likelihood of rediscovery.
GH	Possibly Extinct—Known from only historical occurrences but still some hope of rediscovery.
G1	Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4	Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	Secure—Common; widespread and abundant.
GU	Unrankable—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
GNR	Unranked—Global rank not yet assessed.
T#	Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1.
USFWS Federal Listing Status	
LE	Listed as Federally Endangered
LT	Listed as Federally Threatened
C	Candidate for Federal Listing
PT	Proposed for Listing as Federally Threatened
WP	Listed on the USFWS Work Plan for evaluation
State Conservation Status	
E	Listed as Endangered in the state of Texas

Table 2-13. Ranking status key.

T	Listed as Threatened in the state of Texas
SGCN	Species of Greatest Conservation Need in Texas
NatureServe State (S) Conservation Status Rank	
SX	Presumed Extirpated—Species or ecosystem is believed to be extirpated from the state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH	Possibly Extirpated—Known from only historical records but still some hope of rediscovery. There is evidence that the species may no longer be present in the state/province, but not enough to state this with certainty.
S1	Critically Imperiled—Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2	Imperiled—Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state/province.
S3	Vulnerable—Vulnerable in the state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	Secure—Common, widespread, and abundant in the state/province.
SU	Unrankable—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNR	Unranked—Conservation status not yet assessed.
B	Breeding- Conservation status refers to the breeding population of the species only.

2.3.3.2 Mammals

Mammalian species typically found in similar habitats of rural Taylor County flourish on Dyess AFB, with the exception of white-tailed deer (*Odocoileus virginiana*) and feral hogs (*Sus scrofa*). Quality white-tailed deer habitat is limited and perimeter security fences preclude their necessary freedom of movement. Feral hogs are considered a nuisance species as well as a BASH concern and will be removed if found. Predator species such as the coyote (*Canis latrans*), American badger (*Taxidea taxus*), fox, and bobcat (*Lynx rufus*) are valued, as are raptors and snakes, for their role in controlling rodent and rabbit populations. Resident mammals are typical of an urban/wildland interface. A complete representation of rodent species requires further study.

A list of mammals recorded for Taylor County and therefore with potential to occur on Dyess AFB is presented in Table 2-14. County records are from Lee (1996) and TPWD (2021), and bat records are from a survey conducted by TetraTech in 2017 with the use of acoustic monitoring. The State Conservation Status Rank and Global Conservation Status Rank of protected species according to TPWD (2020) based on NatureServe's conservation status system (Table 2-13) are indicated in the Status column. Species actually observed on Dyess AFB are listed in the Observed column.

Table 2-14. List of mammals. Status ranks are defined in Table 2-13.

Common Name	Scientific Name	Status	Observed
Virginia opossum	*Didelphis virginiana*		x
Least shrew	*Cryptotis parva*		x
Eastern red bat	*Lasiurus borealis*	G3G4/S4	X
Hoary bat	*Lasiurus cinereus*	G3G4/S4	X
Brazilian free-tailed bat	*Tadarida brasiliensis*		X
Western pipistrelle	*Parastrellus hesperus*	G5/S5	X
Cave myotis bat	*Myotis velifer*	G4G5/S2S3	X
Silver-haired bat	*Lasionycteris noctivagans*		X
Tricolored bat	*Perimyotis subflavus*	G2G3/S3S4	
Nine-banded armadillo	*Dasypus novemcinctus*		x
Eastern cottontail	*Sylvilagus floridanus*		x
Black-tailed jackrabbit	*Lepus californicus*		x
Black-tailed prairie dog	*Cynomys ludovicianus*	G4/S3	
Rock squirrel	*Spermophilus variegatus*		
Mexican ground squirrel	*Spermophilus mexicana*		x
Eastern fox squirrel	*Sciurus niger*		x
Merriam's pocket mouse	*Perognathus merriami*		
Hispid pocket mouse	*Chaetodipus hispidus*		x
Silky pocket mouse	*Perognathus merriami*		
Fulvous harvest mouse	*Reithrodontomys fulvescens*		
Plains harvest mouse	*Reithrodontomys montanus*		
Texas mouse	*Peromyscus attwateri*		
Deer mouse	*Peromyscus maniculatus*		
White-ankled mouse	*Permyscus pectoralis*		
Northern pygmy mouse	*Baiomys taylori*		X
Northern grasshopper mouse	*Onychomys leucogaster*		
Hispid cotton rat	*Sigmodon hispidus*		X
Southern plains woodrat	*Neotoma micropus*		X
White-throated woodrat	*Neotoma albigula*		
Roof rat	*Rattus rattus*		X
House mouse	*Mus musculus*		X
Gray fox	*Urocyon cinereoargenteus*		X
Red fox	*Vulpes vulpes*		X
Ringtail	*Bassariscus astutus*		X
Coyote	*Canis latrans*		X
Gray wolf	*Canis lupus*		
Striped skunk	*Mephitis mephitis*		X
Long-tailed weasel	*Mustela frenata*	G5/S5	

Table 2-14. List of mammals. Status ranks are defined in Table 2-13.

Common Name	Scientific Name	Status	Observed
Mink	*Mustela vison*		
Western hog-nosed skunk	*Conepatus leuconotus*	G4/S4	
Eastern spotted skunk	*Spilogale putorius*	G4/S1S3	
Western spotted skunk	*Spilogale gracilis*	G5/S5	
Common raccoon	*Procyon lotor*		X
Badger	*Taxidea taxus*		X
Bobcat	*Lynx rufus*		X
Mountain lion	*Puma concolor*	G5/S2S3	
North American porcupine	*Erethizon dorsatum*		X
Nutria	*Myocaster coypus*		X
American beaver	*Castor canadensis*		X
Pronghorn	*Antilocapra americana*	G5/S5	
White-tailed deer	*Odocoileus virginiana*		X
Feral hog	*Sus scrofa*		X
Axis deer	*Axis axis*		X

2.3.3.3 Birds

A wide variety of bird species have been observed on Dyess AFB. Common raptors include the red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), Mississippi kite (*Ictinia mississippiensis*), northern harrier (*Circus hudsonius*), Cooper's hawk (*Accipiter cooperii*), American kestrel (*Falco sparverius*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), turkey vulture (*Cathartes aura*), and black vulture (*Coragyps atratus*). Grassland and mesquite savannah attract many types of birds. Typical grassland nesting species observed on Dyess AFB include the Cassin's sparrow (*Peucaea cassinii*), lark sparrow (*Chondestes grammacus*), grasshopper sparrow (*Ammodramus savannarum*), vesper sparrow (*Pooecetes gramineus*), mourning dove (*Zenaida macroura*), northern bobwhite (*Colinus virginianus*), Rio Grande wild turkey (*Meleagris gallopavo intermedia*), scissor-tailed flycatcher (*Tyrannus forficatus*), and red-winged blackbird (*Agelaius phoeniceus*). Table 2-15 reflects the current avian checklist.

2.3.3.4 Climate Impacts on Fish and Wildlife

Fish and wildlife communities at Dyess AFB are not expected to experience significant direct impacts due to climate change. A substantial proportion of the base is developed, and the majority of wildlife species present are distributed widely and common, such as red-eared sliders; common snapping turtles; bullfrogs; bullsnakes; eastern cottontails (*Sylvilagus floridanus*); common raccoons (*Procyon lotor*); various mouse, rat, and squirrel species; and common birds such as American robins (*Turdus migratorius*). These common wildlife species can tolerate a wide range of environmental conditions.

Although increasing temperatures under the projected climate scenarios for Dyess AFB are unlikely to impose direct threats to the majority of wildlife species, less common species may be affected by indirect threats. Migrating birds in particular may be indirectly vulnerable to rising temperatures, as many birds time their migrations to coincide with the springtime emergence of insects from their overwintering states.

Table 2-15. Avian checklist for Dyess Air Force Base.

FIELD CHECKLIST OF THE BIRDS OF DYESS AIR FORCE BASE, TEXAS, 2008

Legend:

Abundance in proper habitat at proper time of the year:

▬▬	Common	-Should be seen most days.
▬▬	Uncommon	-Usually present but hard to find.
——	Rare	-Very hard to find; not present every year.
X·····X	Single sightings between dates.	-Bird suspected of lingering between dates.
X	Single sightings	-Single sightings; more data needed to determine abundance.
N	Confirmed nesting record	-by photo, or by observation of bird on nest or parents feeding young.
?	Nesting suspected, but not confirmed.	
D	Documented by photo or specimen.	

H: Habitat code **A**-all habitats **B**-brush **F**-fresh water,shoreline,marsh **G**-grasslands **O**-overhead **R**-riparian **U**-urban/commercial **W**-woods

BBL Four-letter Bird Banding Laboratory Code, Patuxent Wildlife Research Center

Species	D	N	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	H	BBL	Other
DUCKS, GEESE AND SWANS																	
Black-bellied Whistling-Duck	D	N									X				F	BBWD	
Greater White-fronted Goose	D			X											O	GWFG	
Wood Duck	D											X		X	F	WODU	
American Wigeon	D														F	AMWI	
Gadwall	D														F	GADW	fem
Green-winged Teal	D														F	GWTE	
Mallard	D	N													F	MALL	
Northern Pintail														X	F	NOPI	
Blue-winged Teal	D														F	BWTE	fem
Cinnamon Teal						X									F	CITE	
Northern Shoveler	D														F	NSHO	
Canvasback	D			X											F	CANV	
Ring-necked Duck	D														F	RNDU	
Lesser Scaup	D														F	LESC	
Bufflehead	D														F	BUFF	
Common Goldeneye	D			X	X										F	COGO	
Hooded Merganser				X											F	HOME	
Ruddy Duck	D														F	RUDU	
TURKEYS																	
Wild Turkey	D	N													RUW	WITU	
NEW WORLD QUAIL																	
Northern Bobwhite	D	N													BGRW	NOBO	fem
GREBES																	
Pied-billed Grebe	D														F	PBGR	
Eared Grebe	D				X										F	EAGR	
CORMORANTS																	
Double-crested Cormorant	D					X							X	X	F	DCCO	
HERONS, EGRETS AND BITTERNS																	
Great Blue Heron	D														F	GBHE	
Great Egret	D														F	GREG	
Little Blue Heron	D										X				F	LBHE	
Snowy Egret	D					X				X	X				F	SNEG	
Cattle Egret	D						X						X		F	CAEG	
Green Heron	D	?													FR	GRHE	
Black-crowned Night-Heron	D						X			XX					FR	BCNH	
Yellow-crowned Night-Heron	D														FR	YCNH	juv
IBIS AND SPOONBILLS																	
White-faced Ibis							X								F	WFIB	
NEW WORLD VULTURES																	
Black Vulture											X				O	BLVU	
Turkey Vulture	D														A	TUVU	

FIELD CHECKLIST OF THE BIRDS OF DYESS AIR FORCE BASE, TEXAS, 2008

Legend:

Abundance in proper habitat at proper time of the year:

━━━	Common	-Should be seen most days.
━━━	Uncommon	-Usually present but hard to find.
———	Rare	-Very hard to find; not present every year.
X·····X	Single sightings between dates.	-Bird suspected of lingering between dates.
X	Single sightings	-Single sightings; more data needed to determine abundance.
N	Confirmed nesting record	-by photo, or by observation of bird on nest or parents feeding young.
?	Nesting suspected, but not confirmed.	
D	Documented by photo or specimen.	

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BBL Four-letter Bird Banding Laboratory Code, Patuxent Wildlife Research Center

Species	D	N	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	H	BBL	Other
HAWKS, EAGLES AND KITES																	
Mississippi Kite	D	N					━	━	━	━	━				RUW	MIKI	juv
Northern Harrier	D		━	━	━	━						━	━	━	BGR	NOHA	
Sharp-shinned Hawk	D		———	———	———	———					———	———	———	———	RW	SSHA	
Cooper's Hawk	D		———	———	———	———						———	———	———	RW	COHA	
Red-shouldered Hawk	D		———	———	———	———	———						———	———	RW	RSHA	
Swainson's Hawk	D	N				━	━	━	━	━	━	━			RW	SWHA	
Red-tailed Hawk	D	N	━	━	━	━	━	━	━	━	━	━	━	━	A	RTHA	
OSPREY																	
Osprey	D					X						━			F	OSPR	
FALCONS AND CARACARAS																	
American Kestrel	D	?	━	━	━	━	━	━	━	━	━	━	━	━	U	AMKE	fem
Merlin	D		———	———										———	G	MERL	
RAILS, GALLINULES AND COOTS																	
American Coot	D		———	———	———	———						———	———	———	F	AMCO	
CRANES																	
Sandhill Crane	D		———	———	———								———	———	O	SACR	
PLOVERS AND LAPWINGS																	
Killdeer	D	N	━	━	━	━	━	━	━	━	━	━	━	━	FGU	KILL	
Mountain Plover	D										X				G	MOPL	
AVOCETS AND STILTS																	
Black-necked Stilt								X							F	BNST	
SANDPIPERS																	
Wilson's Snipe	D		———	———	———								———	———	F	WISN	
Long-billed Dowitcher						X									F	LBDO	
Long-billed Curlew	D				X						———				F	LBCU	
Upland Sandpiper	D					———				———	———				G	UPSA	
Greater Yellowlegs	D		———	———	———	———					———	———	———	———	F	GRYE	
Lesser Yellowlegs					X		X								F	LEYE	
Solitary Sandpiper	D					———	———			———	———				F	SOSA	
Spotted Sandpiper	D					———	———			———	———	———	———		F	SPSA	other
Least Sandpiper	D		———	———	———							———	———	———	F	LESA	
Pectoral Sandpiper	D						X								F	PESA	
Wilson's Phalarope							X								F	WIPH	
GULLS																	
Ring-billed Gull			━	━									━	━	FU	RBGU	
TERNS																	
Black Tern											X				F	BLTE	

FIELD CHECKLIST OF THE BIRDS OF DYESS AIR FORCE BASE, TEXAS, 2008

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▬▬	Uncommon	-Usually present but hard to find.
——	Rare	-Very hard to find; not present every year.
X·····X	Single sightings between dates.	-Bird suspected of lingering between dates.
X	Single sightings	-Single sightings; more data needed to determine abundance.
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Species	D	N	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	H	BBL	Other
PIGEONS AND DOVES																	
Rock Pigeon	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	FU	ROPI	
Eurasian Collared-Dove	D	?				—	—	—	—						UW	ECDO	
Mourning Dove	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	A	MODO	
White-winged Dove	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	UW	WWDO	
CUCKOOS																	
Yellow-billed Cuckoo	D	N					▬	▬	▬	▬	—				W	YBCU	juv
Greater Roadrunner	D	N	—	—	▬	▬	▬	▬	▬	▬	▬	▬	—	—	BRW	GRRO	
BARN-OWLS																	
Barn Owl	D	N	—	—	—	—	—	—	—	—	—	—	—	—	BGRW	BNOW	
OWLS																	
Great Horned Owl	D	?	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	A	GHOW	
Burrowing Owl	D				X											BUOW	
NIGHTJARS																	
Common Nighthawk	D	N				▬	▬	▬	▬	▬	▬				A	CONI	
Common Poorwill	D				X										U	COPW	
SWIFTS																	
Chimney Swift	D	?				▬	▬	▬	▬	▬	▬	▬			F	CHSW	
HUMMINGBIRDS																	
Ruby-throated Hummingbird											—				GRW	RTHU	
Black-chinned Hummingbird	D	?				—	—	—	—	—	—				GRW	BCHU	
KINGFISHERS																	
Belted Kingfisher	D		▬	▬	▬	▬						▬	▬	▬	F	BEKI	
WOODPECKERS																	
Golden-fronted Woodpecker	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	RUW	GFWO	fem
Ladder-backed Woodpecker	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	RUW	LBWO	fem
Downy Woodpecker	D				X		X							X	W	DOWO	
Northern Flicker	D		—	—	—							—	—	—	W	NOFL	fem
TYRANT FLYCATCHERS																	
Olive-sided Flycatcher	D						X									OSFL	
Eastern Wood-Pewee							X								W	EAWP	
Least Flycatcher	D						—	—							W	LEFL	
Eastern Phoebe	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	R	EAPH	
Say's Phoebe	D					—					—				G	SAPH	
Vermilion Flycatcher	D				X										G	VEFL	
Ash-throated Flycatcher	D	N				▬	▬	▬	▬	▬	▬				W	ATFL	
Great Crested Flycatcher											—				W	GCFL	
Western Kingbird	D	N					▬	▬	▬	▬					UW	WEKI	
Eastern Kingbird	D						X			X					G	EAKI	
Scissor-tailed Flycatcher	D	N				—	▬	▬	▬	▬	▬	—	—		GRUW	STFL	

FIELD CHECKLIST OF THE BIRDS OF DYESS AIR FORCE BASE, TEXAS, 2008

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SHRIKES																	
Loggerhead Shrike	D	?	—			▬	▬				▬	▬	▬	▬	G	LOSH	
VIREOS AND ALLIES																	
White-eyed Vireo							x								R	WEVI	
Bell's Vireo	D	?				▬	▬	▬	▬						BRW	BEVI	
Yellow-throated Vireo											x				R	YTVI	
Blue-headed Vireo							x								R	BHVI	
Red-eyed Vireo							x								R	REVI	
CROWS AND JAYS																	
Blue Jay	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	A	BLJA	
American Crow	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	A	AMCR	
Chihuahuan Raven	D	N	—	—	▬	▬	▬	▬	▬	—	—	—	—	—	W	CHRA	
LARKS																	
Horned Lark	D	?	—	—	—	▬	▬	▬	▬	▬	—	—	—	—	G	HOLA	
SWALLOWS																	
Purple Martin	D					▬	▬	▬	—						F	PUMA	
Tree Swallow											x				O	TRES	
Northern Rough-winged Swallow						x									O	NORW	
Bank Swallow	D						—				x				O	BANS	
Cliff Swallow	D	N			▬	▬	▬	▬	▬	▬	▬	—	—	—	U	CLSW	
Cave Swallow	D	N			▬	▬	▬	▬	▬	▬	▬	▬	x		U	CASW	juv
Barn Swallow	D	N				▬	▬	▬	▬	▬	▬	—	—	—	U	BARS	
CHICKADEES AND TITS																	
Carolina Chickadee							x				x	x		x	W	CACH	
Black-crested Titmouse	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	W	BCTI	
PENDULINE TITS																	
Verdin	D				—	—	—				—	—	—		BW	VERD	
LONG-TAILED TITS																	
Bushtits								x							R	BUSH	
NUTHATCHES																	
Red-breasted Nuthatch												x			W	RBNU	
CREEPERS																	
Brown Creeper	D			—	—	—								—	W	BRCR	
WRENS																	
Cactus Wren	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	BW	CACW	
Rock Wren	D											—	—	—	U	ROWR	
Carolina Wren	D		—	—							—	—	—	—	RW	CARW	
Bewick's Wren	D	N	—	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	BRW	BEWR	

FIELD CHECKLIST OF THE BIRDS OF DYESS AIR FORCE BASE, TEXAS, 2008

Legend:

Abundance in proper habitat at proper time of the year:

▬▬▬	Common	-Should be seen most days.
▬▬▬	Uncommon	-Usually present but hard to find.
———	Rare	-Very hard to find; not present every year.
x·····x	Single sightings between dates.	-Bird suspected of lingering between dates.
x	Single sightings	-Single sightings; more data needed to determine abundance.
N	Confirmed nesting record	-by photo, or by observation of bird on nest or parents feeding young.
?	Nesting suspected, but not confirmed.	
D	Documented by photo or specimen.	

H: Habitat code **A**-all habitats **B**-brush **F**-fresh water,shoreline,marsh **G**-grasslands **O**-overhead **R**-riparian **U**-urban/commercial **W**-woods

BBL Four-letter Bird Banding Laboratory Code, Patuxent Wildlife Research Center

Species	D	N	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	H	BBL	Other	
House Wren	D		———	———	———	———	———				———	———	———	———	RW	HOWR		
Marsh Wren	D		———	———	———	———							———	———	R	MAWR		
KINGLETS																		
Golden-crowned Kinglet	D												x		W	GCKI		
Ruby-crowned Kinglet	D		———	———	———	———	———					———	———	———	W	RCKI		
GNATCATCHERS																		
Blue-gray Gnatcatcher	D		———	———	———	———			———	———	———	———	———	———	BRW	BGGN		
THRUSHES																		
Eastern Bluebird	D	N	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	UW	EABL	fem	juv
Western Bluebird													x		O	WEBL		
Mountain Bluebird	D			x											BG	MOBL		
American Robin	D	N	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	W	AMRO	other	juv
MOCKINGBIRDS AND THRASHERS																		
Northern Mockingbird	D	N	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	BGRUW	NOMO		
Sage Thrasher	D				—								x		B	SATH		
Curve-billed Thrasher	D	N	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	BW	CBTH		
STARLINGS																		
European Starling	D	N	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	A	EUST		
WAGTAILS AND PIPITS																		
American Pipit						—							—		G	AMPI		
Sprague's Pipit	D		———	———	———	———								—	G	SPPI		
WAXWINGS																		
Cedar Waxwing	D		———	———	—	▬▬▬	▬▬▬							———	RUW	CEDW		
WOOD WARBLERS																		
Orange-crowned Warbler	D		———	———	———	———	———				———	———	———	———	BRW	OCWA		
Nashville Warbler	D					—	———				———	———			R	NAWA		
Yellow Warbler	D						———				———	———			BRW	YWAR		
Yellow-rumped Warbler	D		———	———	———	———	———	———				———	———	———	BRUW	YRWA	other	
Pine Warbler	D												x		W	PIWA		
Black-and-white Warbler	D						x								R	BAWW		
Northern Waterthrush	D					—					x				R	NOWA		
MacGillivray's Warbler							———								B	MGWA		
Common Yellowthroat	D						———	———				———			R	COYE		
Wilson's Warbler	D						———				———	———			RW	WIWA		
Yellow-breasted Chat						———	———				—				B	YBCH		
SPARROWS, TOWHEES, JUNCOS																		
Eastern Towhee	D		x												W	EATO		
Spotted Towhee	D		▬▬▬	▬▬▬	▬▬▬	▬▬▬						▬▬▬	▬▬▬	▬▬▬	W	SPTO		
Canyon Towhee	D	N	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	▬▬▬	BW	CANT		
Cassin's Sparrow	D	N			———	▬▬▬	▬▬▬	▬▬▬	—		—				G	CASP		

FIELD CHECKLIST OF THE BIRDS OF DYESS AIR FORCE BASE, TEXAS, 2008

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N	Confirmed nesting record	-by photo, or by observation of bird on nest or parents feeding young.
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BBL Four-letter Bird Banding Laboratory Code, Patuxent Wildlife Research Center

Species	D	N	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	H	BBL	Other	
Chipping Sparrow	D		▬	▬	▬	▬	▬					▬	▬	▬	W	CHSP		
Clay-colored Sparrow	D				▬	▬	▬					▬			BW	CCSP		
Field Sparrow	D		▬	▬	▬	▬	▬						▬	▬	BGW	FISP		
Vesper Sparrow	D		▬	▬	▬	▬						▬	▬	▬	BG	VESP		
Lark Sparrow	D	N			———	▬	▬	▬	———	———	———		———		G	LASP		
Black-throated Sparrow						X									B	BTSP		
Lark Bunting	D		———										▬	▬	G	LARB		
Savannah Sparrow	D		▬	▬	▬	▬	———					▬	▬	▬	G	SAVS		
Le Conte's Sparrow	D		·····X			X								X····X	G	LCSP		
Grasshopper Sparrow	D	N	···X			▬	▬	▬	———	———	———		X·····	·····	G	GRSP		
Fox Sparrow	D			X·····	·····X										RW	FOSP		
Song Sparrow	D		▬	▬	▬	▬	———					———	▬	▬	GRW	SOSP		
Lincoln's Sparrow	D		▬	▬	▬	▬	———					———	▬	▬	GRW	LISP		
Swamp Sparrow			···X										X·····	·····	R	SWSP		
White-crowned Sparrow	D		▬	▬	▬	▬	▬					▬	▬	▬	BRW	WCSP	other	
White-throated Sparrow													X		R	WTSP		
Harris's Sparrow	D		▬	▬	———									———	W	HASP		
Dark-eyed Junco	D		▬	▬	▬	———						———	▬	▬	W	DEJU	other	other
SALTATORS, CARDINALS AND ALLIES																		
Northern Cardinal	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	RUW	NOCA	fem	
Pyrrhuloxia	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	BW	PYRR		
Rose-breasted Grosbeak	D						X								U	RBGR		
Blue Grosbeak	D	N					———								R	BLGR	fem	juv
Indigo Bunting	D						X					X			R	INBU		
Painted Bunting	D	N				▬	▬	▬	▬	▬	———				BRW	PABU	fem	juv
Dickcissel	D	N					▬	▬	▬	▬	▬	———			G	DICK	juv	
BLACKBIRDS, ORIOLES, GRACKLES, ETC.																		
Red-winged Blackbird	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	FR	RWBL	fem	
Eastern Meadowlark	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	G	EAME		
Western Meadowlark		N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	G	WEME		
Yellow-headed Blackbird	D					———				———					G	YHBL		
Common Grackle	D	N	———		▬	▬	▬	▬	▬	▬	▬	▬	▬	———	A	COGR		
Great-tailed Grackle	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	A	GTGR	fem	
Bronzed Cowbird	D							X							G	BROC		
Brown-headed Cowbird	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	A	BHCO	fem	
Baltimore Oriole	D										———				R	BAOR		
Bullock's Oriole	D	N				▬	▬	▬	▬	▬	▬	———			W	BUOR	fem	other
Orchard Oriole	D	?						▬	▬	▬	▬	▬			W	OROR	fem	other
FINCHES, SISKINS, CROSSBILLS																		
House Finch	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	RU	HOFI	fem	
Pine Siskin	D											———	———	———	G	PISI		
Lesser Goldfinch														X	W	LEGO		
American Goldfinch	D		▬	▬	▬	▬	———				———	▬	▬	▬	RUW	AMGO		
OLD WORLD SPARROWS																		
House Sparrow	D	N	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	U	HOSP	fem	

Rising temperatures will prompt insects to emerge earlier, and birds migrating to or through Dyess AFB would miss a major feeding opportunity that could result in diminished bird populations (Both et al. 2010).

Changing climate also has the potential to alter vegetation communities. This could have a negative impact on specialist wildlife species that historically depended on specific native plant species for their survival (Dukes and Mooney 1999). Changing environmental conditions also may create open niches for nonnative invasive species to expand onto Dyess AFB. Newly arriving invasive species often have the ability to outcompete native species that are already experiencing reduced fitness due to shifting environmental conditions (Hellmann et al. 2008). Rising temperatures also could lead to increased potential for food-borne diseases and incidences of infectious animal diseases that are transmittable to humans, particularly those carried by foxes, rodents, and arthropods, such as rabies and West Nile virus (Parkinson and Butler 2005).

Increasing precipitation could have a positive impact on amphibian species inhabiting Dyess AFB, but this could be offset by higher rates of evaporation due to increasing temperatures. Increasing temperatures are also likely to impact water quality negatively. As water temperature rises in lentic systems, dissolved oxygen content will decline, which impacts habitat quality, particularly for larval amphibians. Increasing water temperatures also would increase the chances of algal blooms occurring, which would further deplete dissolved oxygen content and habitat quality (Paerl et al. 2011). Although annual precipitation is projected to increase, summers are expected to get drier. Droughts are likely become common, reducing water availability for fish and wildlife communities and increasing the likelihood of wildland fires. Such shifts in environmental conditions could have negative impacts on specialist wildlife species (Hellmann et al. 2008). Dyess AFB is in the process of acquiring additional neighboring land or arranging conservation easements to increase public safety setbacks. Depending on the nature of this land and Dyess AFB's ability to influence its management, this may provide additional refuges and expanded migration corridors for wildlife if the areas remain undeveloped and available as habitat.

2.3.4 Threatened and Endangered Species and Species of Concern

There are currently no federally listed plant or animal species known to occur on Dyess AFB, although monarch butterfly (*Danaus plexippus*), a candidate for listing, does occur on the base. Species of concern can include state listed species, species on the USFWS National Listing Workplan, or species petitioned for listing or candidate species for listing under the ESA. The TPWD indicates that three species currently listed as State Threatened (T) have the potential to occur within Taylor County. These species include the white-faced ibis (*Plegadis chihi)* (G5/S4B) and the Texas horned lizard (*Phrynosoma cornutum)* (G4G5/S3), both of which have been observed on the base, and the black rail (*Laterallus jamaicensis*) (G3S2), which is also Federally Threatened (LT) but has not been observed on base. Other Species of Greatest Conservation Need (SGCN) that have been observed on base include the western box turtle (*Terrapene ornata*) (G5/S3), eastern red bat (*Lasiurus borealis)* (G3G4/S4), hoary bat (*Lasiurus cinereus*) (G3G4/S4), western pipistrelle (*Parastrellus hesperus*) (G5/S5), cave myotis bat (*Myotis velifer*) (G4G5/S2S3), and monarch butterfly (G4/S4/C) (Table 2-16; TPWD 2020).

Table 2-16. Threatened and endangered species and species of special concern observed on Dyess Air Force Base. Status ranks are defined in Table 2-13.

Common Name	Scientific Name	Status	Observed on Dyess AFB
Western box turtle	*Terrapene ornata*	G5/S3	X
Texas horned lizard	*Phrynosoma cornutum*	T/G4G5/S3	X
Eastern red bat	*Lasiurus borealis*	G3G4/S4	X
Hoary bat	*Lasiurus cinereus*	G3G4/S4	X
Western pipistrelle	*Parastrellus hesperus*	G5/S5	X
Cave myotis bat	*Myotis velifer*	G4G5/S2S3	X
White-faced Ibis	*Plegadis chihi*	T/G5/S4B	X
Monarch butterfly	*Danaus plexippus*	C/G4/S4	X

2.3.5 Wetlands and Floodplains

The regulatory framework governing and defining Waters of the United States (WOTUS) was recently revised and may soon undergo additional revision. On 23 December 2019, the Environmental Protection Agency (EPA) and Department of the Army issued a new rule repealing the 2015 Clean Water Rule, which had interpreted the CWA to include a broad range of waters. The 2019 rule was intended to restore the CWA to its prior language, with agencies implementing the pre-2015 rule ". . . informed by applicable agency guidance documents and consistent with Supreme Court decisions and longstanding agency practice. . ." (84 Federal Register 56626). On 22 June 2020, the Navigable Waters Protection Rule: Definition of "Waters of the United States" went into effect. This rule provides definitions of what is included by WOTUS and stipulates waters that are specifically excluded from jurisdiction, such as ephemeral streams, previously converted cropland, and waste treatment systems, among others.

All WOTUS are administered by the USACE. Under 40 Code of Federal Regulation (CFR) 328.3, the Regulatory Definition of "Waters of the United States" is as follows.

> (1) The territorial seas, and the waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including waters subject to the ebb and flow of the tide.
>
> (2) Tributaries.
>
> (3) Lakes and ponds, and impoundments of jurisdictional waters.
>
> (4) Adjacent wetlands.

The definition of wetlands is unchanged from prior Rules, but *adjacent wetlands* are now restricted to those that

- (i) abut, meaning to touch at least at one point or side of, a water identified in paragraph (a)(1), (2), or (3) above;
- (ii) are inundated by flooding from a water identified in paragraph (a)(1), (2), or (3) above in a typical year;

- (iii) are physically separated from a water identified in paragraph (a)(1), (2), or (3) above only by a natural berm, bank, dune, or similar natural feature; or
- (iv) are physically separated from a water identified in paragraph (a)(1), (2), or (3) above only by an artificial dike, barrier, or similar artificial structure so long as that structure allows for a direct hydrologic surface connection between the wetlands and the water identified in paragraph (a)(1), (2), or (3) above in a typical year, such as through a culvert, flood or tide gate, pump, or similar artificial feature. An adjacent wetland is jurisdictional in its entirety when a road or similar artificial structure divides the wetland, as long as the structure allows for a direct hydrological surface connection through or over that structure in a typical year.

The Navigable Waters Protection Rule also sets out definitions of several key terms important to determining a water body's legal status, as follows.

- *Ephemeral*—The term ephemeral means surface water flowing or pooling only in direct response to precipitation (e.g., rain or snowfall).
- *Intermittent*—The term intermittent means surface water flowing continuously during certain times of the year and more than in direct response to precipitation (e.g., seasonally when the groundwater table is elevated or when snowpack melts).
- *Perennial*—The term perennial means surface water flowing continuously year-round.
- *Ordinary high water mark*—The term ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.
- *Typical year*—The term typical year means when precipitation and other climatic variables are within the normal periodic range (e.g., seasonally, annually) for the geographic area of the applicable aquatic resource based on a rolling 30-year period.

Wetlands are a form of surface water that occurs temporarily on Dyess AFB after storm events. Wetland management is detailed in Section 7.6, *Wetland Protection*. There are 12 sites currently delineated as jurisdictional wetlands that are protected under the CWA that were delineated in 1995 (Table 2-17). Although the Navigable Waters Protection Rule definition is currently in effect, additional changes may be instituted and the INRMP should be corrected during the next update, if needed.

Table 2-17. Descriptions and acreages of jurisdictional wetlands and waters of the United States, Dyess Air Force Base, Taylor County, Texas (United States Army Corps of Engineers 1995).

Site	Site Description	Area (ac)
Wetlands		
1	Depression in Drainage, Human-Induced (Atypical)	<0.1
2	Depression in historical Little Elm Creek	0.1
3	Borrow pit of old levee, human-induced	0.1
4	Depression in Randall Clay Series	0.2
5	Borrow pit near dirt road, human-induced	0.1
6	Depression in woodland, Randall Clay Series	0.2
7	Depression, historical creek channel	0.4
8	Depression adjacent to US5, human-induced	0.2

Table 2-17. Descriptions and acreages of jurisdictional wetlands and waters of the United States, Dyess Air Force Base, Taylor County, Texas (United States Army Corps of Engineers 1995).

Site	Site Description	Area (ac)
9	Depression adjacent to US5	0.3
10	Depression adjacent to US5, human-induced	0.4
11	Impoundment of US5, human-induced	0.7
12	Impoundment drainage way N of flight line, human-induced	0.4
Sub-Total		**3.2**
Waters of the United States		
US1	Lake Totten: pond on golf course	10.1
US2	Little Elm Creek: channelized	12.4
US3	Unnamed Creek, tributary to Lake Totten and Little Elm Creek	0.7
US4	NW tributary to Little Elm Creek	3.1
US5	SW tributary to Little Elm Creek	0.5
C1	Concrete-lined portion of US4	3.8
Sub-Total		**30.6**
Total Jurisdictional Area		**33.8**

In addition to the mapped jurisdictional wetlands above, the National Wetlands Inventory, a database maintained by the Environmental Protection Agency, includes additional aquatic features that may qualify as wetlands (Figure 2-6).

Floodplains provide for the natural control and conveyance of floodwaters. The boundaries of the 100-year floodplain are identified in the 100 Year Floodplain Map (Westin 1995; Figure 2-6). Maps indicate that substantial portions of low-lying areas along Little Elm Creek in the south and east are currently in the 100-year floodplain, including portions of the golf course, with additional areas vulnerable to a 500-year flood event along Little Elm Creek and onto the southern end of the runway. The 100-year flood plain is a significant natural constraint to development at Dyess AFB. This floodplain is associated with two features, the drainage ways and Little Elm Creek.

2.3.6 Other Natural Resource Information

Not applicable.

2.4 Mission and Natural Resources

2.4.1 Land Use

Dyess AFB occupies 5,348 acres on the western side of Abilene. As part of the INRMP process, major land management areas have been classified and mapped as improved, semi-improved, and unimproved (Figure 2-7). None of the base property is currently outleased for crops, hay, or grazing.

2.4.1.1 Semi-improved Grounds

Semi-improved grounds include all areas of the base on which personnel perform periodic maintenance as necessary to maintain required vegetation heights, primarily for operational reasons. Approximately 1,453 acres of Dyess AFB lands are classified as semi-improved grounds and maintained by service contract.

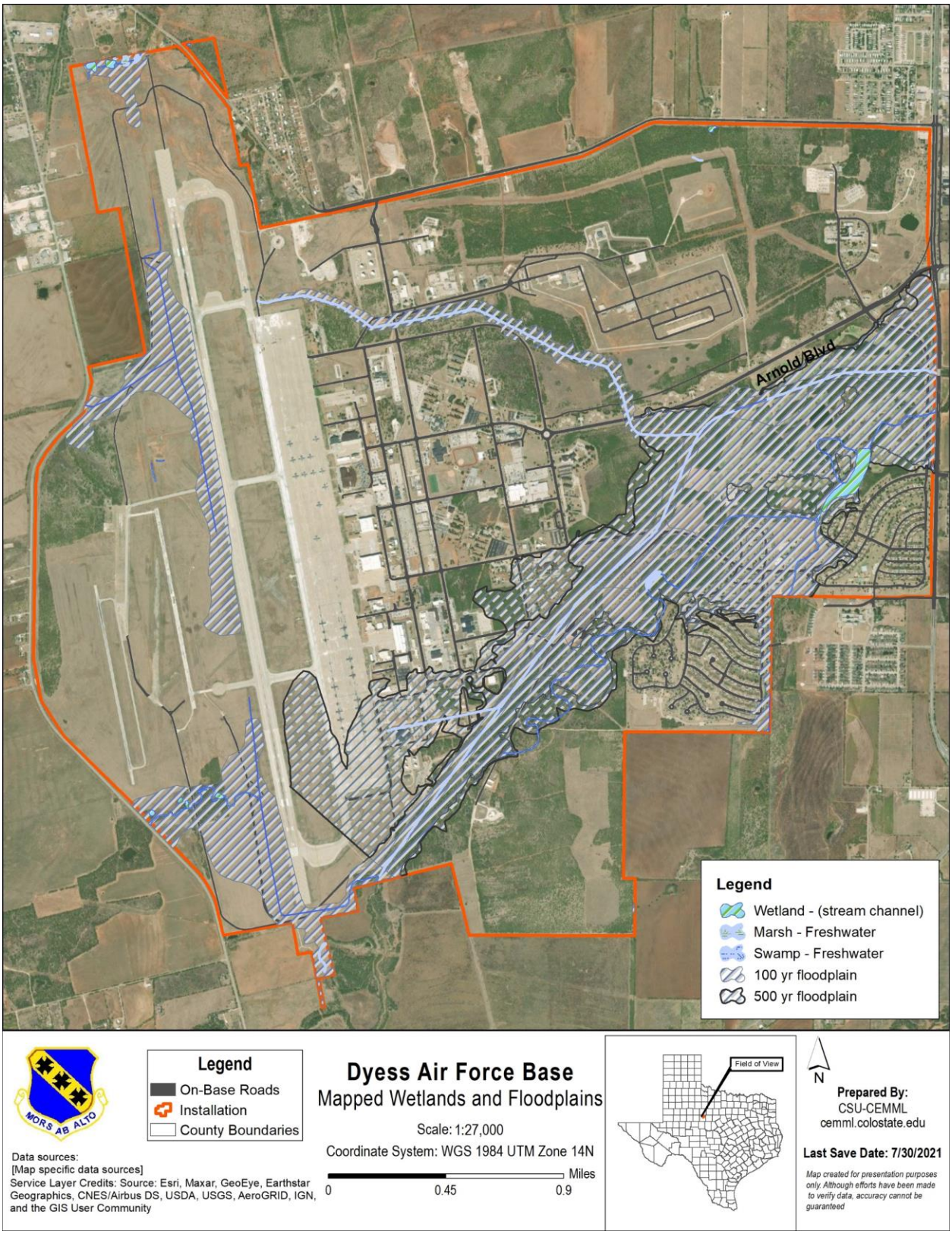

Figure 2-6. Location of wetland features and all flood zones on Dyess Air Force Base.

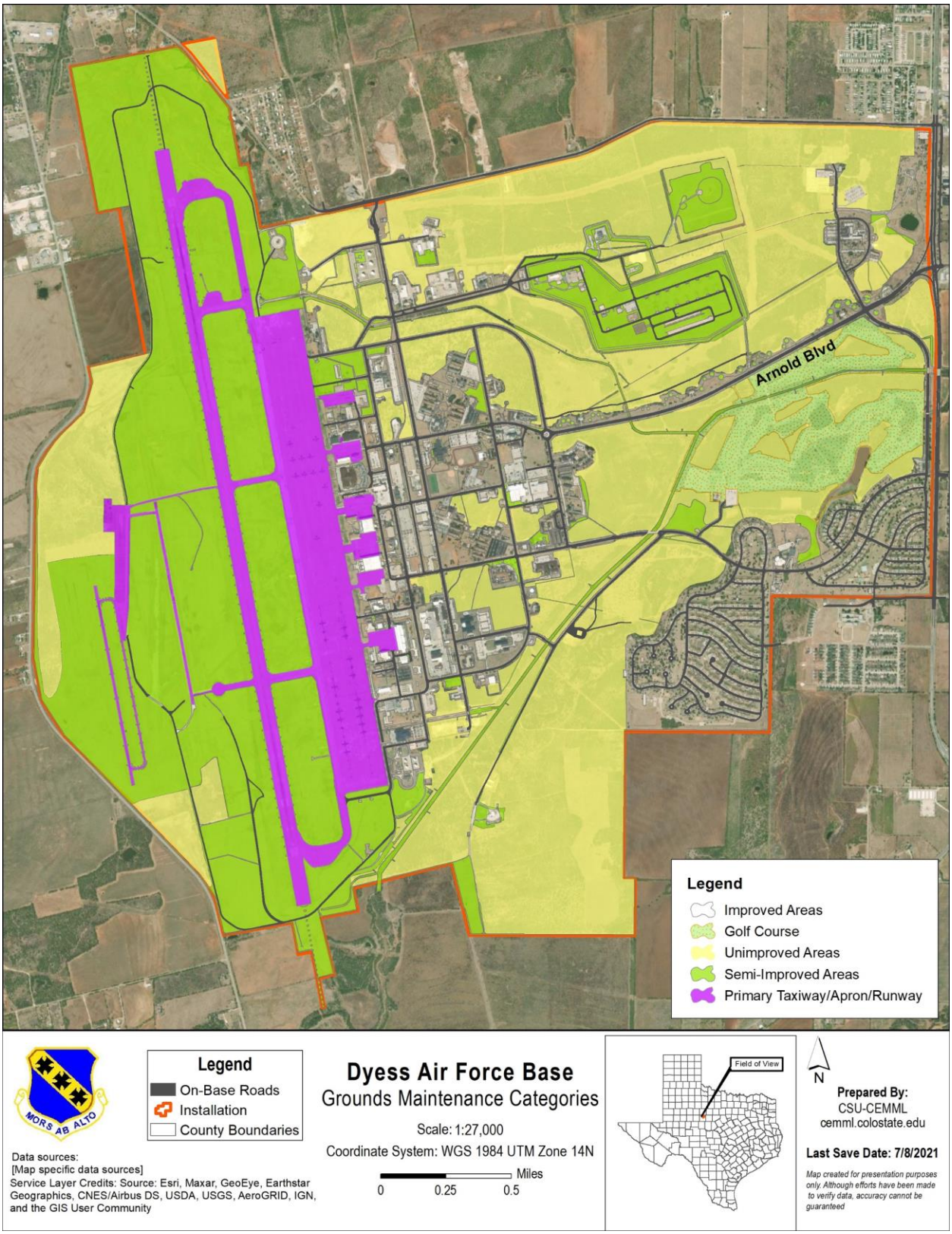

Figure 2-7. Grounds maintenance categories on Dyess Air Force Base.

Most of this land is adjacent to runways, taxiways and aprons, perimeter fences, firebreaks, the grenade range, utility easements, minor stormwater channels, the explosive ordnance disposal, and weapons storage areas.

2.4.1.2 Unimproved Grounds

Unimproved grounds include all areas of the base not included in the improved or semi-improved grounds categories and for which periodic maintenance is not a requirement. This includes forest lands, crop and grazing lands, lakes, ponds, and wetlands, and any area where natural vegetation is unmanaged (AFMAN 32-7003). Approximately 2,029 acres on the base fall into this category.

2.4.2 Natural Resource Constraints to Mission and Mission Planning

Natural resource constraints to future planning and missions at Dyess AFB involve compliance with the CWA and physical constraints related to BASH.

2.4.2.1 Physical Constraints

Natural resources can provide numerous direct physical constraints to base planning and mission operations, with the most significant of these being BASH around the airfield. Dyess AFB is located adjacent to but not directly impacted by important migratory routes used by many bird species, potentially increasing conflicts involving BASH in area training routes. During autumn and winter, ducks, geese, and smaller birds are present in high densities in the Texas panhandle playa lakes region to the north of Dyess AFB; many neo-tropical migrants pass through the area during spring and fall migration; and eastern meadowlarks (*Sturnella magna*), grackles (*Quiscalus* sp.), starlings (*Sturnus vulgaris*), and mourning doves are present year-round. The BASH Plan establishes the Bird Hazard Working Group and proposes procedures for minimizing hazards. With potential increases in low-level flying activities associated with expansion of the base's training mission, all initiatives affecting bird populations need to be closely coordinated to minimize BASH. In addition, all future activities to create aquatic habitats should be evaluated for their potential to increase BASH. It will be crucial to ensure active coordination between the base's natural resources manager (NRM), airfield managers, and safety and operation personnel regarding BASH issues related to future planning and missions.

2.4.2.2 Climate Impacts on Natural Resource Constraints to Mission and Mission Planning

The primary resource requirements for sustaining the military mission at Dyess AFB are air space for training and maintaining combat readiness, and land area for weapons storage and disposal of explosive ordnance. Climate change will have negligible to no effects on the amount of air and land space available; however, climate change may directly and indirectly affect mission-critical infrastructure and the natural resources that support the military mission, including temperatures appropriate for personnel and equipment to function. The following is a brief discussion of potential climate change impacts that may be of particular concern to Dyess AFB now or in the future, with emphasis on the climate projections and related impacts on natural resources described throughout this INRMP.

Temperatures at Dyess AFB are projected to increase under all scenarios and timeframes, with minimum, maximum, and average temperatures expected to be warmer than the historical baseline for almost every month of the year across scenarios (the exception being February of RCP 4.5 2030). The number of HOTDAYS increases from the baseline average of 97 days per year to 143 HOTDAYS per year in the RCP 8.5 2050 scenario (CEMML 2019). At Dyess AFB, increased maintenance requirements for mission-critical infrastructure (e.g., cooling buildings and electrical equipment, maintaining runways and roads), strained

electrical supply, personnel health, and increased drought potential all may be exacerbated by the warming environment. High temperatures also may impact the acquisition and supply chains needed for mission-critical equipment and infrastructure (Pinson et al. 2020).

There are also several indirect impacts of warmer temperatures that could occur on Dyess AFB due to the degradation of natural resources. As discussed in Section 2.3.2.3, *Future Vegetation Cover*, warmer temperatures and changing precipitation patterns are likely to create additional stress on the mesquite woodland and shrubland vegetation, reducing plant productivity and vegetation coverage. This, paired with intervals of increased precipitation intensity, would potentially reduce soil aggregate stability and increase potential erosion rates. In addition to providing erosion control, the native habitat and vegetation at Dyess AFB provides screening of sensitive areas, improves water quality, and supports biodiversity at the installation (Section 2.1.4, *Natural Resources Needed to Support the Military Mission*. Changes to the distribution and abundance of vegetation species at Dyess AFB could alter the ability of the native habit to provide these essential ecosystem services (Stein et al. 2019).

Furthermore, warmer temperatures may indirectly increase the prevalence of mosquito and tick-borne pathogens on the installation, potentially posing health risks for both wildlife and personnel (Süss et al. 2008). Changing climatic conditions also present opportunities for invasive species to outcompete native species (Hellmann et al. 2008), potentially creating additional management challenges and requiring additional military resources (Pinson et al. 2020). Warmer temperatures may also have minor mission impacts by decreasing recreation opportunities due to more frequent extreme heat episodes.

Historically, Dyess AFB has had a humid, subtropical climate with hot humid summers and mild, drier winters. Across the four scenarios, PRECIP is likely to increase from a baseline average of 25.2 inches per year to 30.1 inches per year in the RCP 4.5 2030 and 2050 scenarios; however, the monthly projections are more variable, with each scenario predicting wetter and drier periods at various times throughout the year. In all four scenarios, precipitation likely will increase in May and June—historically the wettest months—and then decrease or increase marginally in July and August, accentuating the current pattern of a wetter early summer followed by a drier late summer (CEMML 2019).

Flood modeling indicates that there is likely to be a decrease in inundation and decreased storm intensities, posing little risk to the military mission. Roads and bridges that cross Little Elm Creek and low-lying areas, such as the Mesquite Grove Golf Course, still may be vulnerable to inundation. Under projected increases in precipitation for all climate scenarios, wildfire frequencies and intensities are likely to remain the same or decrease in the future; however, ongoing wildland fire monitoring and management is advisable due to the many mission-related impacts of wildfire, such as damage to infrastructure, loss of training, impacts to security from damage to fencing and blocking roads, alterations in nutrient cycling, changes to vegetation communities, and accelerated soil erosion (Stein et al. 2019). The importance of fire as a management tool is likely to increase into the future for Dyess AFB, as it will be critical to maintaining healthy grasslands and preventing mesquite re-encroachment.

Adapting to climate change will require that the installation assess current operations and procedures to identify gaps that may increase their vulnerability to changes in climate and its secondary effects. Once these gaps are identified, climate change considerations will need to be integrated across all organizational levels to manage associated risks. Climate change mitigation and adaptation also will require collaboration with internal and external stakeholders to fully ensure that the installation's mission is not compromised in the future (DoD 2014). Several resources are available to guide climate change adaptation within the DoD (Naval Facilities Engineering Command 2017, Stein et al. 2019, and Pinson et al. 2020).

2.4.3 Current Major Mission Impacts on Natural Resources

This chapter describes existing conditions and impacts on the environment at Dyess AFB related to air quality, noise, water resources, and hazardous materials. Existing conditions and impacts relative to other environmental issues are either addressed elsewhere in this INRMP (e.g., vegetation, wildlife, wetlands) or are not included in this document because they have no effect on ecosystem functions at Dyess AFB (e.g., socioeconomics).

2.4.3.1 Air Emission Sources

Emission sources at Dyess AFB include mobile sources (e.g., aircraft, maintenance equipment, automobiles, and heavy equipment), stationary sources (e.g., fire training exercises, painting operations, welding operations, and stationary engines), and prescribed burning for reducing fuel hazards and managing natural resources. Dyess AFB has established certified, federally enforceable emission limits for its stationary sources to maintain a minor source status for Title V permitting purposes.

2.4.3.2 Noise

The principal source of noise at Dyess AFB is aircraft operations, which results in direct and indirect effects on the surrounding community. The Dyess Air Installation Compatible Use Zone study designates a series of restrictive zones surrounding the airport facility and provides recommendations for compatible land use (Figure 2-8). These restrictive zones include land-use restrictions designed to protect the navigable airspace around the installation for aircraft safety, minimize the number of people exposed to noise from aircraft operations, and minimize the number of people exposed to hazards related to aircraft operations and potential accidents.

The B-1B and C-130 are the principal aircraft operating from Dyess AFB, and the average numbers of daily operations for these aircraft are shown in Table 2-18. An airfield operation is defined as one take-off, one landing, or half of a closed pattern. A closed pattern consists of both a departure portion and an approach portion: i.e., two operations. In addition to these assigned aircraft, numerous transient aircraft from other military installations land and take-off from Dyess AFB.

Dyess AFB aircraft use the following basic flight patterns: straight-in approaches; overhead break landing pattern; tactical approaches; combat approaches and departures; Instrument Flight Rule (IFR) or radar closed patterns; and Visual Flight Rule or closed patterns. Dyess AFB flight patterns result from several considerations, including: take-off patterns routed to avoid heavily populated areas as much as possible; Air Force criteria governing the speed; rate of climb and turning radius for each type of aircraft; efforts to control and schedule missions to keep noise levels low, especially at night; and coordination with the Federal Aviation Administration to minimize conflicts with civilian aircraft operations.

To the maximum extent possible, engine run-up locations have been established in areas that minimize noise for people on base, as well as for those in the surrounding communities. Normal base operations do not include late-night engine run-ups, but heavy workloads or unforeseen contingencies sometimes require a limited number of nighttime engine run-ups.

Low-level training routes for B-1 aircraft are located well outside the local flying area and not near the base proper. The Marian Drop Zone is located on Dyess AFB just west of the main runway. This drop zone is used daily by the 317 AW C-130s to conduct low-altitude training.

Impacts to natural resources from noise generated by aircraft operations in and around Dyess AFB are minimal.

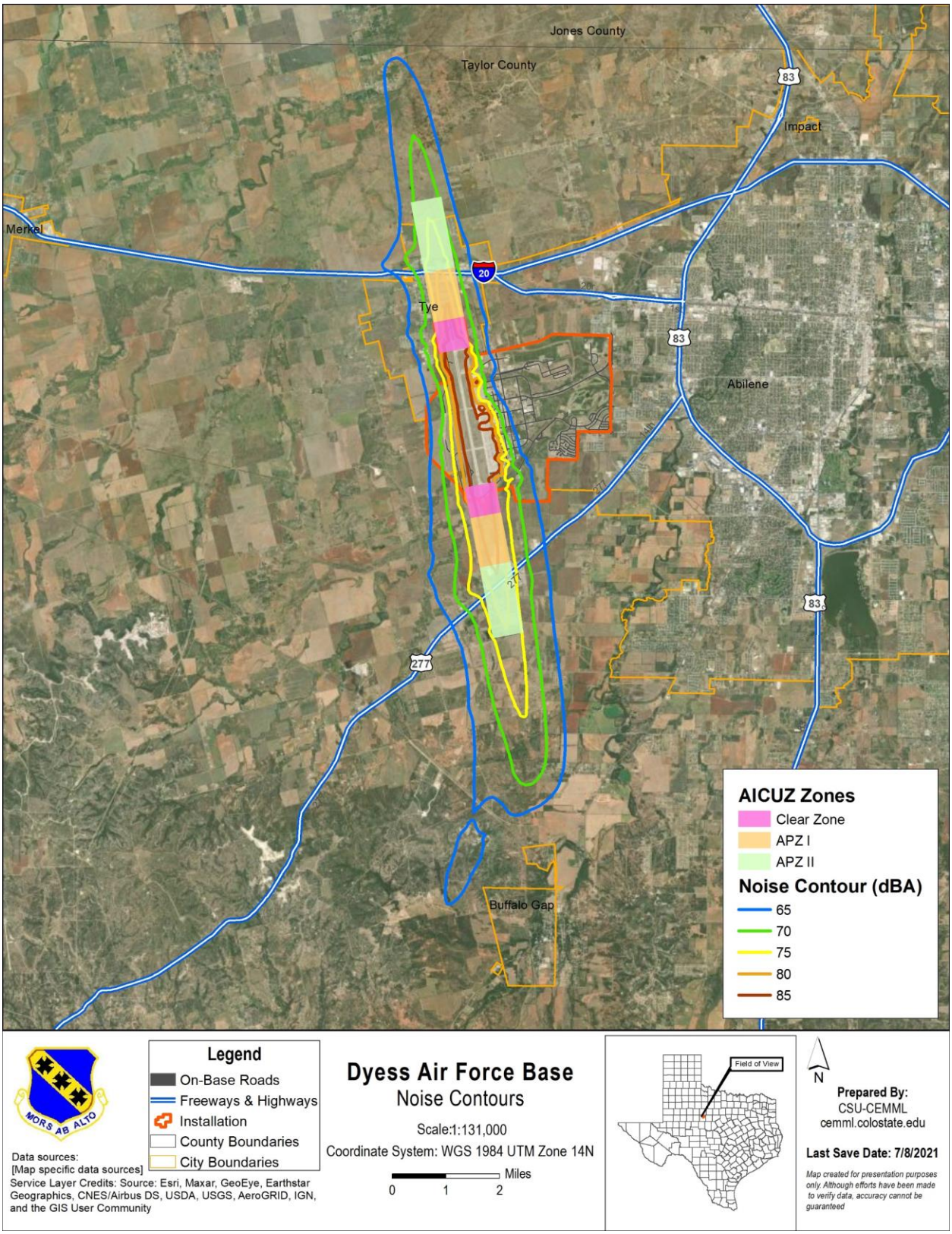

Figure 2-8. Air Installation Compatible Use Zones and noise contours for Dyess Air Force Base.

Table 2-18. Airfield operations (Source: Dyess AFB 2015 Air Installation Compatible Use Zone study).

Squadron	Aircraft	Operations Per Year			Operations Per Average Annual Day		
		Day	Night	TOTAL	Day	Night	TOTAL
9 BS	B-1	4,418	484	4,902	12.10	1.33	13.43
28 BS	B-1	5,420	581	6,001	14.85	1.59	16.44
337 TES	B-1	597	7	604	1.64	0.02	1.65
77 WPS	B-1	848	32	880	2.32	0.09	2.41
317 AG	C-130J	15,952	20,007	35,959	43.70	54.81	98.52
BASED SUBTOTAL		**27,235**	**21,111**	**48,346**	**74.62**	**57.84**	**132.45**
Transient	A-10A	18	0	18	0.05	0.00	0.05
	B-747-100	72	10	82	0.20	0.03	0.22
	C-12	34	0	34	0.09	0.00	0.09
	C-130P	156	2	158	0.43	0.01	0.43
	C-17	10	0	10	0.03	0.00	0.03
	C-21A	26	0	26	0.07	0.00	0.07
	F-15A	10	0	10	0.03	0.00	0.03
	F-16A	22	2	24	0.06	0.01	0.07
	F-18E/F	14	0	14	0.04	0.00	0.04
	Single-Engine Variable Pitch Propeller	64	0	64	0.18	0.00	0.18
	KC-10A	2	0	2	0.01	0.00	0.01
	KC-135	24	4	28	0.07	0.01	0.08
	T-1	80	0	80	0.22	0.00	0.22
	T-38A	2,272	0	2,272	6.22	0.00	6.22
	T-41	2	0	2	0.01	0.00	0.01
	T-44	24	2	26	0.07	0.01	0.07
	UH-1N	24	0	24	0.07	0.00	0.07
TRANSIENT SUBTOTAL		**2,854**	**20**	**2,874**	**7.82**	**0.06**	**7.88**
GRAND TOTAL		**30,089**	**21,131**	**51,220**	**82.44**	**57.89**	**140.33**

2.4.3.3 Impacts to Watersheds

As watersheds are converted from natural and agricultural areas to urban developments, changes in land use and hydrology can trigger a cascade of adjustments that occur downstream. Because the delivery systems tassocaited with urban-development infrastructure are more efficient, an increased volume of stormwater runoff reaches receiving streams faster and with greater velocity. This increased runoff causes degradation, including stream channel erosion, sedimentation, flooding, physical destruction of biota, and loss of stream and riparian habitat.

Dyess AFB has an active program of stormwater management and is discussed in the base Stormwater Pollution Prevention Plan (SWPPP), which is in compliance with the Texas Pollutant Discharge Elimination System (TPDES) permit requirements.

Dyess AFB has two stormwater outfalls. One outfall drains a small portion of the base, including the golf course and housing areas. The second outfall drains areas with the majority of industrial activities. The North and South Diversion Ditches both ultimately discharge out of the second outfall.

2.4.3.4 Ranges

The small-arms range is located in the south-central region of the base near the flight line and has no noise impact beyond the base or to base personnel. The grenade range is located south of the small-arms range. Only dummy-grenade rounds are used, resulting in no noise impact beyond the base or to base personnel. The Explosive Ordnance Disposal area located in the northeast portion of the base was used as an ordnance detonation and burial area. Currently, it is used as a training facility or for emergencies only. Advanced verbal notification to base personnel is given prior to any action.

2.4.3.5 Integrated Solid Waste Management

Dyess AFB is a large-quantity generator of hazardous waste. Hazardous waste-related activities on base are typical of those at military installations and are conducted IAW all applicable laws. The hazardous waste management program for Dyess AFB is a standalone program within the 7 CES/CEIE. Hazardous material spills could negatively impact ground water, surface water, streams, and associated habitats.

2.4.3.6 Groundwater Contamination

The USAF and the EPA signed a Federal Facilities Compliance Agreement in September 1991, which required the base to develop a groundwater sampling plan and monitoring system for four Environmental Restoration Plan sites (FT-03, OT-08, WP-09, and ST-10). The agreement was closed with EPA approval in 1996. In May 2008, Texas Commission of Environmental Quality (TCEQ) granted permission to cease groundwater monitoring at these sites. More than 160 underground storage tanks have been closed at Dyess AFB under the Texas Petroleum Storage Tank Program and under guidance of the Texas Resource Conservation and Recovery Act Program. Dyess AFB is currently free of underground storage tanks and has implemented Environmental Management System (EMS) policy that prohibits the direct burial of tanks. The Dyess AFB EPA One Plan, located in 7 CES/CEIE, specifies responsibilities and procedures for dealing with hazardous material and hazardous waste contingencies, such as hazardous materials spills and oil spills (URS Corporation 2004). These contingencies mitigate the potential for detrimental impacts to ground water resources on base.

2.4.3.7 Environmental Restoration Sites

The USAF Environmental Restoration Plan policy was implemented on 21 January 1982. The records search (Preliminary Assessment) report was completed in July 1985. The Remedial Investigation was

initiated in 1987; the Remedial Investigation final report was approved in 1996. The base received a signed permit in April 2003 and a signed Compliance Plan in April 2003. The permit was revoked in December 2008 and all sites were subsequently closed. Although there are no active restoration sites, some of the sites continue to carry land-use restrictions. Land-use restrictions of restoration sites will reduce loss of natural resources from future development.

2.4.4 Potential Future Mission Impacts on Natural Resources

Projected changes in mission: None known.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The USAF environmental program adheres to the EMS framework and it's Plan, Do, Check, Act cycle for ensuring mission success. EO 13834, *Efficient Federal Operations*; DoDI 4715.17, *Environmental Management Systems*; AFI 32-7001, *Environmental Management*; and International Organization for Standardization 14001 standard, *Environmental Management Systems—Requirements with guidance for use* provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

The natural resources program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively manage associated risks, and instill a culture of continual improvement. The INRMP serves as an administrative operational control that defines compliance-related activities and processes.

4.0 GENERAL ROLES AND RESPONSIBILITIES

General roles and responsibilities that are necessary to implement and support the natural resources program are listed in the table below. Specific natural resources management-related roles and responsibilities are described in appropriate sections of this plan.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	Installation Role/Responsibility Description
Installation Commander	Installation or Wing Commander is responsible for signing and approving the Integrated Natural Resources Management Plan (INRMP). Future INRMP updates requiring Wing Commander signature would include major changes in the military mission, new federally protected/listed plant or animal species, or other new information significantly affecting the ability of the installation to implement the INRMP.
Air Force Civil Engineer Center (AFCEC) Natural Resources Media Manager/Subject Matter Expert/Subject Matter Specialist	The AFCEC Installation Support Team natural resources specialist assumed interim management of the Dyess AFB natural resources program after the base eliminated the position in 2012.
Installation Natural Resources Manager (NRM)/Point of Contact	Overall responsibility to manage the natural resources programs, in coordination with other program areas as described in AFI and Dyess AFB supplements. Ensures that the program complies with Air Force Manual 32-7003, Dyess AFB supplements, Executive Orders, and all applicable federal, state, and local laws. This includes managing all aspects of the installation's fish and wildlife program, including the hunting and fishing program, coordination with the state and federal fish and wildlife agencies, and fish and wildlife habitat improvement, conservation, and rehabilitation. The NRM prepares, coordinates, and implements all natural resources plans and cooperative agreements at Dyess AFB. The NRM also reviews all work requests (Air Force Form 332) for approval/disapproval prior to starting projects. This policy is necessary to ensure that the NRM can properly allocate and schedule resources. The NRM is designated Office of Primary Responsibility to monitor all conservation activities and maintain status and minutes of meetings. All plans, permits, and projects that may affect natural resources shall be reviewed and evaluated by the NRM to ensure consistency with the INRMP as well as compliance with federal laws and regulations.
Installation Security Forces	Security Forces and Texas Parks and Wildlife Department have a Memorandum of Agreement to cooperatively support Conservation Law Enforcement of fishing, hunting, trapping and dispersed outdoor recreation activities on Dyess AFB
Installation Unit Environmental Coordinators (UECs); see AFI 32-7001 for role description	Point of contact that complies with environmental requirements and mission considerations. Serves as connection point between Commanders and environmental

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	Installation Role/Responsibility Description
	staff, between group personnel and environmental staff, and advises supervisors on environmental policies.
Installation Wildland Fire Program Manager	Dyess AFB currently has no Wildland Fire Program Manager
Pest Manager	7 CES/Civil Engineering Operations
Range Operating Agency	Air Force Global Strike Command 7 Operation Support Squadron/OSR: Geographically Separated Units Management
Conservation Law Enforcement Officer	N/A
National Environmental Policy Act/Environmental Impact Analysis Process (EIAP) Manager	USAF analyzes the effects of major federal actions that have the potential to significantly affect the quality of the human environment, including cultural and natural resources. The USAF must (1) inform the public of the proposed action and provide for the public's participation in the decision-making process, and (2) use the Categorical Exclusion (CATEX), Environmental Assessment, or an Environmental Impact Statement is required when considering what level of analysis an action reuires.
National Oceanic and Atmospheric Administration, National Marine Fisheries Service	N/A
United States Forest Service	N/A
United States Fish and Wildlife Service	Cooperates on the five-year revisions and yearly reviews of the INRMP. Adminsters, oversees, and enforces the conservation provisions of the Migratory Bird Treaty Act, which includes responsibility for population management, habitat protection, and regulations development and enforcement. Consults with Environmental to determine the presence of any suspected federally listed threatened, endangered or candidate species on the installation. Consults with installation about how ongoing actions, including the implementation of the INRMP, may affect a listed species or designated critical habitat.
Environmental, Safety, and Occupational Health Leadership Council (ELC)	Reviews the INRMP and approves minor changes to the INRMP. The chair of the ELC is the Vice Wing Commander.
Base Civil Engineer	Recommends minor changes to the INRMP and coordinates implementation of the INRMP.

5.0 TRAINING

USAF installation NRMs/Points of Contact (POCs) and other natural resources support personnel require specific education, training, and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

Installation Supplement—Training

Natural resources management training is provided to ensure that base personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained IAW the Recordkeeping and Reporting section of this plan. USAF installation NRMs/POCs and other natural resources support personnel require specific education, training, and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

- NRMs at Category I installations must take the course DoD Natural Resources Compliance, endorsed by the DoD Interservice Environmental Education Review Board and offered for all DoD Components by the Naval Civil Engineer Corps Officers School (CECOS). See http://www.netc.navy.mil/centers/csfe/cecos/ for CECOS course schedules and registration information. Other applicable environmental management courses are offered by the Air Force Institute of Technology (http://www.afit.edu), the National Conservation Training Center managed by the USFWS (http://www.training.fws.gov), and the Bureau of Land Management Training Center (http://training.fws.gov).
- Natural resources management personnel shall be encouraged to attain professional registration, certification, or licensing for their related fields, and may be allowed to attend appropriate national, regional, and state conferences and training courses.
- All individuals who will be enforcing fish, wildlife, and natural resources laws on USAF lands must receive specialized, professional training on the enforcement of fish, wildlife, and natural resources in compliance with the Sikes Act. This training may be obtained by successfully completing the Land Management Police Training course at the Federal Law Enforcement Training Center (http://www.fletc.gov/).
- Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, to include training that is mandatory to attain any required permits.
- Personnel supporting the BASH program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement.
- The DoD supported publication Conserving Biodiversity on Military Lands—A Handbook for Natural Resources Managers (http://dodbiodiversity.org) provides guidance, case studies, and other information regarding the management of natural resources on DoD installations.

Natural resources management training is provided to ensure that installation personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained IAW the Recordkeeping and Reporting section of this plan. A training program is not currently in place, but there are plans to develop options for training, including banding and

tagging birds and wildlife, monitoring, and wildlife biology field sampling techniques such as blood sampling. These trainings would enhance in-house abilities to monitor and manage natural resources.

6.0 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

The installation maintains required records IAW Air Force Manual 33-363, *Management of Records*, and disposes of records IAW the Air Force Records Management System records disposition schedule. Numerous types of records must be maintained to support implementation of the natural resources program. Specific records are identified in applicable sections of this plan, in the Natural Resources Playbook, and in referenced documents.

Installation Supplement—Recordkeeping

Natural Resources (NR) management and recordkeeping is currently accomplished by Conner Cox, the NRM. The NRM maintains the Natural Resources file on the CE drive. In addition, the NRM maintains and updates a list of wildlife observations, including species, sex, weather, and temperature at the time of the observation. Information from this list will be incorporated in the IRNMP during the next update, if necessary.

6.2 Reporting

The installation NRM is responsible for responding to natural resources-related data calls and reporting requirements. The NRM and supporting AFCEC Natural Resources Media Manager and Subject Matter Specialist should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

Installation Supplement—Reporting

NR reporting is currently accomplished by Conner Cox.

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

This section describes the current status of the installation's NR management program and program areas of interest. Current management practices, including common day-to-day management practices and ongoing special initiatives, are described for each applicable program area used to manage existing resources. Program elements in this outline that do not exist on the installation are identified as not applicable and include a justification, as necessary.

7.1 Fish and Wildlife Management

Applicability Statement

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

Program Overview/Current Management Practices

Actions designed to preserve, enhance, and regulate indigenous wildlife and its habitats, including conservation of special-status species and non-game species, management and harvest of game species, avian protection, BASH reduction, and animal damage control, as required by various federal laws and statutes, including the MBTA, the ESA, EOs, and other regulations.

7.1.1 Base Classification

Dyess AFB is classified as a Category 1 installation, indicating that there is suitable habitat for conserving and managing fish and wildlife (including special-status and non-game species) on base and that such actions will not conflict with the base's mission. Fish and wildlife management is developed IAW the guidelines established in AFMAN 32-7003, *Environmental Conservation*. The entire base is recognized under the ecosystem concept as an important habitat entity. The focus in on managing vegetation and other habitat features to meet the food, cover, water, and territorial requirements necessary to promote biodiversity through natural, self-sustaining ecosystems. Areas for single-species management are de-emphasized in favor of a landscape approach to NR management. This approach favors management that considers NRs at a community or ecosystem level. Quality, integrity, and continuity of the community or ecosystem is the overall goal of this approach, and it is assumed that individual species will prosper within this broader scheme, including special-status species.

Large herbivores such as the American bison, pronghorn, white- tailed deer, and domestic livestock no longer use the rangeland that Dyess AFB now occupies. Smaller mammals, such a black-tailed prairie dog (*Cynomys ludovicianus*) and black-footed ferret (*Mustela nigripes*) that were common and important members of the ecosystem are no longer present. Fragmentation and limited open space combined with the incompatibility of existing land use precludes the feasibility of a grazing program at this time that could be used to mimic the disturbance from bison. Therefore, the ecosystem benefits of many natural disturbances associated with herbivores are lost. These natural benefits include converting plant energy into animal energy, reducing decadent plant material and fine fuels, improving herbaceous composition, enhancing nutrient cycling, dispersing microbial populations, improving invertebrate habitat, reducing standing dead timber, accelerating organic decomposition, and increasing soil permeability due to hoof action. Without the presence of large herbivores, build-ups of decadent plant material inhibit new growth, nutrient cycling is very slow, and soil fertility is diminished.

Avian species are the most diverse and abundant wildlife resource on base. Resident game birds present on Dyess AFB, including the mourning dove, white-winged dove (*Zenaida asiatica*), northern bobwhite, and

wild turkey, are considered an important wildlife component. The ability of these species to expand their ranges outside of base boundaries eliminates the need to manage their numbers. The discharge of a hunting firearm within the city limits of Abilene is prohibited, therefore hunting game birds is not allowed on base at this time, but bow hunting may be a possibility if needed and given sufficient hunter interest.

Many grassland- and forest-dwelling, neo-tropical migratory bird species nest at Dyess AFB. As previously stated, it is DoD policy to promote and support Partners in Flight (PIF) in protecting and conserving neo-tropical migratory birds and their habitats by protecting vital habitat, enhancing biodiversity, and maintaining healthy and productive natural systems on our lands in a way that is consistent with the military mission. Raptors commonly observed at various times of year include the American kestrel, Cooper's hawk, sharp-shinned hawk (*Accipiter striatus*), red-tailed and Swainson's hawks, northern harrier, Mississippi kite, barn and great horned owls, and the turkey and black vultures. Because of the close proximity of the airfield and associated BASH potential, management does not include increasing raptor and waterfowl habitat on base.

Restoring native prairie nesting habitat is a priority NR management goal because of the widespread decline in species that use this habitat. Monitoring and maintaining open grassland habitat is an ongoing challenge that Dyess AFB will begin to address by implementing the Wildfire Management Plan (WFMP).

7.1.2 Habitat Types

Four primary wildlife habitat/vegetation associations of particular importance to wildlife have been identified at Dyess AFB: Mesquite Savannah—grasslands invaded by mesquite, previously maintained by mowing; Riparian Woodlands—associated with the historical and channelized Little Elm Creek system; Mesquite Woodlands—mature and old-growth deciduous mesquite forests; and Aquatic habitat. In the past, permanent monitoring stations were established in these habitats, but the locations and data have since been lost. Establishing a new vegetation-monitoring program with permanent plots will be invaluable for implementing the rotational burning outlined in the WFMP and tracking trends in vegetation over time. Monitoring transects should be established throughout the base, with an emphasis on detecting long-term trends overall and trends resulting from rotational burning efforts in particular. Monitoring plots should be installed prior to implementation of prescribed burning to establish baseline conditions and document the results of burning.

General habitat management goals associated with each habitat type and objectives to improve fish and wildlife habitat conditions within these areas are discussed below. These measures typically are not implemented in and around the flight line area to minimize the potential for BASH conflicts.

7.1.2.1 Grasslands/Mesquite Savannah

Mesquite is a major component of all plant communities present at Dyess AFB. The loss of open grasslands to mesquite encroachment has resulted in the decline of open grassland nesting habitat. A combination of factors has resulted in a reduction of perennial, warm-season bunchgrasses and an increase in Texas wintergrass. The primary goal of grassland management on Dyess AFB is to create mosaics of native prairie and maintain these areas through natural disturbance (i.e., prescribed fire at an interval of approximately three years). Mesquite-reduction projects in 2003 and 2004 resulted in the restoration of 92 acres of native grasses and forbs. The 2005/2006 grassland restoration plan (Section 14.2.6, *Appendix G. Grassland Restoration/Avian Protection*) involved mechanical removal of mesquite on an additional 90 acres of invaded grasslands. In 2009, utility rights-of-way and adjacent areas totaling 100 acres were root plowed, roller chopped, and re-seeded with native, warm-season bunch grasses and forbs that should be present on these sites in good to excellent condition. NR's BMPs for wildlife habitat are used to maintain these areas

and suppress mesquite encroachment. Habitat management of young mesquite forests will continue to emphasize restoring open, native grassland areas while maintaining adjacent forest cover to enhance ecotonal quality and optimize species richness.

Primary grassland restoration objectives are to suppress mesquite; promote organic decomposition and improve soil fertility; restore native herbaceous composition; improve the capacity to capture and store annual rainfall in the soil profile; enhance microbial and invertebrate populations; enhance Texas horned lizard and habitat for ground-nesting birds; improve species diversity and vagility; and improve groundwater resources.

7.1.2.2 Mesquite Woodlands

Mature mesquite woodlands and old growth mesquite/scrub communities comprise a significant portion of the terrestrial wildlife habitat found at Dyess AFB. Woody understory species include prickly pear, lotebush, catclaw acacia, Roemer's acacia (*Acacia roemeriana*), littleleaf sumac, algerita (*Mahonia trifoliolata*), Mormon tea (*Ephedra viridis*), tasajillo, and minor components of grasses and forbs. Resident wildlife associated with mature mesquite woodlands commonly include the golden-fronted woodpecker (*Melanerpes aurifrons*), ladder-backed woodpecker (*Picoides scalaris*), curved-billed thrasher (*Toxostoma curvirostre*), cactus wren (*Campylorhynchus brunneicapillus*), canyon towhee (*Melozone fusca*), northern cardinal (*Cardinalis cardinalis*), pyrrhuloxia (*Cardinalis sinuatus*), mourning dove, mockingbird (*Mimus polyglottos*), Bewick's wren (*Thryomanes bewickii*), northern bobwhite, wild turkey, greater roadrunner (*Geococcyx californianus*), eastern cottontail, western box turtle, Texas horned lizard, southern plains woodrat (*Neotoma micropus*), hispid cotton rat (*Sigmodon hispidus*), striped skunk (*Mephitis mephitis*), nine-banded armadillo (*Dasypus novemcinctus*), North American porcupine (*Erethizon dorsatum*), barn owl, great horned owl, coyote, bobcat, and American badger. Many neo-tropical migratory birds use these old-growth forests as nesting habitat in spring and summer, including the yellow-billed cuckoo (*Coccyzus americanus*), eastern bluebird (*Sialia sialis*), Bullock's oriole (*Icterus bullockii*), ash-throated flycatcher (*Myiarchus cinerascens*), Bell's vireo (*Vireo bellii*), painted bunting (*Passerina ciris*), scissor-tailed flycatcher, and the western kingbird (*Tyrannus verticalis*). Permanent survey transects one and two are used for monitoring vegetation and wildlife in these areas.

The mature mesquite woodlands are considered mid-successional. Mesquite density and the grass/forb component are declining due to competition while understory woody species, such as lotebush, prickly pear, and acacia, are increasing. Ground cover is generally adequate to carry a fire on most sites. Management goals will focus on improving soil conditions through natural disturbance. The use of prescribed fire is anticipated in these areas with the primary goal being to reduce decadent vegetation (particularly mesquite), increase the warm-season component, and improve soil fertility. The largest example of mature mesquite forest (approximately 245 acres) is an "L-shaped," unimproved area bounded on the east by Hospital Road; on the south by East Arnold Boulevard to WSA Drive and the eastern fenceline of the WSA, and the northern lanes of Ammo Road; to the north by the northern boundary of Dyess AFB; and to the west by a line from the northern end of Cross Street (within the WSA) to the northern boundary of Dyess AFB.

Of special interest is an area north of Ammo road and west of Cross Street extending to the material recovery facility in the north-central part of the base. Exposed hardpan clay soil there indicates a high degree of disturbance and top soil loss, most likely due to past construction activity. There is very little ground cover except leaf litter and prickly pear, resulting in limited wildlife use of the area, although the southern plains woodrat is well adapted to this habitat and constructs elaborate mounds of sticks, thorns, and mesquite beans within a prickly pear fortress. This large, gray, herbivorous rodent uses the cactus pads

as its primary source of food and water. Management goals for this area will focus on improving soil moisture by using the single-row, deep-ripping technique to break up the ground and enhance the absorption/conservation of water, and to prepare the seedbed for deep-rooted bunchgrass establishment. The focus will be improvement of the soil fertility by increasing the amount of organic ground cover.

The old-growth mesquite habitat (two isolated areas located in the northeastern part of the base that comprise approximately 64 acres) is a climax woody composition with limited amounts of fine fuels necessary to support prescribed fire. Barring a major natural disturbance (e.g., crown fire, tornado, disease, insects), these areas will likely remain intact indefinitely. The species diversity and unique characteristics of these communities warrant protection from mechanical disturbance or manipulation. Management will focus primarily on monitoring and improving water resources for wildlife.

7.1.2.3 Riparian Woodlands

The riparian deciduous woodlands are part of the original Little Elm Creek system. The area lies between Diversion Road to the west, base family housing on the east, and the Cantonment area to the south. This area encompasses approximately 60 acres and is one of the most diverse and active wildlife habitats on base. The normal hydrology of this historical streambed has been disrupted by construction activities within the area. The past burial of concrete debris adjacent to this system and family housing have created recurring sink holes attractive to rodents, small mammals, and snakes that use them as den sites. Their close proximity to base family housing requires constant monitoring and filling to reduce the associated risks. It is necessary to manage rattlesnake populations by relocating them to the west end of the base or permanently removing them. Management of the area will consist of protecting existing riparian vegetation from further disturbance, restoring degraded vegetation, and monitoring. Survey transect number four is located in this area. Due to heavy fuel loads, consultation with fire ecology professionals is needed to determine what effect the application of prescribed fire will have on existing mid- and upper-story riparian species.

The diversion ditch Riparian Restoration Plan was prepared in 2002 (Section 14.2.4, *Appendix E. Riparian Plan*). The plan, developed in cooperation with the USARDC, provides for the establishment of native riparian over-story and mid-story species along the Little Elm Creek channels that conduct stormwater through Dyess AFB. The initial phase of this riparian restoration effort was the establishment of an experimental plot in 2004 to investigate the influence of various water-absorbent soil amendments on plant survival. These amendments were compared with conventional irrigation to determine the most efficient watering techniques. Trees were planted in four horizontal rows spaced approximately 15 feet apart from the lower extent of the channel to the top. Native trees and shrubs consisted of eastern cottonwood (*Populus deltoides*), black willow, Chickasaw plum (*Prunus angustifolia*), netleaf hackberry, pecan, Texas walnut (*Juglans microcarpa*), western soapberry, and escarpment live oak. The second phase of the project involved large-scale revegetation of the north and east diversion ditches in 2005. Drip irrigation was determined to be the most efficient and cost effective method for ensuring plant survival. The final phase, conducted in 2006, completed these vegetative buffer strips in the south diversion ditch. Established trees received supplemental watering for a period of two years. Mowing within the project area was discontinued and the entire area was allowed to undergo natural succession. This project will provide numerous long-term, positive benefits to wildlife and improve storm-water quality and groundwater recharge. Long-term management of these areas will involve monitoring and suppressing invasive species. Firebreaks will be maintained to protect young trees from premature exposure to fire.

7.1.2.4 Aquatic Habitat

In addition to the intermittent flows that support wildlife in the diversion ditches, there are three impoundments on Dyess AFB that require habitat management, as required by EO 1199, *Protection of Wetlands*, and EO 12962, *Recreational Fisheries*.

Lake Totten is a 10-acre impoundment located in the southeast portion of Mesquite Grove Golf Course and constructed in the late 1950s to capture stormwater. This pond is supplied by an unnamed tributary and two outfalls that drain base housing with excess water flowing over a spillway and into a stormwater conveyance. Lake Totten as a part of Mesquite Grove Golf Course was designated an Audubon Cooperative Sanctuary in 2001. Diverse assemblages of wildlife nest, roost, den, forage, predate, and reproduce within the boundaries of this sanctuary. Mammals including Virginia opossum (*Didelphis virginiana*), fox squirrel (*Sciurus niger*), eastern cottontail, Mexican free-tailed bat (*Tadarida brasiliensis*), black-tailed jackrabbit (*Lepus californicus*), Mexican ground squirrel (*Spermophilus mexicana*), American beaver (*Castor canadensis*), North American porcupine, coyote, gray fox (*Urocyon cinereoargenteus*), common raccoon, striped skunk, American badger, and bobcat have been observed within the boundaries of the golf course. A short list of herptile species observed in or near the lake includes the common bullfrog, Blanchard's cricket frog (*Acris blanchardi*), plains leopard frog (*Rana blairi*), pallid spiny softshell turtle, snapping turtle, red-eared slider, spotted whiptail lizard (*Cnemidophorus gularis*), Texas spiny lizard (*Sceloporus olivaceus*), desert kingsnake (*Lampropeltis getulus splendida*), western diamondback rattlesnake, bullsnake, diamondback water snake, and the western coachwhip (*Masticophis flagellum testaceus*). Bird life is abundant. A variety of resident and migratory avifauna may be observed in close proximity to Lake Totten. Migratory warblers descend to feed on the giant ragweed (*Ambrosia trifida*) and sunflower (*Helianthus* sp.) seeds present in set-aside wildlife areas. Common wading birds include the great blue heron (*Ardea herodias*) and green heron (*Butorides virescens*), whereas yellow-crowned night-heron (*Nyctanassa violacea*) and black-crowned night-heron (*Nycticorax nyticorax*) are spotted occasionally. Various ducks, shorebirds, quail, turkeys, and doves use this aquatic habitat as a food and water source. Large numbers of wild turkeys use the golf course as a safe winter roosting and staging area for feeding forays into adjacent riparian corridors and mesquite forests. Mississippi kites, common nighthawks (*Chordeiles minor*) and other insectivores, such as purple martin (*Progne subis*), barn swallow (*Hirundo rustica),* cliff swallow (*Petrochelidon pyrrhonota*), cave swallow (*Petrochelidon fulva*), and chimney swift (*Chaetura pelagica*) are present in large numbers throughout the summer.

This pond is very scenic when it at or near capacity, but it has a tendency to lose water volume rapidly during extended dry periods and high temperatures. Average depth is only three feet and water levels may fluctuate by as many as six feet during any given growing season. This impoundment is also subject to high evaporation rates because it is oriented in alignment with the prevailing wind direction. Dense algal populations on Lake Totten are indicative of excessive nutrients. Although the golf course has instituted a reduced fertilization policy, runoff from base housing and past practices have probably supplied an excess of nutrients to the sediments of the lake that are still available on a seasonal basis. In 2004, a Lewisville Aquatic Ecosystems Research Facility project was completed to increase native aquatic plant diversity and to improve water quality and wildlife habitat; the project included planting 11 native submerged, emergent, and floating species (Table 7-1). Details of this project may be found in Section 14.2.4, *Appendix E. Riparian Plan* (page 380, Lake Totten Vegetation Restoration Final Report).

Table 7-1. Aquatic and wetland plant species planted at Lake Totten in May 2004.

Species	No. Installed	Depth (feet)	Cage height (feet)	Protection
Water celery	30	3–3.5	4-foot ring	No
Illinois pondweed	30	3–3.5	4-foot ring	No
Water stargrass (grass-leaf mud-plantain)	30	2–2.5	3-foot ring	No
Longleaf pondweed	72	2–3.5	3- and 4-foot ring	No
American white water lily	12	2–2.5	3-foot ring	No
Spatterdock (yellow pond lily)	2	2–2.5	3-foot ring	No
American bulrush (chairmaker's bulrush)	24	0.5	2-foot ring	Yes, at shoreline
Squarestem spikerush	24	1–1.5	3-foot ring	Yes, at shoreline
Bull tongue arrowhead	24	1–1.5	3-foot ring	Yes, at shoreline
Water hyssop	24	0.5	2-foot ring	Yes, at shoreline
American water willow	24	0.5-1.5	2- and 3-foot ring	Yes, at shoreline

Protective cages were installed to protect these young plants from herbivory (Table 7-1), but they have been removed. Management will entail continued monitoring and maintenance of cages and replacing plants as necessary to make certain that founder colonies remain viable and are able to continue spreading in the lake. Additional plantings of overstory species, such as cottonwoods and willows, would increase the habitat value, provide shade and cooling for the water, and increase the value as a fishing spot by making the shoreline shaded and more attractive for anglers. Once well-established, native vegetation is able to survive events like excessive flooding or prolonged drought, both of which are possible in Lake Totten, even within a single growing season. Once riparian habitat has expanded sufficiently, the addition of wood duck (*Aix sponsa*) nesting boxes would also greatly increase the value of this site as wildlife habitat.

A project to support water levels in Lake Totten was competed in 2006. This hugely beneficial project successfully diverted lost stormwater to the channel upstream of this impoundment, creating approximately one mile of new wetland and riparian habitat.

Additional management alternatives include manipulation of water levels (which would require modification to the outlet works), providing a clay barrier to shallow lenses of sand/gravel, and sediment removal. Sediment removal to increase the storage capacity of the lake would require relocating existing fish populations, draining, and significant mechanical disturbance. Another water-conservation alternative would require sealing the bottom with bentonite.

Effluent Ponds

Two effluent ponds have been constructed for the purpose of storing irrigation water to be used on the landscaped areas of the base. These ponds have a total surface area of seven acres and have a combined storage capacity of 22 million gallons. It is necessary to manage vegetation and filamentous algae in these impoundments to alleviate problems associated with the irrigation system. Using triploid grass carp (*Ctenopharyngodon idella*) requires a permit through the TPWD. A TPWD permit was obtained and the

use of triploid grass carp was employed in 2004 as a means to biologically control aquatic vegetation and filamentous algae. This vegetation control option has eliminated the need for herbicides, chemicals, and dyes. Vegetation management of the effluent ponds will require monitoring. Future vegetation and algae control can be accomplished with either grass carp, algaecide, or mechanical/manual removal. Sport fish, including sunfish (*Lepomis* spp.), bass (*Micropterus* spp.), and catfish (*Ictalurus* spp., *Ameiurus* spp.) also were stocked in 2004. Double-crested cormorants (*Nannopterum auritum*) were present throughout the winters of 2004–2005, 2009–2010, and 2018–2019 and had a negative impact on fish numbers. These ponds also would benefit from additional habitat management, such as tree planting for shade and aesthetics.

7.1.3 Habitat Management

Wildlife Habitat BMPs for achieving habitat management goals will entail one or more of the following options as an integrated approach to restore or improve native grasslands, woodlands, and riparian habitats.

7.1.3.1 Prescribed Burning

Fire is a naturally occurring disturbance that promotes diversity and health in natural ecosystems. Prescribed burning through implementation of the WFMP is a cost effective means to reduce decadent herbaceous biomass, control mesquite re-invasion, reduce mesquite impacts on the airfield, improve herbaceous composition, and reduce fine fuels accumulated over time. See Section 7.9, *Wildland Fire Management*.

7.1.3.2 Mechanical Manipulation

Use heavy equipment to perform root plowing, grubbing, ripping, roller- chopping, compaction, imprinting, grading, hauling, land forming, mowing and other means to accomplish habitat-restoration goals. Any practice to control or reduce mesquite or redberry juniper densities will require severing of the root bud zone or crown to prevent resprouting and development of dense, multi-trunked thickets. Treatment boundaries and objectives will be determined and mapped electronically using the base's geographic information system (GIS) and aerial photography. Mesquite density-reduction planning (including use of prescribed burning) must consider wildlife cover requirements and travel corridors, nesting seasons, soil/site descriptions, slope angle and aspect, soil loss and erosion factors, and subsequent planning to control re-invasion. Other restoration projects include restoring abandoned construction stockpile sites, building stormwater turnouts on perimeter slopes prone to erosion, spreading compost or mulch, and other actions requiring heavy equipment. See Section 14.2.6, *Appendix G. Grassland Restoration/Avian Protection*.

7.1.3.3 Range Enhancement (Reseeding)

Disturbance associated with mesquite reduction, water-conservation practices, erosion control, invasive species control, or prescribed burning may require the establishment of native herbaceous plants (grasses and forbs) to improve food and cover for wildlife, improve moisture capture and storage, or prevent soil erosion. Plot date from vegetation monitoring will be crucial for determining the need for and exact nature of reseeding. Application methods include broadcast/roller-chop, range drill with depth gauge and compaction wheels, and hydro-seeding. The primary objective is to establish native plant communities, based on edaphic features and historical ecological site descriptors, to benefit native vertebrate and invertebrate wildlife species. Native, pure live seed, as recommended by the local NRCS office, comprise the seed mixtures and proper seeding rates. Seed brought onto Dyess AFB is required to be free of invasive or noxious species identified in Section 7.11, *Integrated Pest Management Program*, and will be locally produced within 200 miles of the base. See Section 14.2.6, *Appendix G. Grassland Restoration/Avian Protection*.

7.1.3.4 Water-Conservation Practices

Ripping (sub-soiling) and contour furrowing can be conducted to modify the soil micro-relief and fracture impervious soil layers on degraded and abused clay soil as a means to restore healthy hydrological cycles and productivity of degraded habitats.

7.1.3.5 Chemical Brush Control

There are situations where mechanical control of brush such as mesquite is neither feasible nor advantageous. Initial and follow up control may be accomplished very economically by using spot chemical treatments at low application rates to target individual plants, particularly as a follow-up treatment to burning where undesirable resprouting from seed is occurring or fire intensity was not sufficient to kill mesquite crowns. Certified applicators will apply herbicides at the lowest rate and lowest toxicity to humans as is possible to achieve desired results, avoid non-target organisms, and protect the environment. The NRCS and Texas Cooperative Extension Service (TCES) updated herbicide recommendations will receive consideration for use only after GSC Pest Management Coordinator and Armed Forces Pest Management Board approval.

7.1.3.6 Development of Remote Wildlife Water Sources

Design and implement remote watering systems to encourage species distribution in less populated habitats during periods of low rainfall or drought.

7.1.3.7 Fisheries Management

The construction of two impoundments designed to store effluent irrigation water have presented unique opportunities to create recreational fisheries. In a region prone to dry spells and low runoff, the ability to maintain fairly constant water levels is a luxury uncommon in most privately stocked impoundments. Effluent water supplied by the city of Abilene maintains an alkaline pH of 7.7–7.9 and both effluent ponds utilize fountain aeration and submersible diffuse aeration to obtain de-stratification and improve oxygen transfer. Lake Totten on the other hand, is a 10-acre impoundment created in the late 1950s, relying solely on urban runoff and a small tributary entering the base from the south to maintain its water levels. Water levels may fluctuate as much as six feet in any given year, so it is impractical to stock anything other than catfish in Lake Totten. Prior to stocking, electro-shock surveys were performed in all three impoundments in the spring of 2004 to determine what, if any, fish species were present. The golf course effluent pond was completed August 2002 and receives only effluent water supplied by the city of Abilene. Fish observed in this pond were redfin shad, green sunfish (*Lepomis cyanellus*), bullhead catfish, bluegill sunfish (*Lepomis macrochirus*), and glass minnows (*Anchoa mitchilli*). The hospital effluent pond was filled in 2003 and had no fish present. Lake Totten went almost completely dry in 2001 due to an extended drought and had very few fish as expected, although orange spot sunfish (*Lepomis humilis*), green sunfish, and bullhead catfish were observed.

<u>Hospital Pond</u>

Located south of the picnic grounds and east of the hospital, the shorelines are maintained and easily approached. This pond is cone shaped, has a surface area of 2.75 acres, and has a capacity of 40.12 acre-feet. This pond receives water from the golf course effluent pond and supplies irrigation water to the hospital, picnic grounds, and portions of the Airplane Park. Hydraulic loading is not a factor in maintaining a planktonic food base at this time. Future irrigation demands may reduce the presence of beneficial algae, making supplemental feeding necessary. All fish stocks were acquired locally and initial stocking was conducted in the spring of 2004. Per acre stocking rates consisted of 10 triploid grass carp, 400 jumbo

bluegill sunfish, 100 redear sunfish (*Lepomis microlophus*), 18 hybrid native/Florida bass (*Micropterus salmoides floridanus*), and 50 channel catfish (*Ictalurus punctatus*); and 12 pounds each of fathead minnows (*Pimephales promelas*) and golden shiners (*Notemigonus crysoleucas*) were stocked as forage. Management of this fishery is directed at maintaining a small and stable population of large bass, a well-represented size structure and stable population of bluegill, and catfish in the three-pound range, although catfish reproduction will not be encouraged and restocking of catfish will be necessary to maintain their numbers. Restocking of the hospital pond occurred in the spring of 2019 and consisted of 200 bluegill (3–4 inches) and 200 channel catfish (11–14 inches). A project is needed to provide trees, a covered area, and a parking area to develop the effluent hospital pond as a significant recreational area.

Golf Course Pond

The Golf Course effluent pond is flat bottomed and has a capacity of 30 acre-feet. This pond receives incoming effluent water from the city of Abilene and supplies water to the hospital pond, the golf course irrigation system and the remaining landscaped areas of the base. The presence of aquatic plants is discouraged in this pond to eliminate problems associated with the irrigation intake piping. This pond is closed to daily fishing.

Original per acre stockings consisted of 400 bluegill sunfish, 100 redear sunfish, 18 hybrid native/Florida bass, and 10 triploid grass carp. A 2019 electrofishing survey, however, indicated that a fishable bass population no longer exists in the golf course pond. The pond is overpopulated with green sunfish and gizzard shad (*Dorosoma cepedianum*) and likely would need to be drained to remove all of those species if future stocking is desired. Population structure and harvest recommendations for the two effluent ponds will be determined through analysis of catch record data, trapping, and using seine and gill nets. The largemouth bass population will be estimated using the proportional stock density index based on catch records kept over time. Population structure of bluegill will be determined by trapping, using a gill net or seine. Undesirable species in ponds, such as green sunfish and bullhead catfish, will be removed when caught.

Lake Totten

Located in the southeastern portion of the golf course, Lake Totten offers a natural setting with a more challenging shoreline. The stocking in 2004 included 1000 humpback blue catfish (*Ictalurus furcatus*), 1000 channel catfish, and 250 redear sunfish. Restocking requirements and harvest recommendations will be determined from catch records, trapping, and seining surveys. Catfish losses may occur when heavy rains result in excess water flowing over the spillway. Fishery operating funds will come from conservation funds generated from the base's fishing permits and recurring funds for habitat operation and maintenance.

7.1.4 Fish and Wildlife Regulations

Efforts to promote biological diversity in Dyess AFB waters by stocking native sport fish will provide recreational fishing opportunities. Policies and procedures for allowing fishing on base, as well as general guidance for protecting NRs while participating in dispersed outdoor recreation activities are outlined in Section 14.2.5, *Appendix F. Fish and Wildlife Regulations*.

7.1.5 Avian Protection

During the 2005 Environmental, Safety, and Occupational Health Compliance Assessment and Management Program (ESOHCAMP), 7 CES was found to be lacking an Avian Protection Program.

Under the MBTA (16 USC § 703), BGEPA (16 USC § 668), and ESA of 1973, many birds in North America are protected. Dyess AFB must be in compliance with all laws and regulations protecting birds and their habitats, including nest sites. Among other things, it is illegal to pursue, hunt, harass, kill, or collect any migratory or listed bird species, including their eggs or nests. Fines and penalties, including imprisonment, can be substantial for non-compliance.

Dyess AFB is prohibited from killing almost all species of birds without appropriate depredation permits. Destruction of active nests and avian electrocution on utility infrastructure or lines is considered a "take" and is in violation of these laws.

Although it is not possible to prevent all electrocutions, electrical utilities are required to take action to minimize electrocution hazards by constructing new infrastructure according to raptor-protection guidance, and by retrofitting hazardous poles with protective materials. Dyess AFB does not have an avian electrocution problem, but to rectify the ESOHCAMP finding and institute a proactive awareness and training program, the Dyess AFB Avian Protection Plan was developed. This plan will educate utility field personnel in proper procedures when encountering active nests and recording any observed wildlife mortalities around power transmission equipment. Avian-protection training was provided to natural resource, engineering, and electrical shop personnel in 2007 and 2009 and will continue to be provided in alternating years. Additional projects will be programmed as needed to buy and install retrofitting supplies for dangerous structures, as identified in the plan**.**

7.1.5.1 Incidental Take during Military Readiness Activity

IAW the 2003 National Defense Authorization Act (P.L. 107-314), MBTA requirements (16 USC § 703) shall not apply to the incidental take of a migratory bird by a member of the Armed Forces during a military readiness activity. Incidental takes during military readiness activities must conform to the rules and limitations in forthcoming regulations for P.L. 107-314. All records of bird strikes are maintained in the Flight Safety office, 7 BW/SEF.

7.1.5.2 Intentional Takes of Migratory Birds

IAW 50 CFR part 13 and part 21.41, a USFWS depredation permit—number MB093450-0—is on file in the NRM office. Dyess AFB has not had to use the permit, as authorized, for its intended purpose. Lethal take of migratory birds will be a last resort alternative. To date, non-lethal scare tactics and habitat management have proven to be adequate solutions for reducing wildlife impacts to the flying mission. The Dyess AFB BASH Plan and the depredation of migratory birds have been environmentally assessed as required by the National Environmental Policy Act (NEPA) (42 USC. § 4321 *et seq.*) and the Environmental Impact Analysis Process (EIAP) (32 CFR Part 989). Environmental Assessment documentation is on file at 7 CES/CEIE.

7.1.6 Climate Impacts on Fish and Wildlife Management

Fish and wildlife management on Dyess AFB is not likely to require substantial changes in response to climate change. Current fish and wildlife management issues, such as invasive and pest species management, are likely to persist in the future. Increasing temperatures and greater amounts of annual precipitation are not likely to drive away pest and invasive species, such as feral hogs, European starlings and axis deer (*Axis axis*). Fish and wildlife surveys should continue to be conducted on a regular basis to monitor changes in native species populations. Changing climatic conditions also present opportunities for invasive species to flourish and push out native species. Monitoring of invasive species will continue to be

important and management plans should be flexible enough to adapt to changing fish and wildlife concerns (Hellmann et al. 2008).

Increasing temperatures under all climate scenarios are likely to increase potential algal blooms and to reduce dissolved oxygen in water bodies. These changes reduce habitat quality, particularly for larval amphibians (Paerl et al. 2011). Efforts to remove invasive aquatic plants and algae from ponds should be considered and shade trees should be planted around water sources to prevent excessive water temperatures (Poff et al. 2002).

Climate at Dyess AFB will likely favor disease vectors, such as mosquitoes and ticks (Süss et al. 2008). Minimizing stagnant water in and around cantonment area will help to reduce mosquito-related infections. Tick populations in urban settings can be restricted by keeping lawns mowed and by preventing overabundances of hosts, such as deer and rodents. Although annual precipitation is projected to increase, this could be offset by increasing temperatures and drier summers. Open water sources should be left where they do not present BASH concerns, as wildlife species are likely to be drawn to them in times of drought.

7.2 Outdoor Recreation and Public Access to Natural Resources

Applicability Statement

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

Program Overview/Current Management Practices

The primary outdoor recreation and public access goal of Dyess AFB is to maintain a program that will provide quality outdoor recreation opportunities for its military, civilians and dependents while protecting the outdoor recreation resources from overuse and damage. The quality of the outdoor recreational experience will be achieved with the development, management, and maintenance of the improved, semi-improved, and unimproved multi-use lands on base. Rules and regulations regarding use of natural resources for dispersed outdoor recreation are identified in Section 14.2.5, *Appendix F. Fish and Wildlife Regulations*.

The 7 CES and the 7th Force Support Squadron (7 FSS) management, as well as the 7th Security Forces Specialist (7 SFS) and other base agencies interact to achieve the goal of providing quality outdoor recreation to base personnel and dependents. The 7 SFS ensures that recreation facilities are protected from vandalism and abuse, and that patron uses of recreational facilities are coordinated with the 7 SFS to ensure minimum impact to security. The 7 FSS provides coordination and integration of recreation facilities and activities on base.

7.2.1 Access to Natural Resources

Dyess AFB is a closed base. In general, public access to Dyess AFB natural resources, outdoor recreation areas, and facilities is restricted. This policy is a necessary requirement of base security to insure the successful completion of the base mission.

Constraints to dispersed outdoor recreation development in wildlife habitat are associated with many safety buffers that maintain a large distance from the weapons storage area, explosive ordnance disposal area, firing ranges, and the Cantonment area.

Safety considerations must be made when developing dispersed outdoor recreation opportunities in natural resources management areas. The western diamondback rattlesnake could be found anywhere on base and participation in dispersed outdoor recreation activity carries an inherent risk of an encounter.

7.2.2 Off-Road Vehicles

Privately owned off-road vehicles ([ORVs] e.g., four-wheelers, all-terrain vehicles, dirt bikes, go-carts, etc.) or any motorized, privately owned vehicle is restricted to street use and not allowed within the natural areas of Dyess AFB. The only authorized ORV use on base is related to military security and training.

ORV use in NR areas degrades habitat, creates air and soil erosion, and conflicts with NR management goals and objectives, such as protecting wetland areas, restoring native prairies, enhancing wildlife habitat, watchable wildlife programs, or maintaining grasslands to encourage and increase ground-nesting neo-tropical migratory bird populations on base.

7.2.3 Hunting and Fishing

There are two fishing ponds open daily to fishing on Dyess AFB: Hospital Pond and Lake Tottem, both of which are stocked with native sport fish. Those who wish to participate in fishing opportunities must adhere to all Dyess AFB and TPWD regulations.

Currently, there is no active hunting program at Dyess AFB. There is an occasional turkey bow hunt offered when the NRM deems that populations are healthy enough to support a harvest. All Dyess AFB and TPWD rules and regulations must be followed when participating in any Dyess AFB hunting opportunity.

7.2.4 Watchable Wildlife

Dyess AFB has an opportunity to develop a site that is currently mowed into an area with significant recreational and outreach value. The site is on the north side of Texas Drive at the entrance to the golf course and it is mid-way between the housing area and the base pool. Residence often walk through between these two locations. The base would like to investigate the regulatory constraints, feasibility, and costs/benefits of using this site to develop a prairie dog town modeled on the one in Abilene and use the remainder of the site for a native plant display garden and pollinator garden. Prairie dogs would be captive within an enclosure and the site would include a nature trail with interpretive signage. Significant work would be required to fully investigate the feasibility of using this site and developing an implementable design. It would be best to accomplish this in a stepwise manner by first investigating the feasibility, then designing the captive prairie dog town, interpretive signage, and native plant/pollinator gardens separately.

7.2.5 Climate Impacts on Outdoor Recreation and Public Access to Natural Resources

Most outdoor recreation and public access to natural resources on Dyess AFB are expected to be negatively impacted by climate change. Recreational use of improved, semi-improved, and unimproved multi-use lands on base likely will continue under the projected conditions; however, fish populations will need to be assessed on a regular basis. The increasing number of HOTDAYS and potential for drought also may contribute to fewer recreational opportunities if these days preclude comfortable recreation.

7.3 Conservation Law Enforcement

Applicability Statement

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

Program Overview/Current Management Practices

Pursuant to DoDI 4715.03, USAF installations shall coordinate with appropriate agencies to support conservation law enforcement to enforce applicable federal and state laws and regulations pertaining to the management and use of NRs. IAW with installation security and safety requirements, federal or State conservation law enforcement officers shall be given access to USAF installations for the purpose of fish and wildlife law enforcement. Pursuant to the Sikes Act (16 USC § 670a(d)(2)), reimbursable agreements for conservation law enforcement services are authorized with federal and state agencies having responsibility and jurisdiction over fish and wildlife resources.

Only persons who have been certified in conservation law enforcement through successful completion of the Land Management Police Training course at the Federal Law Enforcement Training Center or persons who have been commissioned as a fish and wildlife conservation officer in the state where the installation is located may provide conservation law enforcement on DoD installations.

Dyess AFB does not currently have a conservation law enforcement officer (CLEO) to enforce federal, state, and installation fish and wildlife regulations. It is an NR program goal to develop a shared CLEO presence with other similar sized bases in Texas to fulfill this support.

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

Applicability Statement

This section applies to USAF installations that have threatened and endangered species on USAF property. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

An extensive list of regulations, acts, EOs, and state policies protect individual species on federal lands. Dyess AFB maintains compliance with the ESA, EO 13186, MBTA, BGEPA, and Texas regulations through monitoring and management of habitats and species, as needed (definitions of ranks for the various levels are provided in Table 2-13 above). Should a federally-listed species be found on the base and activities (including those presented in the INRMP) have a possibility of affecting the species, Dyess AFB will initiate consultation with the USFWS. The various regulations governing species protection use different classifications systems to indicate rarity or severity of endangerment. The USFWS categorizes species as endangered (LE), threatened (LT), candidate for listing (C), or listed in the 5-year National Listing Work Plan for evaluation as a candidate (WP). The State of Texas lists species as endangered (E), threatened (T), or species of greatest conservation need (SGCN) and also refines these categories by including the NatureServe Global and State rankings. These rankings are further explained in Table 2-13.

The federal ESA (16 U.S.C § 1531–1544) requires military installations to protect and conserve federally listed threatened and endangered plants, animals, and their habitats. Section 7(a)(1) of the ESA states that all federal departments and agencies shall use their respective authorities to conserve threatened and endangered species. Conservation includes the use of all methods and procedures that are necessary to bring any threatened and endangered species to the point where the measures pursuant to the ESA are no longer

necessary. AFMAN 32-7003, Section 3.38, *ESA Compliance*, requires that ESA candidate species and state listed species be given the same protection afforded to federally listed species when practicable. Species that do not fall into those categories may be monitored to inform NRMs of the status of species in danger of becoming listed on base. Annual work plans and contracted partner inventories in the INRMP fulfill these requirements. The list of species documented on or with potential to occur on Dyess AFB is presented in Table 7-2. In the table, a species has "potential to occur" based on published range information and/or presence of suitable habitat on base. These species are surveyed for regularly.

7.4.1 Management of Federally Listed Species

As shown in Table 7-2, there are 11 species with federal conservation status. Dyess AFB management and monitoring activities are done IAW the 11 species' recovery plans and in coordination with USFWS and TPWD through the INRMP reviews and additional discussions as necessary. When recovery plans are not available, the NRM for Dyess AFB will collaborate with USFWS and TPWD to provide the best management plan for the species.

7.4.1.1 Black Footed Ferret

Status

The black-footed ferret has been federally listed as endangered since 11 March 1967. Historically, the species' range extended from the rolling plains of Texas up to Montana and North Dakota. The species has been reduced to 2% of its original range, mainly due to the destruction of native grasslands and the mass eradication of black-tailed prairie dogs, the ferret's primary prey. The species is also extremely susceptible to canine distemper. To delist the species, the recovery plan calls for establishing 3,000 individuals in populations of 30 or more adults, at least 10 populations of 100 or more individuals, and at least one population occurring in at least nine of the 12 states of the species' historical range.

Monitoring Activities

Black-footed ferrets have not been seen in Texas since 1963, but monitoring for the species still should be conducted to protect the mission of Dyess AFB. There are portions of Dyess AFB that could be good ferret habitat. There will be annual mammal surveys on Dyess AFB to keep up-to-date records of any species found on base and, if a black footed ferret is found on base, the NRM will contact USFWS and TPWD to take proper measures to protect the species and the base's mission.

Management Activities

There are portions of Dyess AFB that have been restored to grass prairie and these areas will continue to be managed to benefit native wildlife. Expansion of native grass prairie and mesquite removal will continue to be implemented in the future to restore native rolling plains habitat. Predator control will also be conducted on base to reduce the population of potential predators that could spread canine distemper (e.g., coyotes). Although black-tailed prairie dogs are not present on base currently, the base is investigating the possibility of developing a small, captive population, primarily as an educational opportunity.

Table 7-2. Threatened, endangered, and species of concern with potential to occur on Dyess Air Force Base.

Common Name (*Scientific Name*)	Regulation(s) and Status (Federal/ State)	Global/State NatureServe Ranking	Distribution in Texas	Preferred Habitat	Reason for Decline or Concern	Occurrence at Dyess AFB
Birds						
Bald eagle (*Haliaeetus leucocephalus*)	MBTA/ BGEPA	G5/S3	There are two separate populations of bald eagles in Texas: breeding and wintering birds. The breeding population is primarily in the eastern half of the state and along the coast. Nonbreeding wintering populations are found from central Texas to the Panhandle.	Found along rivers and large lakes. Nest in tall trees or cliff sides near water.	Species is federally protected even though the status of the birds has been raised to least concern.	Not documented, but potential to occur
Black-capped vireo (*Vireo atricapilla*)	MBTA	G3/S3	Found throughout the Edwards Plateau, eastern Trans-Pecos and southern Rolling Plains regions.	Rangelands with scattered clumps of shrubs and trees separated by grasslands.	Even though the species has recently been delisted, its habitat is still being reduced by habitat fragmentation.	Not documented, but potential to occur
Franklin's gull (*Leucophaeus pipixcan*)	MBTA	G5/S2	This species is only found in spring and fall in Texas due to its migration pattern. During migration they can be found flying along lake shores and wetlands.	Freshwater marshes.	Species' nesting habitat is slowly being reduced due to the draining of marshes for duck nesting.	Not documented, but potential to occur

Table 7-2. Threatened, endangered, and species of concern with potential to occur on Dyess Air Force Base.

Common Name (*Scientific Name*)	Regulation(s) and Status (Federal/ State)	Global/State NatureServe Ranking	Distribution in Texas	Preferred Habitat	Reason for Decline or Concern	Occurrence at Dyess AFB
Mountain plover (*Charadrius montanus*)	MBTA	G3/S2	Found from the Rolling Plains of the Texas Panhandle to the Davis Mountains of southwest Texas.	High plains or shortgrass prairies with depressions and spots of bare ground.	Wintering habitat has been replaced with agricultural operations and urban areas.	Observed on Base
Western burrowing owl (*Athene cunicularia hypugaea*)	MBTA	G4/S2	Species mainly breeds in the Trans-Pecos and Panhandle regions of Texas but will winter throughout most of the State.	Open areas with short vegetation, bare ground, and well-drained soils.	Habitat loss due to the population decline of black-tailed prairie dogs. These owls typically reuse the prairie dog burrows for nesting.	Observed on Base
White-faced ibis (*Plegadis chihi*)	MBTA/T	G5/S4	In winter, they breed along the Gulf Coast and can be found migrating through the Panhandle and west Texas.	Marshes, swamps, ponds and rivers.	Habitat loss due to draining wetlands and widespread use of pesticides.	Observed on Base
Mammals						
Black-tailed prairie dog (*Cynomys ludovicianus*)	SGCN	G4/S3	Found throughout the Panhandle and portions of west Texas.	Shortgrass prairie; avoids tallgrass and brush due to reduced visibility.	Less than 1% of the original prairie dog habitat remains.	Not documented, but potential to occur

Table 7-2. Threatened, endangered, and species of concern with potential to occur on Dyess Air Force Base.

Common Name (*Scientific Name*)	**Regulation(s) and Status (Federal/ State)**	**Global/State NatureServe Ranking**	**Distribution in Texas**	**Preferred Habitat**	**Reason for Decline or Concern**	**Occurrence at Dyess AFB**
Cave myotis bat (*Myotis velifer*)	SGCN	G4/S4	Inhabits High Plains, Rolling Plains, Trans-Pecos, Edwards Plateau, and south Texas.	Caves, rock crevices, under bridges, and abandoned cliff swallow nests.	Species is susceptible to white-nose syndrome—could cause population decline in future.	Not documented, but potential to occur
Tricolored bat (*Perimyotis subflavus*)	WP	G4/S1	Found from the Rolling Plains to far west Texas.	Caves or abandoned mines where there is little temperature change throughout the year; forages in riparian areas.	Species is susceptible to white-nose syndrome—could cause population decline in future.	Not documented, but potential to occur
Eastern/plains spotted skunk (*Spilogale putorius* spp.)	WP	G4/S3	Occurs in eastern half of Texas, westward to the Edwards Plateau, and through north Texas to the Panhandle.	Wooded areas and tallgrass prairie; prefers rocky outcrops when available.	Use of chlorinated hydrocarbon insecticides on the insects that make up their diet.	Not documented, but potential to occur
Western hog-nosed skunk (*Conepatus leuconotus*)	SGCN	G4/S4	Found from southern to northern Texas up to Lubbock county; there's an isolated population in the southeast Texas Big Thicket region.	Foothills and brush-covered land; rocky areas with moderate tree or brush cover.	Conversion of brushy habitat to row crops, competition with feral hogs and pesticide-limiting insect food choices.	Not documented, but potential to occur

Table 7-2. Threatened, endangered, and species of concern with potential to occur on Dyess Air Force Base.

Common Name (*Scientific Name*)	Regulation(s) and Status (Federal/ State)	Global/State NatureServe Ranking	Distribution in Texas	Preferred Habitat	Reason for Decline or Concern	Occurrence at Dyess AFB
Western spotted skunk (*Spilogale gracilis*)	SGCN	G5/S5	Found from southwestern Texas up to the Panhandle.	Rocky bluffs, cliffs, brush-bordered canyons and streambeds.	Conversion of habitat to row crops and use of pesticides limiting insect food choices.	Not documented, but potential to occur
Black-footed ferret (*Mustela nigripes*)	LE	G1/SX	Historically occurred in the High Plains, Rolling Plains and Trans-Pecos ecoregions.	Shortgrass prairies.	Extremely susceptible to canine distemper.	Not documented, but potential to occur
Long-tailed weasel (*Mustela frenata*)	SGCN	G5/S5	Found everywhere in Texas except the Panhandle.	Nest sin rotten logs, hollow stumps, under roots, or in burrows.	Habitat destruction and conversion to agricultural fields.	Not documented, but potential to occur
Mountain lion (*Puma concolor*)	SGCN	G5/S3	Occur in all ecoregions of Texas.	Remote areas with good cover.	Habitat destruction, conflicts with livestock, and encroaching suburban areas.	Not documented, but potential to occur
Reptiles						
Desert massasauga (*Sistrurus catenatus* ssp. *edwardsii*)	PT	G3/S3	Occurs in the Rolling Plains ecoregion out to the High Plains and Trans-Pecos.	Shortgrass prairie and desert grassland.	Habitat fragmentation and landscape conversion.	Not documented, but potential to occur

Table 7-2. Threatened, endangered, and species of concern with potential to occur on Dyess Air Force Base.

Common Name (*Scientific Name*)	Regulation(s) and Status (Federal/ State)	Global/State NatureServe Ranking	Distribution in Texas	Preferred Habitat	Reason for Decline or Concern	Occurrence at Dyess AFB
Spot-tailed earless lizard (*Holbrookia lacerata*)	WP	GNR/S2	Found from south Texas up into the Edwards Plateau, Rolling Plains, and Trans-Pecos ecoregions; has been documented in southeast Taylor County.	Open meadows or prairie savannah with low grass and shrubs.	Habitat fragmentation and landscape conversion.	Not documented, but potential to occur
Texas horned lizard (*Phrynosoma cornutum*)	T	G4/S3	Found throughout most of Texas, mainly west of the Texas pine curtain.	Arid to semiarid open areas with sparse plant cover and loose, loamy soil.	Habitat loss, pesticide use, and fire ants.	Observed on Base
Western box turtle (*Terrapene ornata*)	SGCN	G5/S3	Found throughout Texas.	Pastures, prairies, open areas in woodlands.	Pet trade, habitat fragmentation, and nest predators.	Observed on Base
Western hognose snake (*Heterodon nasicus*)	SGCN	G5/S4	Found throughout the Rolling Plains, High Plains, Trans-Pecos, and Edwards Plateau ecoregions.	Shrub-encroached shortgrass or mixed prairie.	Habitat loss.	Not documented, but potential to occur
Amphibians						
Woodhouse's toad (*Anaxyrus woodhousii*)	SGCN	G5/SU	Found throughout Texas.	Forests, grasslands, sand dunes, and barrier islands.	Habitat fragmentation.	Not documented, but potential to occur

Table 7-2. Threatened, endangered, and species of concern with potential to occur on Dyess Air Force Base.

Common Name (*Scientific Name*)	Regulation(s) and Status (Federal/ State)	Global/State NatureServe Ranking	Distribution in Texas	Preferred Habitat	Reason for Decline or Concern	Occurrence at Dyess AFB
Insects						
Monarch butterfly (*Danaus plexippus*)	C	G4/S4	Can be found all over the state during its migration periods in spring and fall. Texas is a major funnel for these butterflies as they travel from wintering grounds to breeding grounds.	Open fields and meadows with milkweed and/or other nectar-producing flowers.	Illegal logging of the Oyamel forests in Mexico is destroying their wintering grounds, and the decline in milkweed and other nectar-producing plants limits there food sources in their breeding range.	Observed on Base
Fish						
Sharpnose shiner (*Notropis oxyrhynchus*)	LE	G3/S1	Found north of Taylor County in the Brazos River.	Shallow waters of the Brazos River and its major tributaries.	Habitat loss, dams and other modifications to rivers, and invasive species, such as saltcedar (*Tamarix* spp.).	Not documented, but potential to occur

Table 7-2. Threatened, endangered, and species of concern with potential to occur on Dyess Air Force Base.

Common Name (*Scientific Name*)	Regulation(s) and Status (Federal/ State)	Global/State NatureServe Ranking	Distribution in Texas	Preferred Habitat	Reason for Decline or Concern	Occurrence at Dyess AFB
Smalleye shiner (*Notropis buccula*)	LE	G2/S1	Found north of Taylor County in the Brazos River.	Shallow waters of the Brazos River and its major tributaries.	Habitat loss, dams and other modifications to rivers, and invasive species, such as saltcedar.	Not documented, but potential to occur
Mollusks						
Texas fawnsfoot (*Truncilla macrodon*)	Proposed for Listing	G2/S1	Found from central coast of Texas up to north Texas, with an isolated population in the Edwards plateau ecoregion. Species has been found in the Brazos and Colorado river systems.	Freshwater creeks and streams.	Decline in water quality of Texas rivers.	Not documented, but potential to occur
Texas fatmucket (*Lampsilis bracteata*)	Proposed for Listing	G1/S1	Found only in the Edwards Plateau ecoregion except for an isolated population around southern Taylor County.	Freshwater creeks and streams.	Decline in water quality of Texas rivers.	Not documented, but potential to occur
Texas pimpleback (*Quadrula petrina*)	Proposed for Listing	G2/S1	Found from the Texas coast, up the Colorado River to Austin; there is also a population in the Edwards Plateau and in the Rolling Plains.	Freshwater creeks and streams.	Decline in water quality of Texas rivers.	Not documented, but potential to occur

Table 7-2. Threatened, endangered, and species of concern with potential to occur on Dyess Air Force Base.

Common Name (*Scientific Name*)	**Regulation(s) and Status (Federal/ State)**	**Global/State NatureServe Ranking**	**Distribution in Texas**	**Preferred Habitat**	**Reason for Decline or Concern**	**Occurrence at Dyess AFB**
Plants						
Cory's evening-primrose (*Oenothera coryi*)	SGCN	G3/S3	Found in the Rolling Plains and High Plains regions of Texas.	Open shortgrass and tallgrass prairies.	Habitat conversion to agriculture or urban development.	Not documented, but potential to occur
Glass mountains coral-root (*Hexalectris nitida*)	SGCN	G3/S3	Found in the High Plains and Trans-Pecos regions.	Deep canyons in leaf litter under oaks.	Habitat conversion to agriculture or urban development.	Not documented, but potential to occur
Warnock's coral-root (*Hexalectris warnockii*)	SGCN	G2/S2	Eastern side of the Edwards Plateau and the Trans-Pecos regions.	Leaf litter of oak-juniper woodlands on shaded slopes.	Habitat conversion to agriculture or urban development.	Not documented, but potential to occur
Prairie butterfly-weed (*Gaura triangulata*)	SGCN	G3/S3	Found in Rolling Plains ecoregion.	Mixed-grass plains.	Habitat conversion to agriculture or urban development.	Not documented, but potential to occur

7.4.1.2 Tricolored Bat

Status

The tricolored bat (*Perimyotis subflavus*) is on the USFWS National Listing Work Plan work plan for a 12M/PLPCH (12-month finding on a petition to list the species; and if listing is warranted, USFWS generally intends to proceed with a concurrent proposed listing rule and proposed critical habitat designation, if critical habitat is prudent and determinable). The tricolored bat ranges throughout the eastern U.S. to west Texas and Mexico. They prefer caves that hold ambient temperatures of 46.4–55.4 °F for most of the year and can be found foraging for small insects over bodies of water and forest edges.

Monitoring Activities

The NRM for Dyess AFB is going to be working with the USGS North American Bat Monitoring Program to conduct surveys and monitor bats to determine which bat species are roosting, feeding, and/or migrating through the Dyess AFB area. The tricolored bat has been spotted in neighboring counties and very likely could be detected on base in the near future. There are multiple areas on base that this species could use as roosting locations, such as bridges, buildings, and trees. The NRM also will conduct studies with TPWD and USFWS to monitor bat populations on and around Dyess AFB.

Management Activities

To manage for the tricolored bat, it is best reduce disturbance to artificial and natural roost structures that can be used as maternity colonies and hibernacula. In the Rolling Plains ecoregion, management should consist of creating quiet-zone buffers restricting noise, lights, and construction around roosting areas during periods when bats are sensitive to disturbances, such as the breeding season. Promoting foraging habitat for the species by maintaining ponds and other foraging sites is key to managing bats. Minimizing large-scale pesticide applications around known foraging and roosting areas can help to maintain an adequate prey base of flying insects. Wind turbines should not be placed in areas that bats frequent, as they can kill both bats and birds in large numbers.

7.4.1.3 Plains Spotted Skunk

Status

The status of the plains spotted skunk (*Spilogale putorius interrupta*) is under USFWS work plan 12M/PLPCH. Currently, the species can be found in Texas, Oklahoma, Arkansas, and many other western states. Plains spotted skunks require prairies and grasslands where they were found historically from Texas north to mid-western U.S.

Monitoring Activities

The NRM will be conducting ongoing, long-term monitoring for mesomammals on Dyess AFB to keep an up-to-date list of species on the installation. Skunk monitoring will be done to provide maximum mission support and to benefit the Dyess AFB property ecologically IAW the Sikes Act. Field surveys will benefit the wildlife on base by providing the NRM with data that will help to indicate how best to manage the base habitat for increasing biodiversity. The species has not yet been documented on Dyess AFB, but historically it was found in the region and could be found here again.

Management Activities

Habitat management includes restoring and maintaining areas with a diverse mixture of native warm-season grasses and forbs. Native prairie habitat should be maintained or restored wherever possible. Invasive plant species control is a very important part of prairie restoration and it is essential to remove invasive species, such as honey mesquite, Chinese tallow (*Triadica sebifera*), and salt cedar. Removing these species will remove the overstory and promote native, seasonal grass growth. Prescribed rotational fire also will help to reduce nonnative species and promote native warm- and cool-season grass growth to restore the area's historical Rolling Plains ecosystem.

7.4.1.4 Desert Massasauga

Status

The desert massasauga (*Sistrurus catenatus* ssp. *edwardsii*) is under review for listing under the ESA as threatened or endangered. This rattlesnake species can be found from south Texas north through New Mexico to Colorado, and west to Arizona. Habitat consists of mixed-grass prairie with sandy soils that provide for a significant temperature gradient they can take advantage of for thermoregulation. In winter, the species prefers shortgrass prairie with clay soils that provide hibernacula. Degradation of desired habitat is likely the reason most desert massasauga populations are declining.

Monitoring Activities

There is currently no USFWS recovery plan, so to monitor the species the NRM will coordinate with USWFS and TPWD personnel to determine proper survey methodology. A monitoring program will be developed and, if the species is ever found on base, a contact with the USFWS and TPWD will be made and best habitat management options will be employed to ensure that the base's mission can continue and be successful. Dyess AFB does have shortgrass prairie habitat and finding a desert massasauga on base is possible; monitoring activities will continue to ensure compliance with the ESA and Sikes Act.

Management Activities

To best manage for the desert massasauga, an annual reptile survey should be conducted on Dyess AFB. This will help to keep the species list up-to-date and assist the NRM with deciding which management practices should be employed to benefit the reptiles on base. Like other xeric habitats, shortgrass prairie is severely affected by soil disruption (e.g., tilling, overgrazing, urbanization), and recovery is extremely difficult. Removal of the overstory mesquite is a critical component of restoring shortgrass prairie and should be the highest concern when restoring habitat on Dyess AFB. Implementing the rotational burning described in the WFMP will benefit any species with a preference for shortgrass and mid-height prairie habitat.

7.4.1.5 Spot-tailed Earless Lizard

Status

The spot-tailed earless lizard (*Holbrookia lacerata*) is on the USFWS National Listing Work Plan work plan for a 12M/PLPCH. This species has been found in Taylor County and could be found on Dyess AFB. Historically, the species was found in 50 counties across west, central, and south Texas. The decline in its numbers is believed to be the result of native grassland conversion, heavy pesticide use, and the spread of invasive fire ants, which compete with the lizard's preferred native ant prey base.

Monitoring Activities

Reptile surveys have been done in the past on Dyess AFB and there should be continued annual monitoring on the base indefinitely. The objective of continued monitoring is to provide mission support and achieving population stability to deter the species' decline. Monitoring will be conducted in coordination with local TPWD biologists and the NRM. Recorded data will be used in future projects to increase biodiversity on Dyess AFB.

Management Activities

There is little known about the spot-tailed earless lizard, but its historical range consisted of shortgrass prairie with open rocky areas. To benefit the species and potentially increase its population on base, habitat must be restored to shortgrass prairie; removal of invasive and agricultural plant species also will be key when it comes to improving habitat. Prescribed fire will promote growth of native grass species and certain invasive plants can be controlled with a spot treatment herbicide application.

7.4.1.6 Monarch Butterfly

Status

The monarch butterfly has been in the conservation spotlight for many years now but has not yet been listed as threatened or endangered under the ESA. In December 2020, the USFWS announced that listing the monarch butterfly is warranted and it should be on the federal threatened or endangered species list, but its listing is currently precluded by other higher-priority species. Currently the species can be found in every county of Texas, especially during their fall and spring migrations. The species' numbers are declining due to the declines in insect-pollinated plants and their larval host plants, milkweed (*Asclepias* spp.), as well as illegal logging activity in the Oyamel forest of Mexico that is destroying the monarch butterfly's wintering grounds. There are multiple initiatives across North America to restore monarch butterfly habitat and increase the species' numbers.

Monitoring Activities

Monitoring will be done on base by the NRM, who may use the assistance of the TPWD and USFWS. Surveys will be conducted annually during peak migration periods to monitor the trend in monarch butterfly numbers on Dyess AFB. Having documented monarch butterfly numbers over time can indicate to the NRM how populations are doing on and around base and, once a survey is established and data are collected, they will provide insights on how to best manage for the monarch butterfly and which measures to take that would benefit the species most.

Management Activities

To best manage for monarch butterflies, there needs to be an increase in flowering plants on base to create a dependable food source for the butterflies when they migrate through the area. Milkweed and other native flowering plants and grasses can be planted to benefit multiple species native to the Rolling Plains ecoregion. Planting can be done in places on base that are currently open, monocultural fields and fields that are regularly mowed. The NRCS may be able to assist with these projects through their working lands programs. Establishing native prairie would benefit multiple different pollinator species, thus increasing the overall biodiversity of Dyess AFB and ensuring mission accomplishment by following USFWS standards.

7.4.1.7 Sharpnose Shiner and Smalleye Shiner

Status

The sharpnose and smalleye shiners (*Notropis oxyrhynchus* and *N. buccula*, respectively) are minnows that belong to the Cyprinidae family. These species are native to the Brazos River and can be found in shallow sandy-bottomed upper portions of the river. Historically, they were found in the Brazos, Wichita, and Colorado River systems, but today they are restricted to portions of the Brazos River upstream of Possum Kingdom Reservoir, with much of the area being designated critical habitat. Both species were listed as Endangered on August 4th 2014 under the endangered species act. Habitat loss and fragmentation is the main cause for their decline. Structures, such as low water crossings, dams, and fences, can create barriers to migration, thus preventing certain populations from reproducing.

Monitoring Activities

Sharpnose and smalleye shiners can be difficult to properly identify and may require contacting someone with expertise on the species at USFWS or any other agency working on the species' recovery. Monitoring for these species should be conducted with guidance from experienced personnel to ensure that all monitoring practices are IAW ESA guidelines. Dyess AFB is in the upper Brazos River basin and Little Elm Creek is a part of that system. According to USFWS, there is little need for presence/absence surveys because these species are expected to occur when conditions are favorable. Yearly monitoring would be beneficial, however, to determine the effects of drought on the remaining populations of these species. The USFWS has standardized monitoring practices to ensure accordance with the ESA and state protocols.

Management Activities

To best manage for the sharpnose and smalleye shiners, habitat degradation must be reversed by removing barriers that could limit their migration. It is also important to remove invasive species, such as saltcedar (*Tamarix* spp.) that encroaches on the edges of shallow-water embankments also would be beneficial to these species. Conservation of these species may conflict with potential reservoir development in the upper Brazos River to meet future water demand.

7.4.1.8 Texas Fawnsfoot, Texas Fatmucket, and Texas Pimpleback

Status

The Texas Fawnsfoot (*Truncilla macrodon*), Texas Fatmucket (*Lampsilis bracteata*), and Texas Pimpleback (*Quadrula petrina*) are all freshwater mussels found throughout central Texas. All three species are currently proposed for listing under the ESA. They have been documented both north and south of Dyess AFB in Runnels and Shackelford counties. The closest location for proposed listed mussels is in the Clear Fork of the Brazos River south of 180 near Lueders and Bluff Creek near Winters. Because Little Elm Creek flows through Dyess AFB and feeds into the river systems in which these species are found, it is possible that the species could occur on base. This connectivity of hydrologic systems also means that stormwater from the base could degrade the water quality of Little Elm Creek, then have downstream effects on the mussels in the Clear Fork. It is important for the base's NRM to understand the habitat and potential for these species to be found.

Monitoring Activities

These species are not currently monitored, but surveys are needed to determine whether any currently occur on base or likely to occur.

Management Activities

No management activities directed at special-status mollusks are currently planned, but activities will be planned if the species is documented on base.

7.4.2 Management of State Listed Threatened and Endangered Species, Species of Greatest Conservation Need, and Species Protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act

Management of state listed species and species protected under the MBTA and BGEPA consists of documenting their occurrence when observed and properly managing habitats. Appropriate habitat management activities include invasive species removal and planned rotational burning. The species in Table 7-3 have the potential to occur on Dyess AFB.

Table 7-3. State listed species and species protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Except where nolted, status ranks are defined in Table 2-13.

Common Name	Scientific Name	Status
Bald eagle	*Haliaeetus leucocephalus*	MBTA[1]/BGEPA[1], G5S3
Black-capped vireo	*Vireo atricapilla*	MBTA, G3/S3
Black-tailed prairie dog	*Cynomys ludovicianus*	SGCN, G4/S3
Cave myotis bat	*Myotis velifer*	SGCN, G4/S4
Cory's evening-primrose	*Oenothera coryi*	SGCN, G3/S3
Franklin's gull	*Leucophaeus pipixcan*	MBTA, G5/S2
Glass mountains coral-root	*Hexalectris nitida*	SGCN, G3/S3
Long-tailed weasel	*Mustela frenata*	SGCN, G5/S5
Mountain lion	*Puma concolor*	SGCN, G5/S3
Mountain plover	*Charadrius montanus*	MBTA, G3/S2
Prairie butterfly-weed	*Gaura triangulata*	SGCN, G3/S3
Texas horned lizard	*Phrynosoma cornutum*	T, G4/S3
Warnock's coral-root	*Hexalectris warnockii*	SGCN, G2/S2
Western box turtle	*Terrapene ornata*	SGCN, G5/S3
Western burrowing owl	*Athene cunicularia hypugaea*	MBTA, G4/S2
Western hognose snake	*Heterodon nasicus*	SGCN, G5/S4
Western hog-nosed skunk	*Conepatus leuconotus*	SGCN, G4S4
Western spotted skunk	*Spilogale gracilis*	SGCN, G5/S5
White-faced ibis	*Plegadis chihi*	MBTA,T, G5/S4
Woodhouse's toad	*Anaxyrus woodhousii*	SGCN, G5/SU

[1] MBTA=Migratory Bird treaty Act, BGEPA=Bald and Golden Eagle Protection Act

7.5 Water Resource Protection

Applicability Statement

This section applies to USAF installations that have water resources. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Healthy, functional riparian areas associated with creeks and floodplains contain overstory and midstory species and herbaceous ground cover that provide numerous benefits to an ecosystem. Restoration and conservation of riparian corridors along the Little Elm Creek diversion system was initiated in 2004 through a demonstration project developed by the USARDC (Section 14.2.4, *Appendix E. Riparian Plan*). This project resulted in the establishment of vegetative buffer strips of native riparian overstory and midstory species along the northern and southern reaches (tributaries) of the Little Elm Creek system. Rainfall events that result in sheet flow and stormwater runoff are normally associated with intense thunderstorms producing very heavy rains over a relatively short time span. Downgrading the land-management classification to unimproved (i.e., areas where natural vegetation is allowed to grow unimpeded by maintenance activities) in these areas has proven effective in slowing stormwater velocities, reducing erosion along the creek channels, reducing suspended solids and impurities, and improving the quality of water passing through the base during these events. Many additional benefits to groundwater supplies and wildlife are expected as the buffer strips become more established. Additional riparian projects are described in Section 8.0, *MANAGEMENT GOALS AND OBJECTIVES*.

What remains of the natural Little Elm Creek system is still important habitat for a rich diversity of floral and faunal species associated with an intermittent stream ecotone. This isolated riparian area has been cut off from the historical stream hydrology and only receives runoff from the adjacent upland flats. Overstory species, including netleaf hackberry and American elm (*Ulmus americana*) are still present, western soapberry, chittamwood (*Bumelia lanuginosa*), and mesquite, are common, as are lotebush, algerita, prickly pear, catclaw acacia, and littleleaf sumac. Noticeably absent are cottonwood, pecan, black willow, willow baccharis (*Baccharis salicina*), and buttonbush. Significant past construction impacts have disrupted the normal hydrology of this remnant creek system. Restoring normal stream flow would require reshaping the original streambed, resulting in further damage to existing riparian vegetation and would be impractical due to its isolation from the original watershed.

The existing stormwater flow requires maintenance anticipated to occur in 2021. Sediment has accumulated in the canals and some culverts have become blocked, allowing dense growth of marsh vegetation, including cattails. This vegetation is impeding the proper flow of stormwater and causing low stream crossings to be impassible. The sediment and vegetation will be cleared, and then the system will require ongoing maintenance and monitoring to ensure proper function to avoid creating wetlands inside the canals.

7.5.1 Groundwater

Groundwater is an important source of water for many occupants of the Mesquite Plains district. Drought, undesirable brush species, and human expansion impact groundwater and surface water inventories, exert increasing demands on local, regional, and state water resources. A regional effort among federal, state, and private landowners to control or minimize the negative impact of mesquite and juniper on groundwater resources and rangeland is ongoing. Restoration projects aimed at reducing mesquite densities impacting grasslands on Dyess AFB are developed following BMPs recommended by the NRCS and the TCEQ.

The nearest aquifer to Dyess AFB is the Edwards-Trinity (Plateau) Aquifer, which has its north-eastward extent in southwest Taylor County (George, et al. 2011). Dyess AFB does not sit directly on any aquifer, and it is not in the recharge zone for any nearby aquifers.

7.5.2 Surface Runoff

Surface runoff on the base is generally slow from the large flat areas. After extended dry periods, the shrink-swell characteristic of the clay soils permits rapid absorption of water, but runoff from them is heavy once they are saturated. Water may pond in low areas for long periods of time. Management goals associated with these broad, flat areas are directed at improving the herbaceous composition on poor, degraded soils to improve capture and storage of annual rainfall. Lack of topsoil and degraded soil conditions in northern portions of the base require that BMPs be implemented, such as deep ripping to improve infiltration and obtain greater lateral movement of moisture. An experimental project will be initiated with the objective of improving soil moisture and fertility while establishing native, deep-rooted, perennial bunchgrasses.

7.5.3 Effluent Water

To provide irrigation water to the golf course, Dyess AFB has used effluent water in a joint effort with the City of Abilene via an Energy Savings Performance Contract. There are two effluent storage ponds, with a total capacity of 22 million gallons, to accept treated wastewater via pipeline from Abilene's Lake Kirby. Conversion to effluent irrigation water has resulted in substantial savings in water costs and, most importantly, has reduced consumption of potable water by 30%.

7.5.4 Non-point Source Pollution

In accordance with AFMAN 32-7003, non-point source pollution in stormwater draining into the base's water bodies should be minimized. Pollutants include sediments, nutrients, pesticides, oils, greases, and debris. BMPs to mitigate these issues should be implemented during construction, land management, and ground maintenance activities. Dyess AFB has an active approach and program directed toward stormwater, wastewater, drinking water, and effluent water management. Stormwater discharges are managed under a TCEQ permit (a TPDES permit). Dyess AFB is required to perform quarterly reviews of BMPs applicable to base operations. In May 2005, the Annual Comprehensive Compliance Evaluation of the base's SWPPP and BMPs was completed, and many BMP monitoring requirements were reduced. By May 2007, Dyess AFB will be required to comply with new permitting requirements as a Small Municipal Separate Storm Sewer System (MS4).

The base currently implements several stormwater BMPs, the most effective being the riparian restoration effort (Section 14.2.4, *Appendix E. Riparian Plan*) initiated in 2003 to reduce suspended solids and filter impurities from stormwater passing through the base. Where effluent could enter a water body and lead to nutrient imbalances an eutrophication (such as runoff from the golf course), there are sufficient buffers of land between the source and the water body. When new residents arrive on base, they are informed of proper measures for disposing of pollutants and locations where they are permitted to work on automobiles. Civil Engineering is responsible for regularly sweeping streets and parking lots. A total of 9 oil/water separators serve the base's industrial facilities and pretreat discharges to the sanitary sewer system.

7.5.5 Wastewater

Dyess AFB has no on-base treatment for sewer discharges. Wastewater is discharged directly to the City of Abilene's treatment plant. A major sewer renovation project was recently completed to replace a leaking,

antiquated system, including an upgrade to the most crucial lift station located near the north diversion channel. Upgrades to the remaining lift stations are ongoing.

7.5.6 Drinking Water

Drinking water for the base come from the city of Abilene. Dyess AFB drinking water is managed under the Integrated Water Quality Management Plan, driven primarily by the Water Contingency Response Plan, Monitoring Plan, and Operations and Maintenance (O&M) Manual. Five-year, cross-connection surveys have been completed and upgrades to improve the program are planned. Automatic flushing systems have been installed to reduce labor requirements and conserve water.

7.5.7 Water Resources Protection Summary

Dyess AFB has appropriate plans addressing spill prevention, pesticide and fertilizer usage, and other NR management activities.

One industrial discharge point at Dyess AFB is permitted to discharge stormwater under TPDES permit TXR05L345.

There are no local or state floodplain/floodway regulations.

The riparian restoration project is the result of a plan developed by the USARDC and the USACE (Fisher et al. 2003).

Agency Contacts—The following is a list of state and federal agency contact points.

- TCEQ, Region 3 Regional Director, Winona Henry (325) 698-9674
- TCEQ, Region 3 Air/Water/Waste Section Manager Michael Taylor (325) 698-9674
- Federal Emergency Management Agency (FEMA)—(817) 898-5127
- City of Abilene Texas Texas – Stormwater Services — Srini Valavala (325) 676-6280
- Taylor County—(325) 674-1393

7.6 Wetland Protection

Applicability Statement

This section applies to USAF installations that have existing wetlands on USAF property. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Floodplains and wetlands are protected under the CWA. Dyess AFB floodplain studies (Westin 1995) demonstrate that substantial portions of low-lying areas along Little Elm Creek are currently in the 100-year floodplain, including areas of the airfield, golf course, and family housing. Flood hazards and other safety issues associated with development in floodplains present significant constraints to future planning and base missions in these areas.

7.6.1 Floodplains

Floodplains provide for the natural control and conveyance of floodwaters. Altering and diminishing floodplains can lead to higher flow velocities and increased erosion, as well as property damage and possible loss of life within the modified floodplain area and areas downstream. Floodplains also provide a

number of values related to maintaining water quality, cultural resources, and living resources. The floodplain includes lowland and flat areas adjoining inland waterways that are subject to a one percent or greater chance of flooding in any given year, otherwise known as the 100-year floodplain. The Dyess AFB 100-year floodplain is mapped on the NR Geo-database and is available at the office of the NRM. This map can be amended or revised as necessary. Floodplain information is available via computer-aided drafting, GIS, and hard copy.

Significant federal statutes and orders relative to floodplain management for Dyess AFB include the National Flood Insurance Act of 1968; the Flood Disaster Protection Act of 1973; EO 11988, *Floodplain Management*; and EO 12372, *Intergovernmental Review of Federal Programs*. Applicable regulations and instructions include 44 CFR, Chapter 1, § 59–77; 43 Federal Register 6030; and AFMAN 32-7003. The aforementioned AFMAN implements EO 11988 in the USAF. The base is located in the city of Abilene, which is a participant in the National Flood Insurance Program. The base is not subject to city floodplain ordinances. According to floodplain management personnel with the State of Texas and City of Abilene, there are no applicable County or State floodplain ordinances or regulations.

The purpose of floodplain management is to manage the floodplain resources of the base to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and preserve and enhance the natural and beneficial values of floodplains and associated riparian areas. The boundaries of the 100-year floodplain are shown in Figure 2-4 (Section 2.2.4, *Hydrology*). This map indicates the presence of substantial floodplains in the south and east portions of the base. The 100-year floodplain is a significant natural constraint to development at Dyess AFB.

Figure 7-1 represents a decision tree showing the steps that will be taken for all future projects proposed at the base. Proponents of all proposed USAF actions must consider and document environmental effects through the EIAP delineated in AFI 32-7061, *The Environmental Impact Analysis Process*, as promulgated in 32 CFR, Part 989. All proposed Dyess AFB projects are reviewed and coordinated on through submission of USAF Form 332 (Work Order Request) and, if required, USAF Form 813 (Request for Environmental Impact Analysis) as part of the EIAP process. Through this process, a determination will be made as to whether or not a proposed action at Dyess AFB has impacts in the floodplain or directly or indirectly supports development in the floodplain. If this determination is negative, the proposed action would not be constrained by floodplain considerations. If floodplains would be affected, alternatives to the proposed action that would satisfy the purpose and need but not impact the floodplain need to be identified. If a practicable alternative can be identified, this alternative should be implemented in place of the proposed action after considering all factors.

7.6.1.1 Floodplain Decision Tree

If no practicable alternative to the floodplain location can be identified, the proponent must design or modify the proposed action to minimize potential harm to or within the floodplain. Where practicable, structures shall be elevated so that the floor of the first occupied level is at least one foot above the 100-year flood elevation and at least 18 inches above the gutter inlet, whichever is greater. Elevation should not be accomplished by use of fill. All structures that must be built in the floodplain shall be constructed with materials resistant to flood damage to prevent flotation, collapse, lateral movement, or other flood damage. Channel excavation to remove areas from the floodplain should be minimized through innovative design, including use of detention structures and other means to slow runoff, encourage infiltration, and minimize increases in peak discharge. No action may take place within a floodplain until a Finding of No Practicable Alternative (FONPA) has been signed by HQ GSC/A7, or responsibilities under 32 CFR 989 could be

fulfilled with a categorical exclusion (CATEX), Finding of No Significant Impact (FONSI), or Record of Decision (ROD).

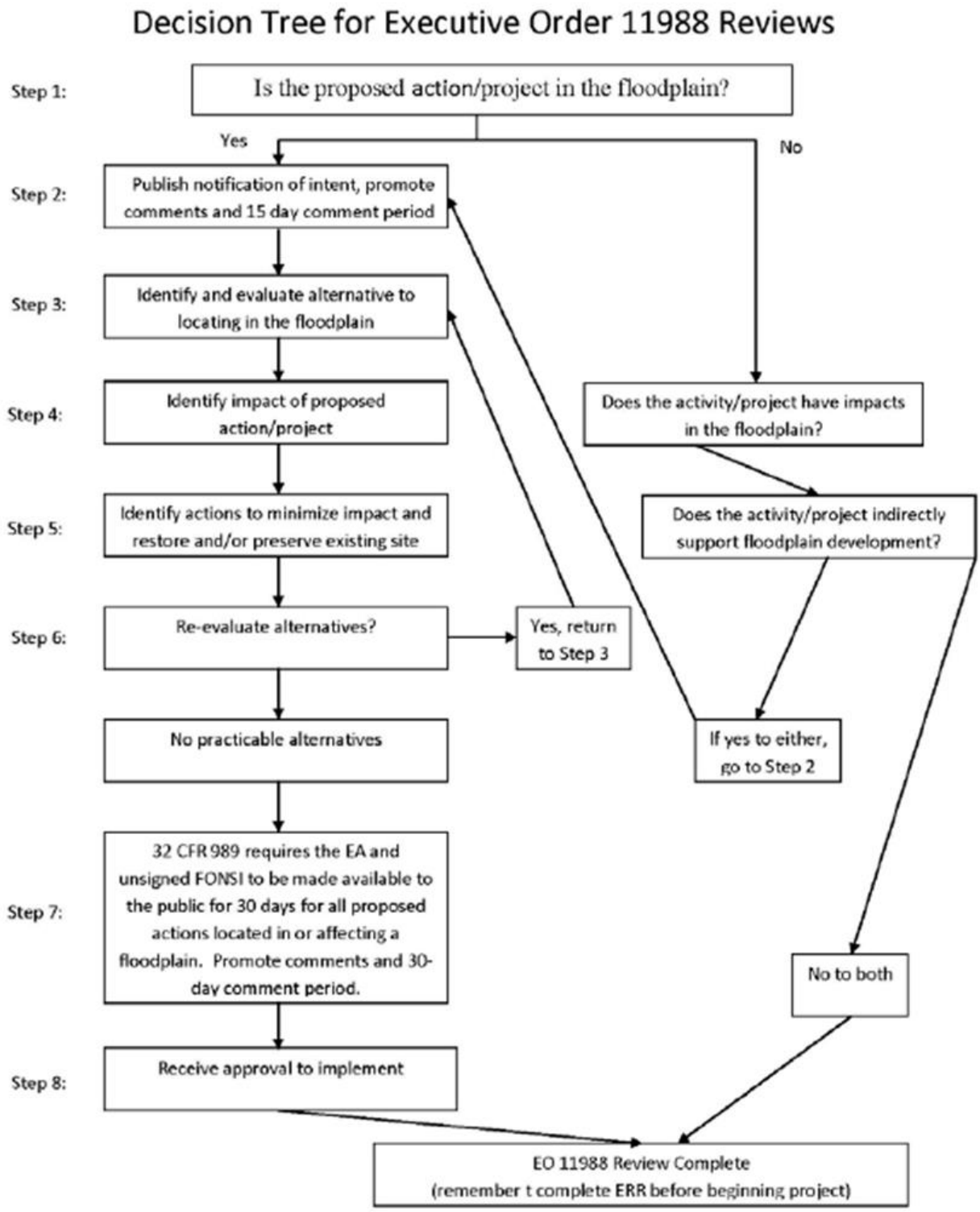

Figure 7-1. Floodplain decision tree.

The floodway is that part of the floodplain required to carry all of the 100-year flow with no more than a 1-foot rise in the 100-year flood elevation. If fill were placed in a floodplain, the floodway is that portion that cannot be filled without causing an increase in the 100-year flood elevation that exceeds one foot. No occupied structures shall be placed in the floodway. If a structure such as a support column for a bridge must be placed in the floodway, a request for a "no rise" certificate must be made to FEMA along with hydrologic and hydraulic studies showing that no change in the 100-year flood elevation will occur. If no practicable alternative to the proposed action can be identified, a FONPA must be prepared for signature. The public review process required under EO 12372 must be followed. In addition, if no practicable alternative to the floodplain location exists and fill must be placed in the floodplain, a complete hydrologic and hydraulic analysis of the impacts to the floodplain must be conducted and a letter of map revision must be requested from FEMA.

7.6.2 Wetlands and Waters of the Unites States

It is recognized that the natural wetland is a rare phenomenon in this region, occurring primarily but infrequently as playas (intermittent lakes). Playas are quite common and can cover up to 500 acres in counties north of this installation, but they are sparse and less than a half-acre at the more southern latitude where Dyess AFB is located. Wetlands also may be associated with creeks. Overall, most wetlands in this region are manmade, dug within the last 80 years for capturing floodwaters from an intermittent stream or sheet drainage and occasionally both; historically, these are marginally successful, but many will hold water for several months in most years. The presence of hydric soils, wetland hydrology, and hydrophytic vegetation characterize a wetland. The National Wetlands Inventory is contained on maps produced by the USFWS. Wetlands/Waters of the United States were delineated in 1995 and reported in the document, *Delineations of Jurisdictional Waters of the US and Wetlands on Dyess AFB* (USAF 1995).

7.6.2.1 Protection Requirements

EO 11990, dated 24 May 1977, requires all federal agencies to provide leadership in wetland protection when acquiring, managing, and disposing of federal lands; providing federally undertaken, financed, or assisted construction and improvements; and conducting federal activities and programs that affect land use. In support of this EO, DoD issued DoDI 4715.3, which sets a goal of no net loss of wetlands on DoD lands. The USAF has been directed to avoid undertaking or providing assistance for any new construction that is located in wetlands, unless no practicable alternatives to construction are available and the proposed action includes all practicable measures to minimize harm on wetlands that may result from such use.

7.6.2.2 Wetland Decision Tree

Figure 7-2 depicts a decision-making tool showing the steps that will be taken for all projects proposed at the base. The components of this decision tree are discussed below. Proponents of all proposed Air Force actions must consider and document environmental effects through the EIAP as required by AFI 32-7061 as promulgated in 32 CFR Part 989. As part of the EIAP, a determination will be made as to whether or not a proposed action at Dyess AFB has impacts on wetland areas. If this determination is negative, the proposed action would not be constrained by wetlands considerations.

If wetlands would be affected, alternatives to the proposed action need to be identified that will satisfy the purpose and need and that will not impact wetlands areas. If a practicable alternative can be identified, this alternative should be implemented in place of the proposed action after considering all factors. If any question exists as to whether or not the proposed action will impact wetlands, additional study shall be performed in cooperation with the USACE and the USFWS to accurately delineate the wetlands in the area of the proposed action.

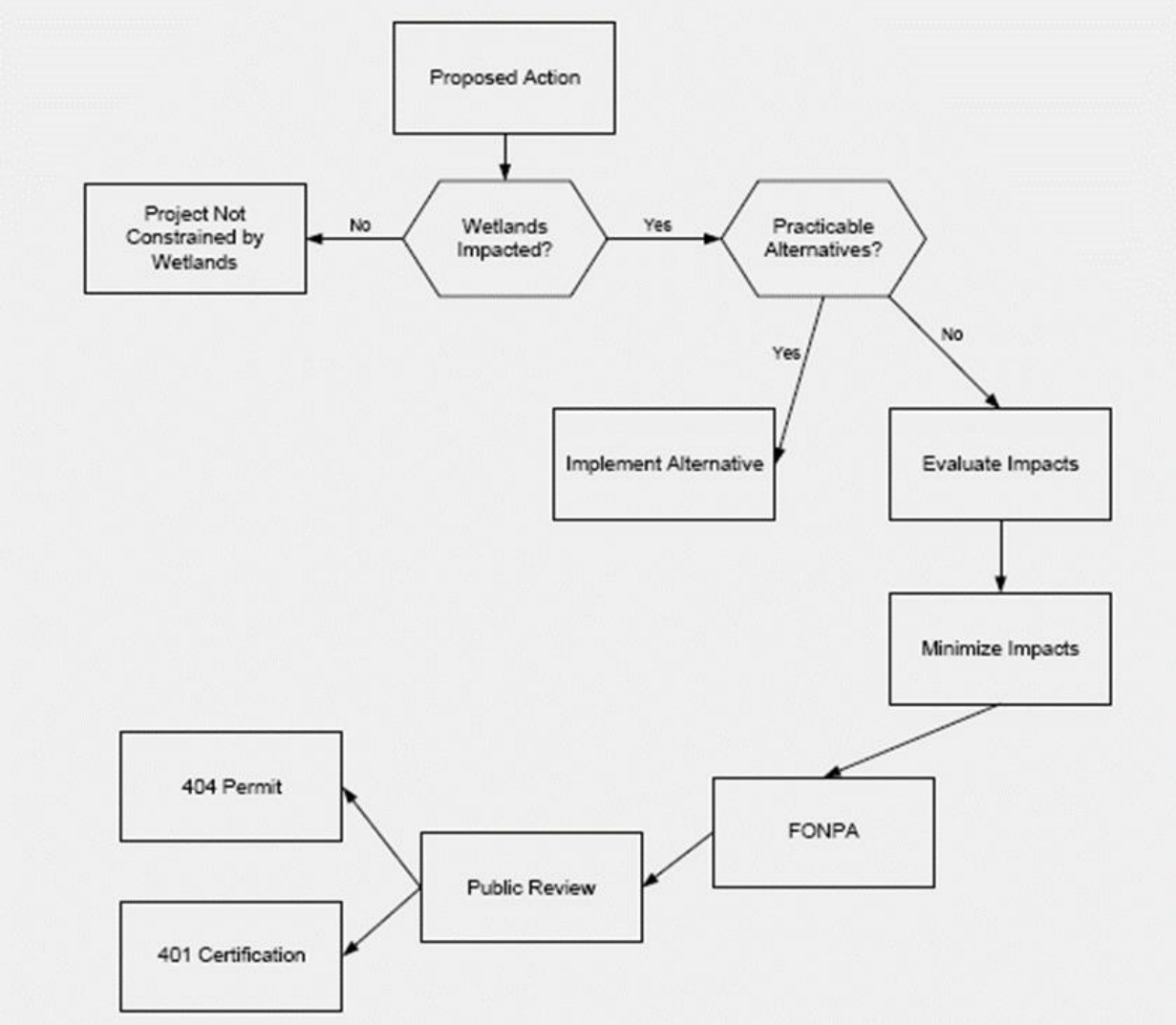

Figure 7-2. Wetlands decision tree.

If no practicable alternative can be identified, the proponent must design or modify the proposed action to minimize potential harm to wetland areas. Mitigation in accordance with the "no net loss" policy shall be performed. Minimization may include site plan reconfiguration to minimize the area of wetlands filled, provision of vegetation buffer areas along the perimeter of wetlands, and soil erosion control. Mitigation can include restoration of temporarily disturbed wetlands, creation of new wetlands, restoration of previously modified wetlands, or enhancement of degraded wetlands. If no practicable alternative to the proposed action can be identified, a FONPA must be prepared by the base and signed by the Command Civil Engineer (GSC/A7) before any action in wetlands may proceed. No city, county, or state wetlands ordinances or regulations are applicable. The public review process required under EO 12372, *Intergovernmental Review of Federal Programs*, must be followed.

7.6.2.3 Permitting

In addition, the wetlands permitting process under Section 404 of the CWA must be followed. Section 404 requires a permit from USACE for any activity involving the discharge of fill material into WOTUS Depending on the impact of the action and waters to be affected, the action may be permissible under a nationwide or other general permit. Otherwise, a project-specific permit would be required, which includes coordination with other federal and state agencies under the Fish and Wildlife Coordination Act. Under Section 401 of the CWA, the TCEQ would also review the action for consistency with the Texas Surface Water Quality Standards. A water quality certification would be issued if the action were consistent with these standards.

Adverse effects on wetlands located on DoD lands should be avoided whenever possible and minimized or mitigated when unavoidable. Section 404 of the Clean Water Act require the Corps to administer a review process whereby the placement of dredged or filled material into WOTUS, including wetlands, may be permitted after notice and opportunity for public input have been provided. A wetland inventory is the first and most basic step toward protecting and managing wetland resources. AFPD 32-70: Environmental Quality directs installations to develop and maintain current inventories of wetlands to plan for long-term protection or mitigation.

In 2001, the U.S Supreme Court ruled the USACE does not have jurisdiction over isolated wetlands (Solid Waste Association of Northern Cook County v. U.S. Army Corps of Engineers). However, if wetlands are "adjacent" to other jurisdictional features (e.g., streams, other waters), the USACE may take jurisdiction over the wetlands. Because the definition of adjacent is not clearly defined, jurisdiction is determined on a case-by-case basis by the Corps. The requirements of EO 11990 apply equally to jurisdictional and non-jurisdictional wetlands.

7.6.2.4 Current Wetlands

The purpose of wetlands program management is to manage the wetlands and water resources of the base to minimize the destruction of wetlands, and preserve and enhance the natural and beneficial values of these resources. Present wetlands areas are shown in Figure 7-3, Figure 7-4, Figure 7-5, Figure 7-6, and Figure 7-7 and mapped in the document, *Delineations of Jurisdictional Waters of the U.S. and Wetlands on Dyess* AFB (USAF 1995), available at the NRM's office.

According to the SCS Soil Survey (SCS 1976) and the Wetlands delineation report, Randall clay, Rotan clay loam, Rowena clay loam, Tobosa clay inclusions, and areas of Colorado, Gageby, and Weymouth soils all exhibit properties of hydric soils (SCS 1993). The 12 wetlands delineated within the study area on Dyess AFB comprise approximately 3.2 acres and are distributed throughout the undeveloped and moderately developed areas of the base.

Figure 7-3. Jurisdictional wetlands and waters of the United States in the southeast corner of Dyess Air Force Base.

Figure 7-4. Jurisdictional wetlands and waters of the United States in the northeast corner of Dyess Air Force Base.

Figure 7-5. Jurisdictional wetlands and waters of the United States north of Base Housing on Dyess Air Force Base.

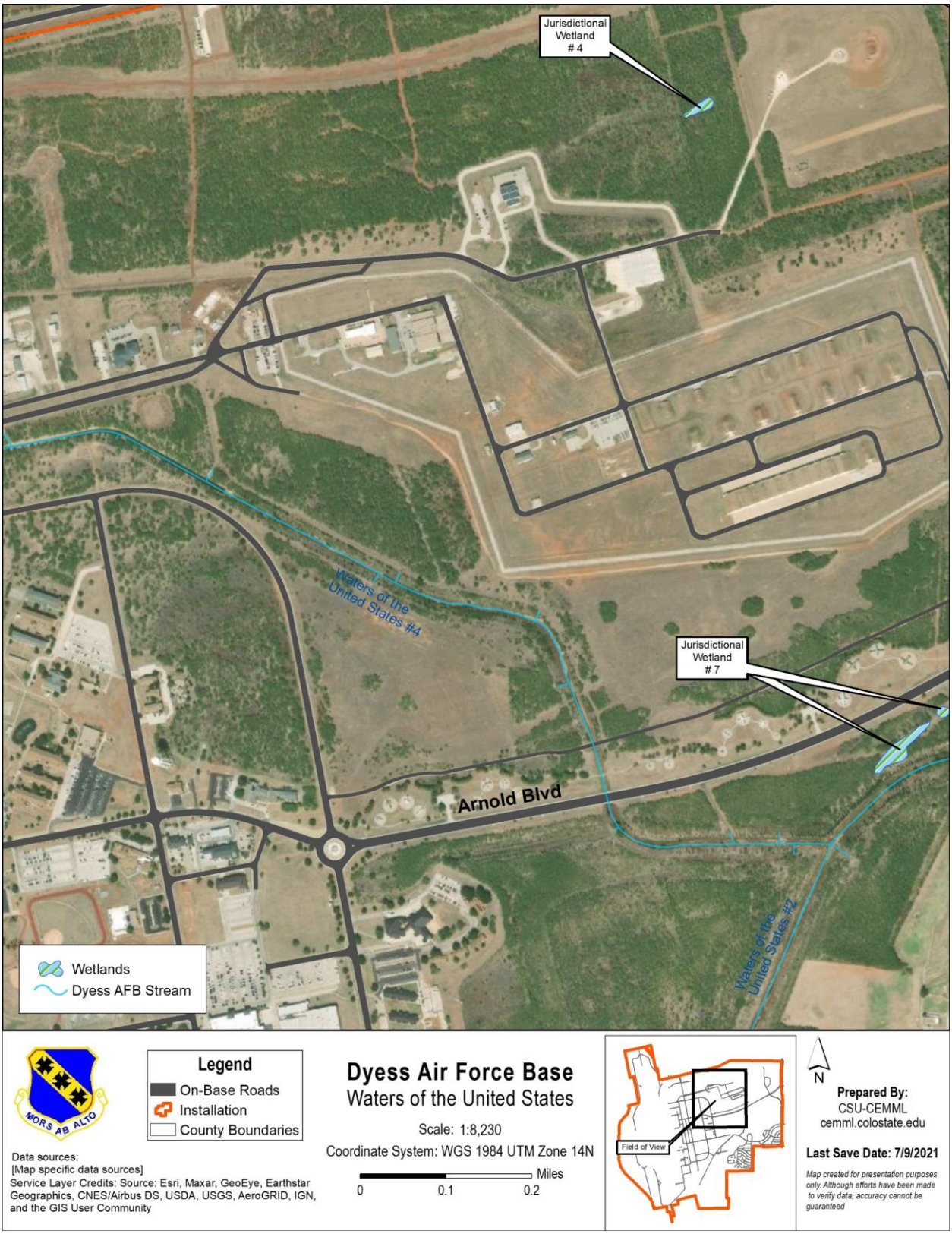

Figure 7-6. Jurisdictional wetlands and waters of the United States in central Dyess Air Force Base.

Figure 7-7. Jurisdictional wetlands and waters of the United States at the north end of Dyess Air Force Base Runway.

Four of the delineated wetlands are associated with the southwest tributary to Little Elm Creek (8, 9, 10, and 11). Of these four, two (8 and 11) are remnants of stock watering tanks built by ranchers prior to the original base opening in 1942. Wetland 9 appears as an enlarged section of the creek, whereas wetland 10 is a scalloped and banked area with little obvious connection to the creek, presumed to be the results of road-building activities. Neither wetland is a classic wetland by any means, as they are not on hydric soils, nor do the soils display redoximorphic features—the soils barely qualify by virtue of the hydric moisture regime. Water is present only after very heavy thunderstorms that occasionally cause flooding in the area. Natural siltation is evident in these wetlands and they can be expected to become shallower over time. Also, because they are unnatural structures, it can be anticipated that animal burrowing and erosion will eventually breach these structures and their water-retention capabilities will be eliminated or greatly diminished, as will their wetland designations. There are no plans to enhance or maintain these unnatural structures. As they become eliminated, they will once again become part of the floodplain, which is more natural, beneficial, and permanent for both that area and the region overall; however, until such occurrence, these areas will be protected as wetlands IAW U.S. and Texas law and DoD and USAF instructions.

Delineated wetlands 2 and 7 are associated with the now-defunct historical streambeds that were destroyed when Little Elm Creek was channelized in 1957. Wetlands 4 and 6 occur within the Randall clay series, which is listed as a hydric soil characterized by concave formation with occasional significant depressions. This poorly-drained clay soil is located on two small sites in the northeast area of the base and has two depressions that display wetland characteristics and have been delineated as wetlands of about 0.2 acres each. These formations are natural and can be expected to function as playas for the foreseeable future. No maintenance is required, and playa enhancement in north Texas ultimately has detrimental results. These natural wetlands function well when left in their natural state.

Five other wetlands have been delineated and noted for protection. Wetland 12 was intentionally created near the north end of the runway by a small berm of dirt and has been retaining water intermittently—enough to allow growth of hydrophytic vegetation in normally wet periods—and has been delineated on the wetland map. No soil changes typical of wetlands have occurred and wetland designation from the soil criteria is made from hydric moisture regime alone. There are no plans to maintain the artificial berm that created this wetland, and erosion and animal activity can be expected to eventually breach the containment. Once the berm has been breached, the area will no longer hold water, will lose its ability to support hydrophytic vegetation, and will return to floodplain, which is its natural function.

The remaining three delineated wetlands, (1, 3, and 5) are also anthropogenic in origin. Two of them (1 and 5) are the result of poor dirt work, one on the northeast part of the base, the other on the south central sector. Wetland 3 is a borrow pit resulting from the construction of an old levee.

There are other undelineated areas on the base that may be regarded as questionable wetlands and are under observation. In some years, hydrophytic vegetation is present, although not dominant, and the soils do not indicate a hydric moisture regime. These possible wetlands are to be avoided if possible; action affecting them will require further wetland determination and delineation.

Jurisdictional wetlands delineation reports are provided in the following three items.

- Delineations of Jurisdictional Waters of the US and Wetlands on Dyess AFB, Texas (USAF 1995)
- National Wetland Inventory maps
- Soil survey map, (Section 2.2.4, *Hydrology*)

There are no state required buffer areas surrounding wetlands.

There is no wetland banking project within the watersheds encompassing the installation. There are no current mitigation plans.

There are no signed FONPAs for installation projects. Agency Contacts are listed below.

- USACE, Fort Worth District—Steve Brooks (817) 886-1730
- USFWS— Christina Williams, 512-490-0057 ext. 235
- TPWD Habitat Assessment Program Field Office—Rick Hanson (806) 761-4936
- TPWD Habitat Assessment Program Lead—Laura Zebehazy (512) 389-4638

7.6.3 Climate Impacts on Wetland Protection

There are 12 jurisdictional wetlands delineated within the study area on Dyess AFB that comprise approximately 3.2 acres, distributed throughout the undeveloped and developed areas of the base. Wetland ecosystems at Dyess AFB will be particularly vulnerable to the projected temperature increases that could increase evaporation rates in these areas. In general, wetlands are vulnerable to changes in quantity and quality of their water supply, and it is expected that climate change will have pronounced effects by altering hydrological regimes (Erwin 2009). Drainage management has been a challenge at Dyess AFB, and some of the stormwater canals have become clogged and begun to grow wetland vegetation. These require regular maintenance to prevent development of additional wetlands that would slow drainage and potentially cause flooding.

7.7 Grounds Maintenance

Applicability Statement

This section applies to USAF installations that perform ground maintenance activities that could impact natural resources. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

7.7.1 Land Management Categories

The improved grounds on Dyess AFB include 365 acres of family housing lawns mowed by occupants; 217 acres of golf course fairways and greens maintained by contractors, and 418 acres maintained by service contract. The 1,645 acres of semi-improved grounds are maintained by service contract. The Land Management Plan, a component of this INRMP (Section 14.2.7, *Appendix H. Land Management Plan and Urban Forestry*), details procedures and specifications for all contractual care of Dyess AFB landscape elements. The land management plan incorporates the principles set forth in the Dyess AFB Landscape Guide and the USAF Landscape Design Guide. All lawns and shrubs located around or adjacent to a base housing unit are the responsibility of the resident.

Dyess AFB currently controls nine off-base sites on a combined total area of 751 acres. These include six Realistic Bomber Training Initiative (RBTI) sites, the Tennyson Drop Zone, and the Moran NEXRAD site. The RBTI sites range in size from 5 to 25 acres and are maintained by the on-site contractor. The 520-acre Tennyson Drop Zone site used by the 317th Airlift Wing for C-130 training, and the 2-acre NEXRAD site located at Moran are maintained by 7 CES/CEO. Remote areas are monitored by the Dyess AFB NRM. RBTI NR management guidance will be provided under the authority of this INRMP through the Base Comprehensive Range Plan located at 7th Operations Support Squadron/Operational Standoff Range (7 OSS/OSOR). A vegetation management plan developed for the Lonestar Snyder Electronic Scoring Site

(ESS) Annex is located in Appendix I, Section 10.5.1 of the Land Management Plan (see Section 14.2.7, *Appendix H. Land Management Plan and Urban Forestry*).

7.7.2 Mesquite Grove Golf Course Environmental Management

The base NRM, the Mesquite Grove Greens Superintendent, and Pest Management cooperate in the development of golf course habitat enhancement, fisheries and wildlife protection, maintenance plans, pest control plans, and application schedules. In 2001, Mesquite Grove was designated an Audubon International Cooperative Wildlife Sanctuary. Biennial recertification standards have been met in alternating years since that time. This accomplishment is the result of cooperative efforts that reflect the goals and objectives set forth in this INRMP and the base Integrated Pest Management Plan (IPMP). The elimination or reduced use of fertilizers and chemicals on base has reduced the potential for non-point source pollution in groundwater and stormwater runoff.

The Mesquite Grove Environmental Management Plan is in compliance with all appropriate environmental regulations and is committed to upholding the standards necessary to maintain the Audubon International Cooperative Sanctuary status and will continue to focus on the highest standards of environmental excellence.

7.7.3 Urban Forestry

The purpose and need of the Dyess AFB Urban Forestry Plan (see Section 14.2.7, *Appendix H. Land Management Plan and Urban Forestry*) is to state overall philosophy of urban forestry management and to ensure compliance with AFMAN 32-7003, Natural Resources Management. This plan is not to be construed as a contracting document, although contracting documents regarding trees will generally follow this plan. This plan is a component plan to the Dyess AFB INRMP and as such will be reviewed by the appropriate authority annually. The format and content of this plan are in accordance with AFMAN 32-7003 and its referral to the Air Force Landscape Design Guide.

Any urban forestry setting is greatly influenced by natural factors and native origins. The urban forests of Dyess AFB reflect natural placement of native trees, as well as introduced species and nonnative trees that established as a result of human intervention. In many cases, trees exist due only to extraordinary efforts.

7.8 Forest Management

Applicability Statement

This section applies to USAF installations that maintain forested land on USAF property. This section **IS NOT** applicable to this installation.

7.9 Wildland Fire Management

Applicability Statement

This section applies to USAF installations with unimproved lands that present a wildfire hazard and/or installations that use prescribed burning as a land management tool. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

The Wildland Fire Management Program aims to protect, enhance, and maintain NRs on Dyess AFB. By using prescribed burning and wildland fire suppression strategies, as described in the Dyess AFB WFMP

(see Section 15.1, *Tab 1—Wildland Fire Management Plan*), the program can support NR goals and objectives.

Wildland fire is an important part of the historical ecological regime on Dyess AFB. On a 1- to 35-year burn cycle, fire has shaped vegetative communities in the central mixed-grass prairie for millennia (Zouhar 2021). Ignited by both people and lightning, fires in this ecosystem create opportunities for native grass to grow by removing accumulated plant litter and suppressing shrub and cactus encroachment. Decades of shifts in land use and changes in climate have altered vegetation species composition and fire frequency, resulting in large expanses of vegetation being converted to impenetrable and mesquite thickets that support much lower plant and animal diversity than the native prairies (Zouhar 2021). Prescribed burning is necessary to ensure that the integrity of the native ecology remains intact, habitat for rare species increases, and risk of future fire threat to base operations is reduced. The desired result of the rotational burning on Dyess AFB is to achieve a matrix of healthy grasslands appropriate to the underlying soil type and mesquite woodlands dominated by grassland species but also capable of supporting the occasional mesquite tree for its contributions to nitrogen fixing, organic carbon, and the overstory, which can provide a valuable niche of habitat.

7.9.1 Wildland Fire Management Plan

The WFMP guides all wildfire suppression and prescribed fire activities on Dyess AFB. It is the goal of the plan to conserve natural resources in a manner consistent with supporting the military mission and public safety.

7.9.2 Prescribed Fire Activities

The Wildland Fire Management Program will be used to protect, maintain, and enhance natural resources on base and will follow specific burn prescriptions to reduce potential fuel hazards. The re-introduction of fire as a means of reducing wildfire risks and realizing ecosystem management objectives will consist of burning (every five years or less if conditions warrant) all restored grasslands and mesquite savannah capable of sustaining a prescribed burn. Sites will be chosen by the NRM (7 CES/CEIE) in coordination with the base Fire Department (7th Civil Engineering Squadron / Civil Engineering Fire based on natural breaks in vegetation or maintained firebreaks. Proposed fuel breaks that will be re-established or developed and units to be burned or treated with tree removal are shown in Figure 7-8, Figure 7-9, Figure 7-10, Figure 7-11, and Figure 7-12, and units with no perceived threat are shown in Figure 7-13.

Unplanned ignitions from lightning strikes, mission starts, etc., may be allowed to burn (employed as a management tool) if current and expected conditions fall within the parameters of management prescriptions for the area, provided that adequate personnel and equipment are available to manage the fire as a prescribed burn. The Senior Fire Officer must make appropriate contacts with the Fire Alarm Control Center to ensure that the fire will not interfere with missions, other planned activities, study plots or other concerns in the burn area.

Prescribed burning concerns include smoke management, accomplishing site-specific management objectives with minimal resource damage, and accomplishing annual burning goals needed for effective ecosystem management. There is a need for continued evaluation of how ecosystems respond to varying fire regimes, including season when burning takes place, fire-return interval, fire intensity, and ignition techniques, and other factors as needed.

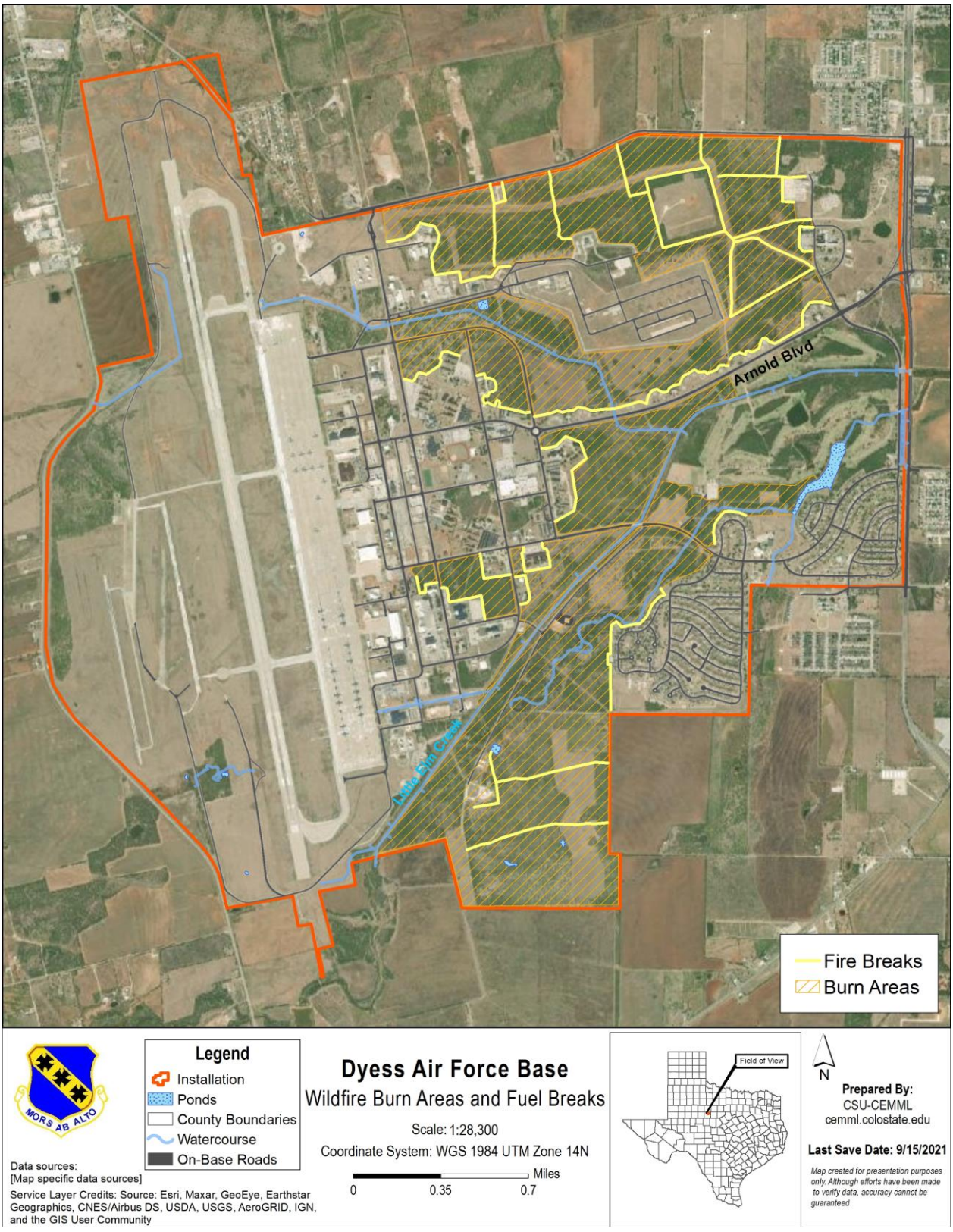

Figure 7-8. Overview of firebreaks and burn areas on Dyess Air Force Base.

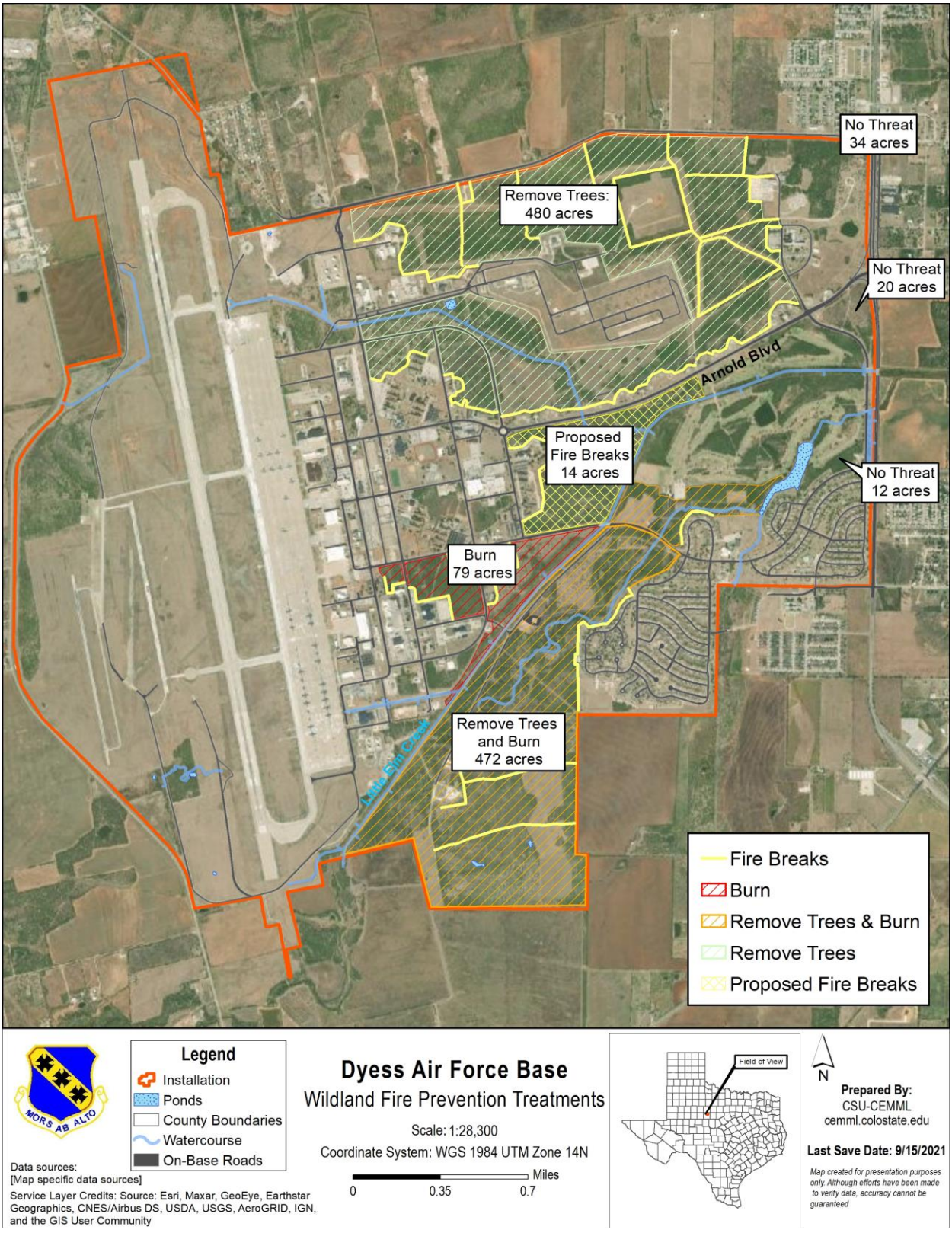

Figure 7-9. Overview of desired burn area outcomes on Dyess Air Force Base.

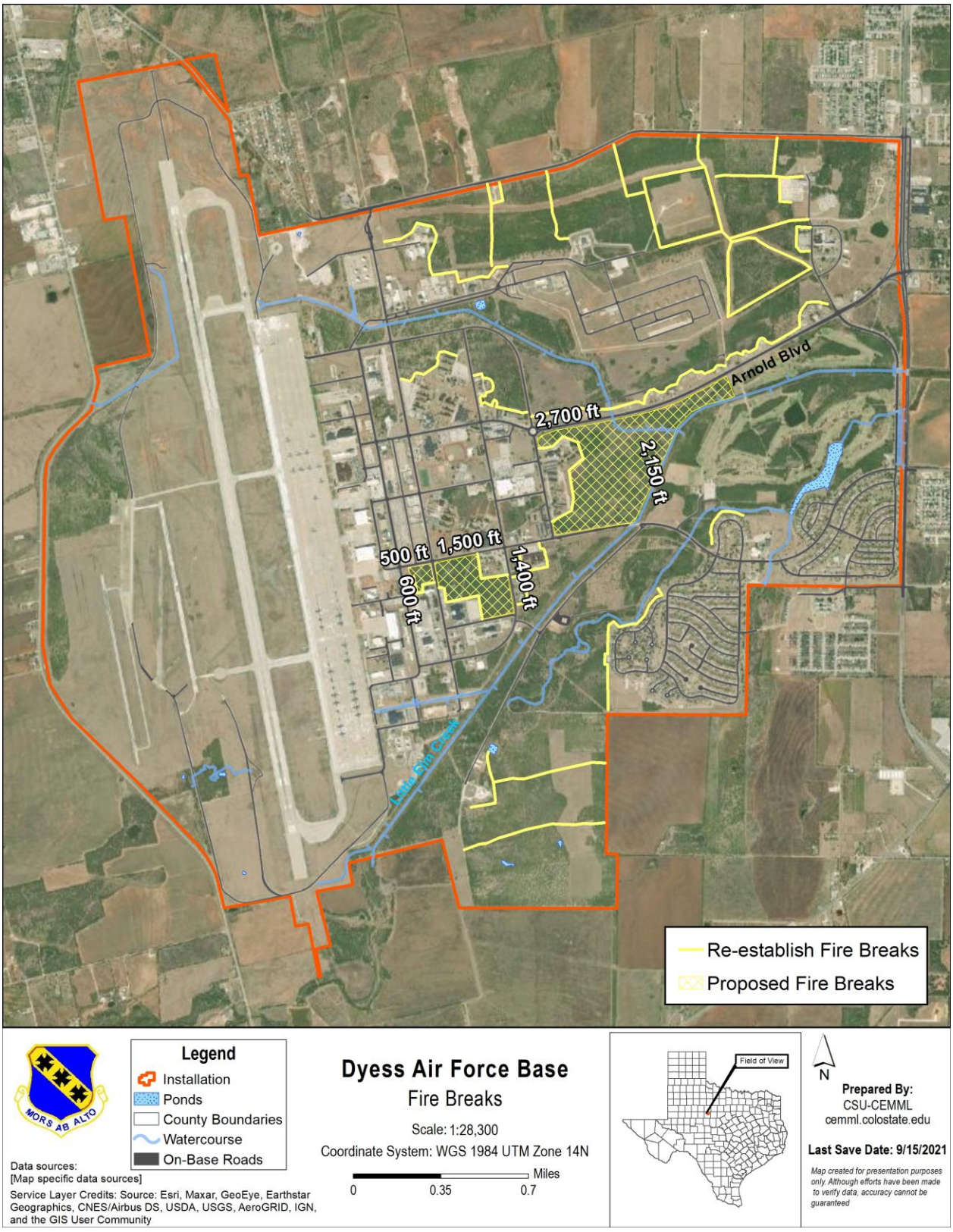

Figure 7-10. Firebreaks to be re-established or proposed on Dyess Air Force Base.

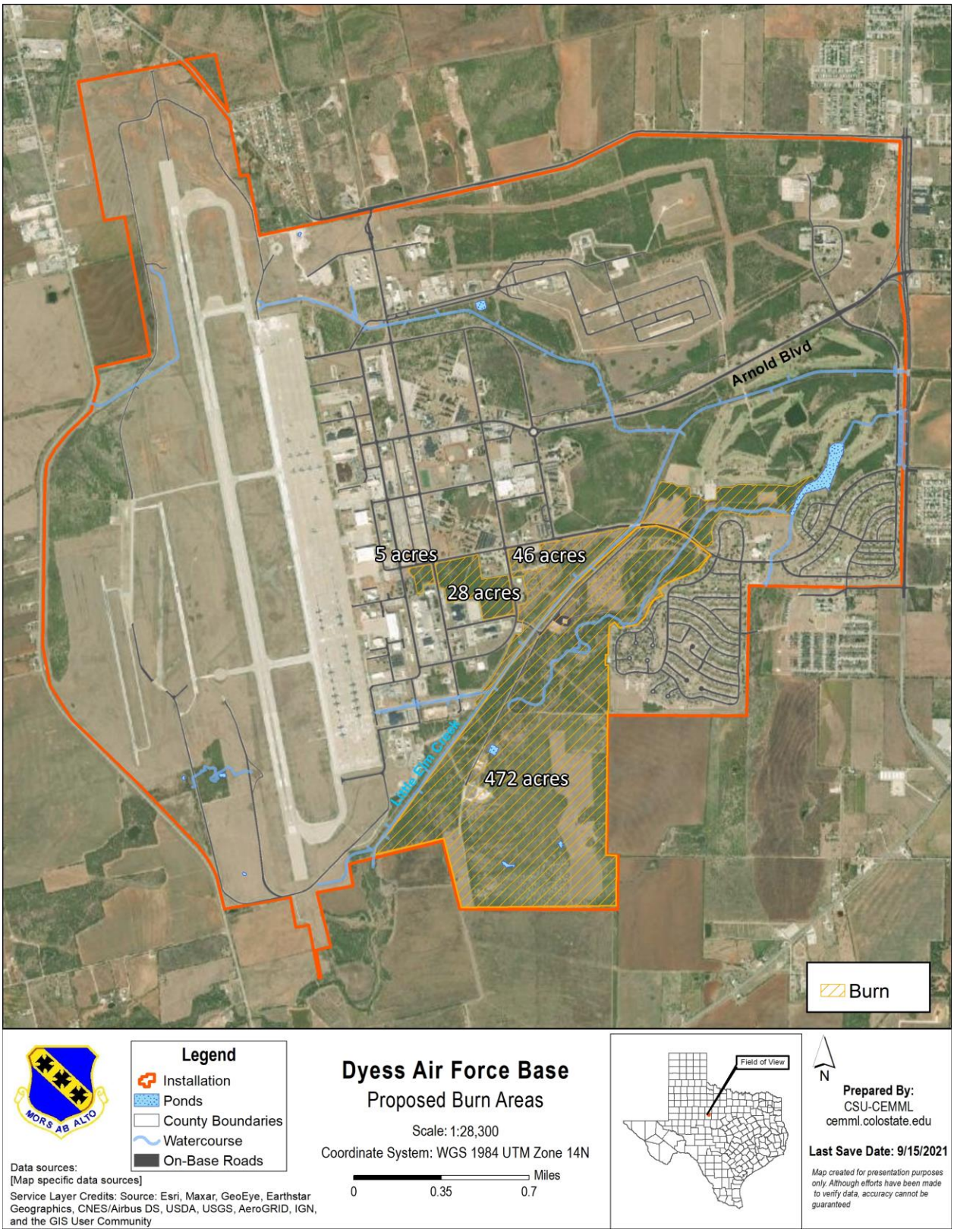

Figure 7-11. Proposed burn areas on Dyess Air Force Base.

Figure 7-12. Units proposed for tree removal on Dyess Air Force Base.

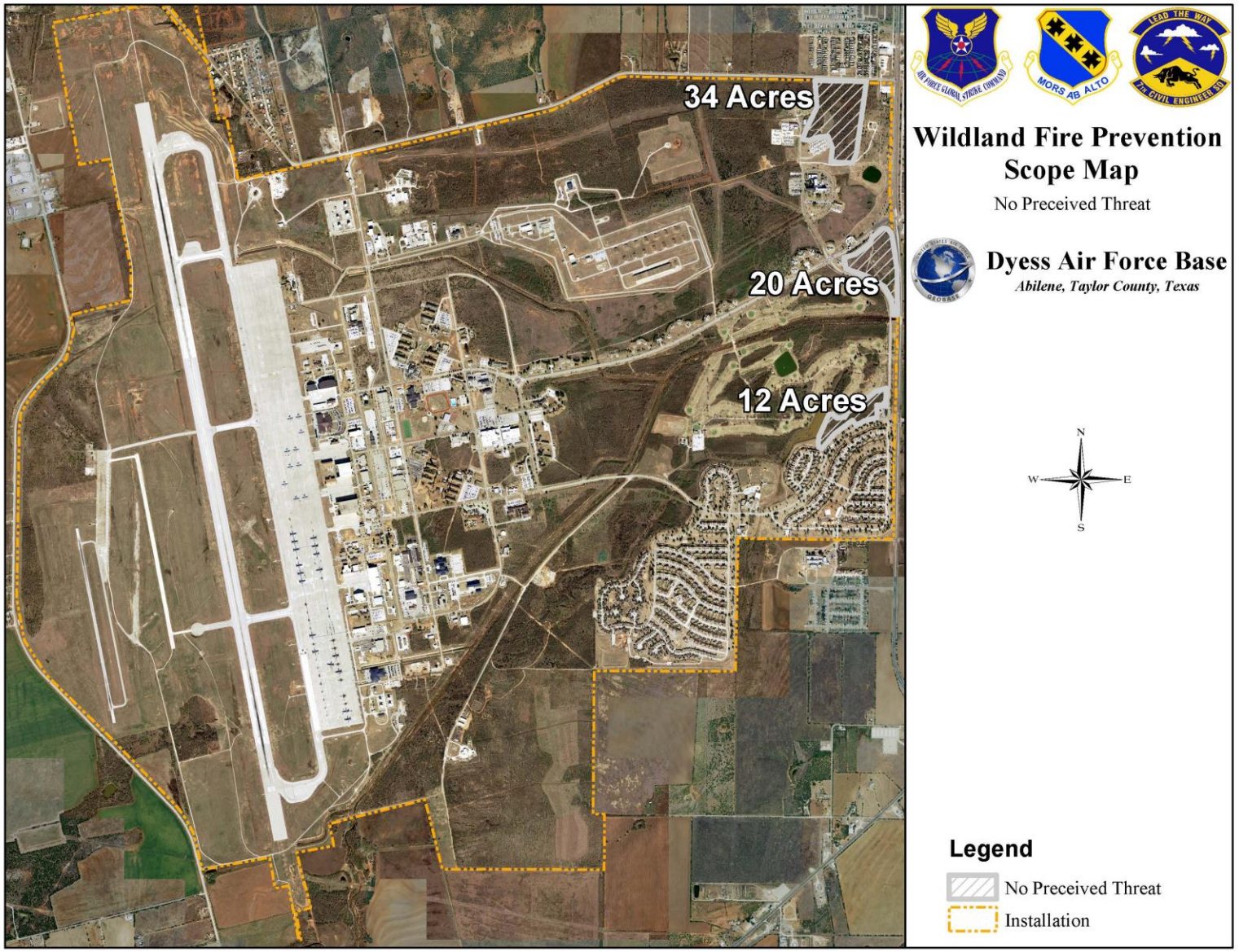

Figure 7-13. Units with no perceived threat on Dyess Air Force Base.

Monitoring is a key element of any NR management effort. The WFMP incorporates a variety of monitoring levels, and these should be coordinated with the existing vegetation monitoring already established. The long-term monitoring presented in the WFMP in particular can be integrated into the vegetation-monitoring program, which should be developed to track trends in vegetation and habitat base-wide. The allocation of vegetation monitoring plots should be compared to the proposed burn units, plots should be added as needed, and a schedule should be established to ensure that plots are read prior to a burn. Plot data collected prior to a burn can be used to help establish a baseline and the plots can be revisited at appropriate post-burn intervals to determine an effective burn interval and evaluate the success of the rotational burn program.

7.9.3 Climate Impacts on Wildland Fire Management

The climate models projected various changes in precipitation patterns and amounts, with each scenario yielding wetter and drier periods at various points throughout the year. The RCP 4.5 2030 scenario projects a considerably wetter spring, as well as a wetter year overall, which likely would decrease fire activity in general. During the peak of fire season—June through September—the RCP 4.5 scenarios both indicate an overall increase in precipitation, whereas the RCP 8.5 scenarios both project slight decreases.

Temperature increases under the RCP 4.5 2030 scenario are moderate, but they are more substantial under the other scenarios, with maximum temperature increases of over 5 °F in five months of the year in the RCP 8.5 2050 scenario, including three months during the fire season. These temperature increases will lead to longer fire seasons and more days of elevated fire ignition probability and greater fire intensity.

Because precipitation is projected to increase in almost every month in all climate scenarios, which is likely to counter-balance the influences of increasing temperatures, wildfire frequencies and intensities at Dyess AFB are likely to remain approximately the same or decrease relative to current day wildfire frequencies and intensities. In addition, if the base is successful in implementing the rotational burning program described in the WFMP, this will further reduce the fire danger on base as the mesquite thickets are restored to grasslands. Grasslands, however, are particularly vulnerable to increasing temperatures and changing precipitation patterns, so developing resilient and healthy grasslands as soon as possible will be important to buffering the effects of climate change on the base. The decision to continue rotational burning in the coming decades will rely heavily on monitoring data to determine the suitability of sites, effectiveness of past and proposed burns, and the costs and benefits of burning.

7.10 Agricultural Outleasing

Applicability Statement

This section applies to USAF installations that lease eligible USAF land for agricultural purposes. This section **IS NOT** applicable to this installation.

7.11 Integrated Pest Management Program

Applicability Statement

This section applies to USAF installations that perform pest management activities in support of NR management (e.g., invasive species, forest pests). This section **IS** applicable to this installation.

Program Overview/Current Management Practices

The control of nuisance wildlife species is primarily the responsibility of the Pest Management Shop, 7 CES/CEOUE. The Dyess AFB IPMP (see Section 15.5, *Tab 5—Integrated Pest Management Plan (IPMP)*)

and the Dyess AFB BASH Plan (OPLAN 91-212) identify responsibilities for pest management, BASH and NR personnel for the control of nuisance wildlife. Pest management personnel and the NRM work closely in ascertaining nuisance wildlife situations and which actions, methods, and procedures are required to alleviate impacts to humans and wildlife.

The most costly nuisance wildlife species on base is the American beaver. Feral hogs, fox squirrels, Mexican ground squirrels, rock pigeons (*Columba livia*), coyotes and the western diamondback rattlesnake also could be considered nuisances. Fox squirrel damage is primarily associated with disruptions in the distribution of electrical power.

Beavers have made their presence known around Lake Totten and in the diversion ditch riparian corridors by toppling a significant number of cottonwood trees. Protective cages have been built around many cottonwood trees to preclude further beaver damage.

Feral hogs are the number one nuisance species in Texas and would pose a significant BASH threat to the flying mission if allowed to persist on the base. Maintaining fences is the most effective method of feral hog control, but they have been observed rooting around the perimeter fence and eventual incursions are likely. If feral hogs are observed on base, trapping with cellular traps and night hunting would be the most effective removal tools. Depending on the length of time feral hogs are present, some mitigation of damage may be necessary, particularly if hogs root in wetlands and change the water flow patterns, introduce invasive plants, or damage vegetation.

Mexican ground squirrels can impact turf management at the golf course and rock pigeons impact personnel, equipment, and work areas in and around hangars. A pigeon trapping program has proven successful in reducing pigeon numbers along the flightline, but relocation of pigeons has proven ineffective. Trapped pigeons are turned over to the City of Abilene's Animal Control for disposition. Occasionally coyotes, rodents, snakes, and other small animals attracted to improperly stored pet foods and poorly maintained yards are reported in the family housing area. The NR office developed a brochure for base family housing residents that provides guidance concerning the urban/wildlife interface. The remnant Little Elm creek channel adjacent to family housing provides excellent habitat for rodents, small mammals, and snakes. NR management to control the diamondback rattlesnake involves locating their winter den sites and removing the snakes. Relocation to suitable habitat on the airfield will help to reduce rodent populations and discourage raptors away from the flightline. The interior base housing perimeter is adjacent to potential snake habitat. Educating family housing residents in snake identification, rodent habitat removal, elimination of rodent food sources, and using exclusion barriers is a natural resource, ground safety, and pest management priority.

Currently, the primary wildlife animal pests are invasive species (Section 7.11, *Integrated Pest Management Program*), such as red imported fire ants (*Solenopsis invicta*) and Africanized honey bees (*Apis mellifera scutellata*), as well as stray or unleashed pets. Control of invasive wildlife and invertebrates is identified in the IPMP (Section 15.2, *Tab 5—Integrated Pest Management Plan (IPMP)*). Fire ants are a nuisance and health threat to humans, but they are more devastating to certain insects, reptiles, and ground nesting birds.

Africanized honey bees represent a growing concern, as all bee samples sent in for analysis have returned positive as Africanized honey bees. The aggressive behavior of these bees is a threat to humans and wildlife. Pheromone traps are established at regular intervals around the perimeter of the base to help reduce hive establishment on base.

Non-domesticated and free-roaming cats are a very real danger to numerous species of birds, reptiles, and other wildlife. Feral cats are pose the threat of spreading rabies and, more seriously, feline leukemia. Feral cats are aggressively live-trapped and turned over to Abilene's Animal Control for disposition.

Emergency wildlife-control measures may be warranted if unanticipated wildlife problems endanger installation operations or threaten public health. In such cases, the TPWD, USFWS, and/or the Wildlife Services Division ([WSD] of the United States Department of Agriculture [USDA] Animal and Plant Health Inspection Services [APHIS]) will be notified, as applicable.

7.11.1 Invasive Plant Species Management Planning

7.11.1.1 Invasive Species Management Plan

EO 13112, *Invasive Species*, enacted 3 February 1999, requires all federal agencies to prevent the introduction of invasive species, provide for their control, and minimize their economic, ecological, and human health impacts. The Dyess AFB Invasive Species Management Plan (ISMP) was developed to comply with AFMAN 32-7003, I*nvasive Species Management*, as applicable to Dyess AFB.

The term "invasive," as it pertains to the ISMP, includes but is not limited to noxious plant species designated by the USDA, the State of Texas, or Taylor County.

Invasive species are capable of affecting the structure, organization, or function of ecological systems (Sheley 1999). Ecological checks and balances that have developed over thousands of years can be disrupted when invasive species are introduced or when natural controls are suppressed. Uncontrolled plant species with invasive characteristics can quickly dominate a plant community. In most cases, biological invasions occur gradually and inconspicuously. By the time public awareness develops, the effects are often irreversible and resources may be irretrievably committed, productivity lowered, and biodiversity reduced (Bureau of Land Management 1994). When left uncontrolled, invasive plants either directly or indirectly crowd out desirable native species, create plant monocultures, degrade wildlife habitat, interfere with recreational activities, contribute to wildfires, damage water resources, reduce foraging habitat, and/or negatively impact endangered species.

The best defense against the spread of invasive plants at Dyess AFB includes land-management strategies of prevention, early detection, and control of established populations. The purpose of the Dyess AFB ISMP is to provide a blueprint for base-wide action to prevent the introduction of invasive terrestrial vascular plant species, provide for their control, and to minimize their operational, mission, environmental, and human health impacts.

Dr. Barron Rector of Texas A&M University developed a prioritized invasive plant list for Dyess AFB that is based on species with the greatest potential for economic, ecological, or human health impacts, with the potential for introduction based on current distribution patterns, and potential pathways of introduction. Invasive species of concern are identified in Section 14.2.8, *Appendix I. Invasive Species Plan*. Species of potential concern are detailed in the *Invasive Species Plan*.

The species of concern identified at Dyess AFB include honey mesquite, saltcedar, ball mustard (*Rapistrum rugosum*; also known as bastard cabbage), field bindweed (*Convolvulus arvensis*), giant reed (*Arundo donax*), and malta centaurea (*Centaurea melitensis*). Their profiles below contain brief descriptions and information concerning their habitat/range, biology/ecology, potential impacts, invasion pathways, and management/control options.

7.11.1.2 Honey Mesquite

Description

Honey mesquite, recognized as the primary noxious brush species in Texas, impacts a major portion of Dyess AFB and is the number one species of concern. Honey mesquite is a small to medium perennial deciduous tree. The leaves are bipinnately compound, 3–6 inches long. Each leaflet has 10–16 pairs of minor leaflets (approximately 1 inch long) with a smooth outer edge and leaf surface; leaflets are green to gray-green above and paler below. The flowers are generally white or pale yellow in 2- to 3-inch-long slender spikes. Flowers appear in late spring to early summer in clusters of 2–6 spikes. The bark is rough and scaly; older bark is gray brown and newer bark is a reddish brown color. Twigs have obviously paired spines up to one inch long.

Habitat and Range

Mesquite is one of the most widely distributed trees in west-central Texas. Honey mesquite has a very high heat tolerance and low water requirement. The species has adapted to a wide variety of soil types. It generally occurs in the plains and foothills of semi-arid regions of the southwestern U.S. and northern Mexico. Mesquite is abundant on Dyess AFB and surrounding areas.

Biology and Ecology

Mesquite mainly propagates by seed but is also capable of sprouting from dormant buds below the ground surface. Mesquite flowers in the summer, and seeds mature 35-40 days after flowering (Global Invasive Species Database 2010). Mesquite is a prolific seed producer and seeds are capable of remaining viable for 2–50 years (Invasive Species Specialist Group 2010). Seeds require scarification for germination due to their tough outer coating.

Impacts

Mesquite rapidly displaces native grasses and other understory species. Monocultures of mesquite are capable of displacing native grassland ecosystems and wildlife habitat.

Potential Invasion

Mesquite is abundant on Dyess AFB and surrounding areas.

Management/Control Options

Mechanical and natural (prescribed fire) control methods are used to control honey mesquite on Dyess AFB. In most cases, chemical control will be limited to low-volume spot treatment. Because the tree's seeds are abundant and long-lived, there is a high rate of seed germination over a variety of environmental conditions, and the trees can re-sprout following a disturbance, the species is difficult to manage.

For mechanical measures to be successful, the dormant buds along the underground stem need to be removed or significantly damaged to prevent re-sprouting. Honey mesquite will quickly re-sprout if only the aboveground biomass is removed. Power grubbing and/or root plowing followed by chemical treatments will increase the rate of success for mesquite control.

Foliar treatments of triclopyr, clopyralid, and surfactant are used on immature trees, and basal treatments of triclopyr and vegetable oil have proven to be effective. Foliar treatments should be applied 45 to 60 days following bud break (April 1) when leaves are dark green and mature.

Foliar Herbicide Mixture
0.5 % triclopyr
0.5 % clopyralid
0.25 % surfactant
0.25–0.50 % dye
98.5 % water

Basal Herbicide Mixture
25 % triclopyr
74.75 % vegetable oil
0.25 % dye

7.11.1.3 Saltcedar

Description

Saltcedar is a deciduous shrub/small tree that often forms dense thickets. It reaches heights of 5–20 feet and has long, slender, gray-green branches. The alternate, scale-like leaves are gray-green, narrowly pointed, and overlap one another. Saltcedar flowers are white to pinkish with five petals. It is listed by the State of Texas as a noxious plant.

Habitat and Range

Saltcedar is native to Eurasia and Africa but is now widespread in the U.S. It is well adapted to alkaline soils and temperature extremes and particularly thrives along waterways and wetlands. Saltcedar has been identified in a few isolated locations along drainage ways at Dyess AFB.

Biology and Ecology

Saltcedar produces numerous seeds that are easily dispersed by wind. The species also produces roots from buried or submerged stems or stem fragments (Merkel and Hopkins 1957). This allows saltcedar to produce

new plants vegetatively from stems torn from the parent plants and buried by sediment after flooding. Under favorable environmental conditions, saltcedar flowers continuously but does require insect pollination (Stevens 1990).

Impacts

Saltcedar is an aggressive species capable of displacing native species by decreasing groundwater availability and increasing surface soil salinity. Saltcedar has a very high rate of evapotranspiration, which could deplete soil moisture (Carman and Brotherson 1982). Monocultures of saltcedar are capable of decreasing wildlife habitat value, drying up wetlands or riparian areas, and clogging stream channels.

Potential Invasion

Saltcedar will generally follow watersheds and inhabit areas where the taproot is capable of reaching the water table (i.e., near surface water areas).

Management/Control Options

Because of saltcedar's ability to resprout from roots, many mechanical methods are unsuccessful unless followed by chemical treatments. Chemical methods have proven to be effective to treat individual plants or large areas. For larger areas with monocultures of saltcedar, the best method is a foliar application of imazapyr herbicide. A proven method for spot eradication involves cutting the plant at ground surface and threating the cut stump with equal parts of glyphosate and triclopyr.

7.11.1.4 Ball Mustard

Description

Ball mustard is an annual plant. It grows to heights of 1–5 feet or more. The leaves are lobed and a deep green color or they may have a reddish tint. Leaves growing higher on the plant stem are less lobed and more elongated. Ball mustard flowers form small, yellow clusters at the tips of the flower stalks. The fruit consists of a two-segmented seed capsule containing 1-2 seeds. It is designated a terrestrial noxious-weed in the State of Texas.

Habitat and Range

Ball mustard is native to central Europe, the Mediterranean, northern Africa, and western, temperate Asia. It is currently documented in 16 U.S. states and thrives in areas where there has been significant soil disturbance, such as along roadsides and in construction sites and agricultural fields. Ball mustard has been identified at Dyess AFB.

Biology and Ecology

Ball mustard germinates in late fall or early winter and develops a broad circle of basal leaves that smothers other seedlings. It typically flowers from early spring into summer and produces many seeds.

Impacts

Competing with native species for sunlight, moisture, and soil nutrients, ball mustard can quickly dominate open/disturbed sites, decreasing habitat quality and species diversity.

Potential Invasion

Ball mustard is highly invasive on sites where soils have been disturbed. Construction areas, roadsides, and agricultural areas are most susceptible.

Management/Control Options

The most effective management method is to manually remove the plant and all or most of its taproot. Dyess AFB physically removes and destroys whole plants when identified. If ball mustard is cut or mowed, it may continue to send up flowering stalks, thus producing more seed. Chemical control of ball mustard may be difficult because of its resistance to several selective herbicides (Strickland 2012). Research on effective herbicide control is ongoing.

7.11.1.5 Field Bindweed

Description

Field bindweed is a creeping perennial plant capable of forming a dense ground cover. Leaves are generally 1–2 inches long and shaped like arrowheads. The flowers are funnel shaped and pink or white in color. Field bindweed is a listed by the State of Texas as a noxious plant.

Habitat and Range

Native to the eastern Mediterranean region, field bindweed is now widespread in the U.S. because it adapts well to a variety of soil types and temperature extremes. Field bindweed has been identified near the horse stables and along the southern boundary at Dyess AFB.

Biology and Ecology

Field bindweed spreads by seed and root fragments. Buds along the root system, which may extend 20 to 30 feet, can send up shoots and begin to grow new plants (Zollinger and Lym 2004). Flowering occurs for an extended period of time, usually from June until the first frost (November). Field bindweed is a prolific seed producer in growing seasons with high temperatures and low rainfall (Zollinger and Lym 2004), and the seeds are capable of remaining dormant for many years.

Impacts

Field bindweed is an aggressive species capable of displacing native vegetation. The plant is also very problematic to the agricultural industry. Dense infestations compete for water and nutrients while the vines climb on other plants, eventually shading and inhibiting their growth.

Potential Invasion

Field bindweed is often translocated via contaminated feed (hay) and nursery stock, or seeds are dispersed by animals. Transporting soil containing field bindweed root fragments also have potential o infest an area.

Management/Control Options

Because of seed viability and energy reserves stored in the roots, a repetitive combination of treatments is necessary to control field bindweed. Accepted measures to control field bindweed are a combination of cultivation and selective herbicides. Disking will help to eliminate seedlings to kill new infestations and it should control established stands. Cultivation depletes root reserves of established plants and stimulates dormant seeds to germinate. Following cultivation, infested areas should be chemically treated with picloram or dicamba (Zollinger and Lym2004).

7.11.1.6 Giant Reed

Description

Giant reed is a perennial grass. It grows in tall, erect stands 6–20 feet high. The heart-shaped leaves are elongated, flat and up to 3.5 inches wide. Tufts of hairs are present at the leaf base. Flowers occur in dense spikelets that taper to a fine point.

Habitat and Range

Giant reed is native to India but has been planted throughout the U.S. as an ornamental species. It invades low-gradient riparian areas or other environments where abundant moisture is available, and it tolerates a variety of soil and nutrient conditions. A population of giant reed has been identified west of the flight line at Dyess AFB.

Biology and Ecology

Little is known about giant reed regarding seed viability, dormancy, and germination (Benton et al. 2005). Reproduction is primarily vegetative and involves rhizomes sprouting new plants.

Impacts

Giant Reed displaces native riparian/wetland vegetation and provides a poor-quality habitat for terrestrial insects and wildlife. The massive stands restrict free flow of water by trapping sediment and may reduce water availability through high rates of evapotranspiration (Global Invasive Species Database 2005).

Potential Invasion

Areas along waterways are most susceptible to invasion by giant reed. Due to its vegetative reproduction and rapid growth, it can quickly infest and dominate new areas.

Management/Control Options

Giant reed infestations are best controlled through chemical means. A treatment proven to be effective is the application of glyphosate herbicide (Benton 2005). Herbicide can be applied either as a foliar spray or in a cut stem treatment. Herbicide treatments are most effective when applied as the plant is actively translocating nutrients to the rootmass, ideally after flowering but prior to dormancy. Prescribed burning as a stand-alone treatment or in combination with herbicide application may be effective if conducted after flowering has occurred. Regular mowing may be partly effective, but rhizomes left in the soil will usually re-sprout (Benton 2005).

7.11.1.7 Malta Centaurea

Description

Malta centaurea (also known as malta starthistle) is an erect, winter annual. The plant grows to a height of 6–24 inches. The lower leaves are lobed and approximately 2–4 inches long. The upper leaves are narrow, 1¼ inches long, and have margins that extend down the stem, giving it a winged appearance. It bears yellow flowers that are 1/2–5/8 inch in length.

Habitat and Range

Malta centaurea is native to Africa and Europe but is now common throughout the western U.S. It often occurs in a variety of soil types at disturbed sites, grasslands, rangeland, open woodlands, fields, pastures, roadsides, and waste places. Malta centaurea has been identified along NRCS transects at Dyess AFB.

Biology and Ecology

Malta centaurea reproduces by seed. Seeds germinate in autumn and exist as basal rosettes through winter and early spring. Flowering stems usually develop in late spring or early summer.

Impacts

Malta centaurea is capable of rapidly displacing native vegetation and creating a monoculture. It also may be toxic to horses when consumed over an extended period of time.

Potential Invasion

Seeds usually fall near the parent plant or are dispersed to short distances with wind, but they may be dispersed greater distances by human activities, animals, water, and soil movement (DiTomaso and Healy 2007).

Management/Control Options

Mowing and burning can prevent seed production when employed over a period of 2–3 years or more, depending on the degree of infestation (DiTomaso and Healy 2007). Mowing is most effective when plants are cut below the height of the lowest branches and 2–5% of the total population of seed heads are in bloom (DiTomaso and Healy 2007). Prescribed burns can provide control if implemented after annual plants have dried (DiTomaso and Healy 2007). Malta centaurea is also susceptible to the herbicide clopyralid.

7.11.1.8 Invasive Species Inventory

The NR office maintains a comprehensive species list to provide a record of species identified on base and a means of tracking plant populations. The most recent invasive species survey areas are shown in Figure 7-14. Baseline monitoring data in concert with subsequent survey data will enable assessments of population trends, causative factors, rate of expansion, persistence, and potential for further spread into adjacent ecosystems. An occurrence and distribution map was maintained in the NR Geo-database, but these files are no longer extant. Future invasive species surveys should include requirements to curate the data in a format compatible with Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) standards and transfer the final deliverable into GeoBase.

Pathways of introduction for invasive plant species exist throughout the 6,340 acres of Dyess AFB. Potential pathways for invasion are listed below.

- Stormwater inflows
- Adjacent roadways and landowners (perimeters)
- Incoming flights and cargo
- Contaminated seed, hay or feed
- Construction fill
- Contaminated vehicles, clothing, equipment associated with deployment, leave (i.e., fishing gear, boats/trailers), Temporary Duty, and training activities
- Nursery stock plantings

Invasive plants or weeds generally prefer highly disturbed sites in which open niches in the plant community are made available. The areas at Dyess AFB listed below were determined to be the most susceptible to infestation and, therefore, they are the focus of periodic vegetation surveys (see Invasive Species Survey Area). All primary areas of introduction will be monitored at appropriate times of year for new infestations. Because not all weed species flower at the same time (cool-season versus warm-season) and may not flower at all during dry years, an accurate weed inventory requires monitoring several times during the growing season every year.

- Horse stables
- Stockpile areas
- Water bodies
- Outdoor Recreation Center
- Explosive ordnance range
- Stormwater channels
- Stormwater inflows
- Base perimeter

Figure 7-14. Invasive species survey area.

7.11.1.9 Priority of Treatment Areas

Prevent further invasion of alien plants into uncolonized areas.

Prevention strategies should be stressed over control measures, as control measures are futile once a certain population threshold of the invading species is attained. A combination of ecosystem values and the threat of invasion should be used to prioritize areas for prevention, as follows.

- Priority 1 areas are those with intact ecosystem processes, essentially free of invaders. Management activities that would cause deliberate or inadvertent introduction of alien plants should be not be initiated. Management objectives should include maintenance of unpolluted flora as a top priority.
- Priority 2 areas are intact ecosystems that possess only a few invading taxa. Invaders threaten the ecosystem, plant community structure, or landscape-level processes, but control efforts may be successful. No management activities that would cause further introduction of alien plants should be allowed. Management objectives should emphasize aggressive, integrated control measures to reduce or eliminate alien plant populations.
- Priority 3 areas are intact, native ecosystems that possess only a few invading taxa that do not appear to threaten the ecosystem but the spread of which may still be worth controlling. No management activities that would cause further introduction of alien plants should be allowed. Management objectives should emphasize integrated control measures to reduce or eliminate alien plant populations.

7.11.1.10 Control Strategies

Employ integrated weed-management strategies to control invaders based on a prioritization procedure combining nature, quantity and number of invading species, their potential for spread to adjacent ecosystems, the nature of affected ecosystems, loss of values because of their spread, and long-term costs of control.

Strategies for control are both more complicated and more costly than preventing invasions. Control is a treatment strategy, not a prevention strategy. Physical, cultural, and biological control methods will be used in almost all cases. Herbicide use will be considered as a last resort for low-volume, spot-treatment applications to individual plants. All other measures will be evaluated prior to using herbicide.

Integrated Weed Management Control methods are detailed in the section *Integrated Pest Management Plan.*

7.11.1.11 Prevention

Establish procedures for preventing biological invasions of alien plants

Disseminate information concerning laws, rules, and regulations about introducing or spreading invasive species.

- Dyess AFB Fish and Wildlife Regulations prohibit the introduction of invasive species. These regulations will be made available to base personnel participating in fishing and other dispersed outdoor recreation activities.
- Disseminate updated invasive species information and requirements to Security Forces and Logistics Readiness personnel concerning customs inspections and shipping containers. The Dyess AFB NRM will relay crucial information concerning invasive species management to the appropriate agencies.

- Quarantine incoming horses at the Dyess Riding Club for a minimum of thirty days to isolate any invasive vectors, seed, or diseases.
- Fill material needed for construction will be acquired from on base.
- Promote invasive species awareness. Articles and brochures will be made available to base personnel concerning the impacts of invasive species.

7.11.1.12 Proper Land Management

- Revise or eliminate land-management practices that inadvertently contribute to the spread of alien plants.
- Discontinue the practice of plowing perimeter firebreaks. Limit soil disturbance (plowing) of perimeters by grounds maintenance activities.
- Establish native turf grass (buffalograss) in all perimeter firebreaks to compete with potential invasive species.
- Maintain a healthy landscape of diverse forest, shrubland, and grassland communities.

7.11.1.13 Cooperative Efforts

- Maintain a good neighbor policy with adjacent landowners and participate in cooperative efforts, when possible, to control invasive species.

7.11.1.14 Integrated Weed-Management Control Methods

Invasive species treatment will be determined by the target species (biology and species density), effectiveness and time requirement of control technique, land use, environmental conditions, and cost. The following management methods listed below are discussed in this section.

- Physical
- Cultural
- Thermal
- Biological
- Chemical

A combination of these methods used in sequence during a period of several years may be most effective. An integrated management system can minimize the use of herbicides while improving grass cover and maintaining or improving surface and groundwater quality. In some cases, potential invasive species may be managed by monitoring (e.g., dodder [*Cuscuta cuspidata*]) and controlled at a later time if deemed problematic.

<u>Physical Treatments</u>

Physical methods involve using manual and mechanical techniques where either aboveground or belowground biomass is injured or removed. Potential mechanical methods to be used at Dyess AFB are discussed below.

- Mowing is most effective when used to reduce seed production of some plants, especially annuals. Mowing at the appropriate growth stage and growing conditions is crucial for reducing seed production. Frequent mowing also can be used to effectively control woody species.
- Hand grubbing can be used for complete removal of small, non-sprouting species. The method is labor intensive and involves using hand tools to remove the plants.

- Power grubbing is most useful for larger (3-foot tall), sprouting plants that can be uprooted below the lowest bud. The method is most effective for scattered, low-density stands. The soil disturbance necessitates seeding with native range grasses and forbs as a follow-up treatment.
- Bulldozing is used to remove woody stems at or below the soil surface. It is most effective for non-sprouting species; if sprouting species are bulldozed, the plants are likely to re-sprout unless the bud zone is removed. This method may cause significant soil disturbance. The soil disturbance necessitates seeding with native range grasses and forbs as a follow-up treatment.
- Root plowing is a non-selective method used to cut the roots of woody plant species in moderate to dense stands. The method uses a root plow (V-shaped, 8–12 feet wide with several short fins attached perpendicularly to the blade) pulled behind a crawler tractor. Root plowing is an effective brush-control method that also reduces soil compaction, improves soil-moisture retention, and provides excellent seedbed preparation for broadcast seeding when combined with roller chop compaction techniques. The soil disturbance necessitates seeding with native range grasses and forbs as a follow-up treatment.
- Heavy offset disking can be used to control shallow-rooted brush species. The method involves pulling a typical agricultural disk behind a tractor. Disking is not recommended for plant species with buds deeper than 6-8 inches, such as mesquite, or for rocky soils. The soil disturbance necessitates seeding with native range grasses and forbs as a follow-up treatment.

Cultural Treatment

Cultural control methods involve using plant competition and/or fertilization to favor desirable species. Re-vegetation with native plants may be the best long-term alternative for controlling weeds on sites without an understory of desirable species (Sheley 1999).

Thermal (Prescribed Burning) Treatment

Prescribed burning may be used to control undesirable plant species, especially woody species. All burning activities will be performed IAW the WFMP (Section 15.1, *Tab 1—Wildland Fire Management Plan*) and appropriate burn prescription.

Biological Controls

Biological control of invasive species involves the use of organisms, such as grazing animals, insects, or pathogens, to suppress plant growth. Biological control results may be neither immediate nor adequate, and the undertaking could be a long-term project (Sheley 1999). Risks of using biological-control methods include threats to non-target species (flora and fauna) and dangers to the environment. Careful selection and monitoring of candidate biological control agents are imperative. The Technical Advisory Group (TAG) on the Introduction of Biological Control Agents of Weeds of the USDA APHIS should be consulted prior to implementing biological-control measures. The Pest Management Shop will approve any biological control treatment prior to implementation.

Chemical Treatments

Chemical methods may include liquids or pellets and may be applied to individual plants. Herbicides will be a last-resort control option and applied as low-volume spot-treatments. Broadcast application of herbicides will be restricted to dense, localized infestations. A target species' susceptibility to a specific herbicide, application rate and timing, and application method will determine how successfully it is controlled. Herbicide choice will depend on the species targeted, proximity of desirable species and surface water, soil attributes, and ambient environmental conditions (Sheley 1999).

The Pest Management Consultant (GSC Entomologist) and the Armed Forces Pest Management Board approves all chemical treatments. The herbicide label is the legal guide for use and application of the chemical. Chemical mixtures will be consistent with the percentages listed on the label and applied only by licensed applicators. The herbicides listed below are suggestions. Licensed Dyess AFB Pest Management personnel will have the final approval on which herbicides will be used at Dyess AFB.

- Triclopyr
- Clopyralid
- Imazapyr
- Picloram
- Dicamba
- 2,4-Dichlorophenoxacetic acid (2,4-D)
- Dichlobenil
- Glyphosate

7.12 Bird/Wildlife Aircraft Strike Hazard

Applicability Statement

This section applies to USAF installations that maintain a BASH program to prevent and reduce wildlife-related hazards to aircraft operations. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

The 7 BW BASH Plan (OPLAN 91-212; Dyess AFB 2019) constitutes an integral planning document of this INRMP. The reduction of bird and wildlife strike hazards will be considered of paramount importance in all NR considerations.

At no time will the INRMP be in conflict with Dyess AFB BASH Plan, nor will wildlife enhancement activities be undertaken that might constitute a hazard to aircraft or crew, as safety of aircrews and integrity of aircraft are paramount at all times. In addition, the NRM shall ensure that the INRMP complies with all applicable laws, AFIs, and Air Force Policies and guidelines. BASH problems are wildlife problems and, as the wildlife professional on base, the NRM will devote extensive effort to aircrew safety. The NRM will serve as an active member of the Bird Hazard Working Group, will ensure that accurate biological data pertinent to the BASH program is available at all times, and be available to serve as an advisor at any time necessary to ensure safety of flight personnel.

This INRMP recognizes that bird and wildlife hazards to the flying mission are a biological problem, most often with biological solutions, and further recognizes the responsibility of NR personnel to the BASH program for both on-site and off-site lands.

7.13 Coastal Zone and Marine Resources Management

Applicability Statement

This section applies to USAF installations that are located along coasts and/or within coastal management zones. This section **IS NOT** applicable to this installation.

7.14 Cultural Resources Protection

Applicability Statement

This section applies to USAF installations that have cultural resources that may be impacted by natural resources management activities. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Several archeological surveys have been conducted throughout Dyess AFB and 100% of the base has been evaluated for archeological significance. During these surveys, seven prehistoric- and historic-era archeological sites have been recorded. To protect these resources and to integrate cultural resources management into the planning and implementation of construction, training, and land use, an Integrated Cultural Resources Management Plan (ICRMP) has been prepared and is reviewed annually by 7 CES/CEIE, with any major revisions required every five years.

In support of the USAF mission at Dyess AFB and to assist with National Historic Preservation Act compliance, the ICRMP cites the laws relevant to historical preservation (with which the USAF also must comply), presents a variety of 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, 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.

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 resources activity/action with the cultural resources manager.

Specific examples of necessary ICRMP coordination with INRMP implementation include those listed below.

- Fire management, such as firebreak construction
- Removal of natural and manmade materials
- Restoration projects, such as mesquite reduction, tree planting, and native grassland restoration

7.15 Public Outreach

Applicability Statement

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

Program Overview/Current Management Practices

There is currently no NR management at the installation level to implement Public Outreach; however, the base would like to initiate a program of public outreach for base personnel, particularly to raise awareness and interest in the fishing program. One option would be to establish a reporting system with an email address or phone number to report fish and begin keeping size records for the biggest fish.

7.16 Climate Change Vulnerabilities

Applicability Statement

This section applies to USAF installations that have identified climate change risks, vulnerabilities, and adaptation strategies using authoritative region-specific climate science, climate projections, and existing tools. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Vulnerability to climate change refers to the extent to which a species, habitat, ecosystem, place, or project is susceptible to harm from climate change impacts (Stein et al. 2019). By this definition, species and systems that are more vulnerable will experience greater harm, whereas less vulnerable species and systems will be less affected or even benefit from climate change.

With precipitation and fire behavior unlikely to change dramatically for the worse at Dyess AFB, the increasing heat, particularly the increase in HOTDAYS over 90 °F, is the most significant climate change factor to plan for, along with a likely increase in drought periods. This is likely to have significant effects on the base's recreational fishery, which may require additional monitoring and maintenance to ensure that suitable water levels, temperatures, oxygenation, and fish populations are sustained. Increasing temperatures may make summertime outdoor recreation less appealing as well, and it may affect workers' ability to complete tasks safely. Changes in temperatures and drought periods also may affect Dyess AFB's ability to continue to perform rotational burning for NR benefits, as ideal times of year for burning may not produce the conditions necessary for the burn prescriptions. Flexibility in funding, monitoring, and planning will be required to accommodate this uncertainty.

Many current management activities are appropriate for increasing resilience or facilitating adaptation to climate change. The ecosystem approach used on installations, which prioritizes functional diversity and the maintenance of habitat, habitat variability, and habitat connectivity will likely help to support species needing to adapt or migrate as environmental conditions shift; however, when approaching the uncertainty inherent with climate change projections, additional analyses and planning are required. Increasing temperatures may have deleterious effects on sensitive species and distributions of native plants and animals as well and could exacerbate problems, such as invertebrate pests, disease, and invasive plant and animal distributions. Monitoring baseline conditions for these NR elements will be crucial in determining effects and planning for interventions.

Scenario planning and a scenario-based assessment model have emerged to help decision-makers take proactive management actions, despite uncertainty (Banuls and Salmeron 2007). Scenario planning and other management actions may require new partnerships across installation boundaries to account for the broad regional impacts of climate change.

7.17 Geographic Information Systems

Applicability Statement

This section applies to all USAF installations that maintain an INRMP, since all geospatial information must be maintained within the USAF GeoBase system. The installation is required to implement this element.

Program Overview/Current Management Practices

Current NR-related GIS capabilities include mapping of current and future land uses, such as, greenbelts, recreation areas, landscaped areas, tree locations, and open spaces. Planned NR-related GIS capabilities include building upon the existing capabilities and expanding the current database and modes of presentation, and entering data into the GIS system. NR layers in the Dyess AFB database include soil surveys, land-management and grounds-maintenance units, WOTUS and wetland delineations, neotropical bird survey data, dispersed outdoor recreation areas, invasive species survey maps, firebreaks, wildland fire management units and prescribed burn areas, and vegetation analysis data. Mapping data will be updated at differing periods as deemed necessary. Expanding capabilities will facilitate and promote daily use of

digitized GIS maps and information by program managers. To ensure maximum utility of the Dyess AFB GIS capabilities, these data will be recorded and placed in the GIS in such a way that it is fully compatible with the overall system.

8.0 MANAGEMENT GOALS AND OBJECTIVES

The installation establishes long-term, expansive goals and supporting objectives to manage and protect NRs while supporting the military mission. Goals express a vision for a desired condition for the installation's NRs and are the primary focal points for INRMP implementation. Objectives indicate a management initiative or strategy for specific long- or medium-range outcomes and are supported by projects. Projects are specific actions that can be accomplished within a single year. Also, in cases where off-installation land uses may jeopardize USAF missions, this section may list specific goals and objectives aimed at eliminating, reducing, or mitigating the effects of encroachment on military missions. These NR management goals for the future have been formulated by the preparers of the INRMP from an assessment of the NRs, current condition of those resources, mission requirements, and management issues previously identified. Below are the integrated goals for the entire NR program.

The installation goals and objectives are displayed in the 'Installation Supplement' section below in a format that facilitates an integrated approach to NR management. By using this approach, measurable objectives can be used to assess the attainment of goals. Individual work tasks support INRMP objectives. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable.

Installation Supplement—Management Goals and Objectives

GOAL 1 PROVIDE DIRECT SUPPORT AND COORDINATION SERVICES TO DYESS AFB BY MAINTAINING NR DATABASES AND A RESPONSIVE AND PROACTIVE NR STAFF.

Objective 1.1 Coordinate with the installation GIS analyst to maintain a comprehensive NR GIS database that is available to support development of the base's General Plan, Environmental Assessments/FONSIs/ FONPAs, Environmental Impact Statements (EISs)/RODs, Airfield Management Plan, and BASH Reduction Plans, and to support timely review of Militart Construction (MILCON) and O&M project planning, and site selection and decision-making.

Project 1.1.1 Develop a NR GIS database that holds both SDSFIE-compatible GeoBase data and installation-specific GIS data for resources management decision-making at Dyess AFB.

Project 1.1.2 Maintain and update digital spatial NR data as new information becomes available and expand NR data integration with the Dyess AFB Geo-database. Ensure that historical data referenced in the INRMP are fully transferred into GeoBase, including attributes

Project 1.1.3 Maintain delineated wetland boundaries in the Dyess GIS system and transfer the 1995 wetland delineation data to GeoBase.

Objective 1.2 Ensure that NR staff have the capability to conduct site surveys and review project documentation to support timely completion of base construction contracts and projects.

Project 1.2.1 Conduct site-specific surveys to identify areas of potential conflict between projects outside of General Plan Development Areas or

BASH issues and the protection of floodplains, wetlands, and protected species.

Objective 1.3 Ensure sufficient NR staffing, training, and resources to meet Dyess AFB mission needs.

Project 1.3.1 Improve coordination between the NRM and other maintenance and management personnel by developing working groups and standard operating procedures that can be distributed as needed to the appropriate groups.

Project 1.3.2 Review the eDASH Natural Resources Training Matrix on an annual basis and ensure that all NR staff can access course material relevant to their duties (e.g., Natural Resources Compliance Training, Pest Management Training, Natural Resources Awareness, Natural Resources Wetlands, etc.).

Objective 1.4 Maintain present Dyess AFB Land Management Plan compatibility with INRMP guidelines and philosophy (AFMAN32-7003), the IIPMP, mission requirements, and enhancement, maintenance, and restoration of ecosystem health.

Project 1.4.1 Coordinate updates to the Land Management Plan in conjunction with INRMP updates and reviews, updates to associated plans, and to ensure compatibility, as needed.

Objective 1.5 Support the flying mission of Dyess AFB by coordinating with the BASH team and wing safety to monitor hazards, modify habitat as required, and maintain compliance with Operational Plans.

Project 1.5.1 Reduce broadleaf weeds on the airfield seasonally or as needed to comply with Dyess AFB BASH Plan (OPLAN 91-212, Appendix 1 to Annex 1, paragraph 8.7).

Project 1.5.2 Reduce or eliminate standing water on the airfield as required under Dyess AFB BASH Plan (OPLAN 91- 212, Appendix 1 to Annex 1, paragraph 8.7).

Project 1.5.3 Remove snags (dead trees) that attract raptors from the airfield as required under Dyess AFB BASH Plan (OPLAN 91-212, Appendix 1 to Annex 1, paragraph 8.7).

GOAL 2 ENSURE COMPLIANCE WITH THE SIKES ACT, ESA, MBTA, EO 13186 (MIGRATORY BIRDS), AND APPLICABLE FEDERAL AND STATE LAWS AND REGULATIONS RELATED TO SENSITIVE SPECIES PROTECTION AND NATIVE SPECIES MANAGEMENT WHILE ENSURING LONG-TERM AVAILABILITY OF DYESS AFB'S MILITARY RESOURCES.

Objective 2.1 Protect federally- and state- listed threatened and endangered species and species of concern under the terms of regulator agreements without compromising the military mission.

Project 2.1.1 Monitor the Federal Register to keep apprised on the USFWS proposed rules to federally list additional plant and animal species as either threatened or endangered.

Project 2.1.2 Maintain a current checklist of federally- and state-listed threatened, endangered, candidate, and species of concern, as listed for Taylor County, Texas, and ensure that the INRMP is updated with the most current species lists and correct ranking system.

Project 2.1.3 Develop a plan for regular (yearly or at appropriate intervals by taxonomic group) surveys of Dyess AFB for federally- and/or state-listed mammals, reptiles, fish, birds, invertebrates, and plants, and determine the feasibility of conducting surveys either in-house or using contracts.

Project 2.1.4 Conduct targeted surveys using appropriate protocols for tricolored bats, shiners, black-footed ferrets, desert massasauga, spot-tailed earless lizard, and monarch butterflies to determine their status on base in anticipation of listing or status changes to these species.

Project 2.1.5 Develop and implement a plan to map and annually monitor suitable habitat for Texas horned lizard and black-tailed prairie dog.

Project 2.1.6 Improve habitat conditions for special-status species by evaluating opportunities to restore habitat or enhance existing services to wildlife and native plants under warmer and most likely wetter conditions, possibly interspersed with seasonal drought in the long-term.

Project 2.1.7 Conduct baseline surveys for invertebrates across all known vegetation types on Dyess AFB to determine whether any federal or state listed species are present. Focus survey efforts on taxa that include sensitive species (e.g., pollinators).

Project 2.1.8 Annually survey for monarch butterflies and monarch breeding activity on the base.

Project 2.1.9 Coordinate with regional pollinator experts to design native pollinator habitat that includes native milkweed species and other forbs visited by a wide array of pollinators.

Objective 2.2 Sustain, enhance, and monitor native wildlife and plants to support the military mission.

Project 2.2.1 Monitor avian species in support of Partners In Flight and TPWD to determine the status of these species within various base habitats.

Project 2.2.2 Maintain the PIF priority bird checklist for the Rolling Plains geographic area.

Project 2.2.3 Monitor wildlife on the airfield in support of Dyess AFB BASH Plan (OPLAN 91-212).

Project 2.2.4 Monitor aquatic wildlife.

Project 2.2.5 Increase wood duck habitat at Lake Totten by constructing nesting boxes and planning for yearly maintenance of all bird nesting structures across the base.

Project 2.2.6 Conduct a survey of bird nesting boxes across the base, determine the need for maintenance, repairs, or additional boxes, and develop a protocol for yearly surveys and maintenance prior to initiation of nesting season.

GOAL 3 APPLY BMPS AND EOS 11990 (WETLANDS), 11988 (FLOODPLAINS), AND 13112 (INVASIVE SPECIES) TO PROTECT, RESTORE, AND MAINTAIN NATIVE HABITATS THAT CONTRIBUTE TO BIOLOGICAL DIVERSITY, SUPPORT THE MISSION, AND PROVIDE SUSTAINABLE AND ATTRACTIVE HABITAT FOR WILDLIFE, RESIDENTS, VISITORS, AND BASE EMPLOYEES.

Objective 3.1 Restore native communities damaged or otherwise impacted by human activities.

Project 3.1.1 Establish a vegetation-monitoring program in all vegetation types on base and prioritize collecting data in prescribed burn units to establish baseline conditions prior to burning. As part of this effort, ensure that all vegetation-monitoring program data, including plot locations and protocols, are incorporated into the GeoBase system.

Project 3.1.2 Establish a schedule for visiting and recording data at all vegetation monitoring plots either yearly or in a rotation and analyze the data to detect trends in vegetation related to management or external factors, such as increasing temperature and precipitation.

Project 3.1.3 Develop a management plan for increasing healthy and diverse grasslands on Dyess AFB under projected wetter and hotter conditions.

Project 3.1.4 Protect, restore, and maintain aquatic and riparian habitat along Little Elm Creek by establishing monitoring plots and condition thresholds that would indicate restoration is needed and to identify sites that may be threatened by erosion and increasing severity of storm events.

Project 3.1.5 Based on results of vegetation monitoring, develop management recommendations for habitats identified as vulnerable in the climate change projections.

Objective 3.2 Provide for floodplain, wetland, and watershed protection and improved water quality through creation, updating, and implementation of adaptive management plans, monitoring, and

restoration where required and not in conflict with the mission or other NR objectives.

Project 3.2.1 Establish and maintain cooperative agreements with local, state, and federal water resources management agencies and groups to enhance and protect watersheds from increasingly severe storm events and higher yearly precipitation levels. Maintain copies of agreements and plans for implementation.

Project 3.2.2 Establish an annual environmental compliance budget for watershed protection, including funding for updating and maintaining associated plans and monitoring of watersheds that may suffer from increased erosion and flooding from extreme weather events.

Project 3.2.3 Ensure that stormwater infrastructure is functioning properly with adequate drainage. Repair or conduct maintenance as needed yearly to accommodate increasingly severe precipitation events.

Project 3.2.4 Maintain, update, and implement the Dyess AFB SWPPP and incorporate information on adaptations to increasingly severe storms with potential for more erosion and flooding.

Project 3.2.5 Maintain baseline wetlands inventory from the 1995 USACE wetlands delineation report and regularly check wetland conditions trends and boundaries.

Project 3.2.6 Ensure that all applicable wetland laws and AFIs are adhered to and the wetlands are protected.

Project 3.2.7 Evaluate all Dyess AFB wetlands and WOTUS impacted by invasive species and develop a plan to restore them with native vegetation.

Objective 3.3 Improve water quality on base and downstream of base by minimizing soil erosion, decreasing pesticide and fertilizer use, and preventing water-quality impacts from NR and grounds management activities.

Project 3.3.1 Evaluate land-management activities, the grounds maintenance contract, and construction contracts to assess whether additional measures may be incorporated to minimize non-point source pollution as storm severity increases potential amounts of runoff.

Project 3.3.2 Implement measures to improve stormwater quality leaving the base, reduce downstream flooding, and improve riparian habitat.

Project 3.3.3 Evaluate Dyess AFB for erosion-prone sites that may experience increased soil loss as precipitation intensity and temperature increase and soil aggregate stability decreases.

Project 3.3.4 Minimize non-point sources of water pollution that result from land-management activities.

Objective 3.4 Support wildland fire management and develop a fire program that minimizes the risk of wildfire and maximizes the benefits to native habitats without compromising the military mission.

Project 3.4.1 Protect and stabilize all perimeter and interior firebreaks from erosion and invasive species establishment by establishing a regular schedule of surveys and maintenance for each firebreak.

Project 3.4.2 Maintain firebreaks by mowing 10-foot-wide center lane keeping grasses at a maximum height of 3 inches. Maintain native grasses for 5 feet of each side of the center 10 foot lane.

Project 3.4.3 Review firebreak maps and plans periodically, maintain accurate maps, and provide up-to-date firebreak maps and additional maintenance requirements to the Grounds Maintenance QAE (7 CES/CEO) and any other users that require it.

Project 3.4.4 Protect firebreaks from unauthorized vehicular use with fencing, signage, and outreach, including notification of penalties for misuse. Restrict firebreak access to the fire department, grounds maintenance, and NR personnel and enforce violations as they occur.

Project 3.4.5 With the WFMP as a guide, use prescribed fire on a rotational basis to reduce fuel loading in burn units and provide benefits to NR management in areas where it is compatible with smoke management guidelines and the military mission.

Project 3.4.6 Establish a schedule to burn all restored grasslands and mesquite savannah capable of sustaining a prescribed burn on a three- to five-year rotational basis to maximize suppression of undesirable shrubs and establish or maintain native shortgrass and tallgrass prairie vegetation.

Project 3.4.7 In coordination with Project 3.4.6, develop a synchronized vegetation-monitoring schedule for collecting data at established plots to evaluate the effects of burning and support continued rotational burns.

Project 3.4.8 If unplanned ignitions occur, evaluate the potential to use them as a management tool if current and expected conditions fall within the parameters of management prescriptions for the area, provided that adequate personnel and equipment are available to manage the fire as a prescribed burn.

Objective 3.5 Maintain a robust and nimble invasive species-monitoring and control program capable of detecting new introductions, monitoring existing infestations, and treating priority species for eradication or long-term management.

Project 3.5.1 Conduct a survey of noxious weeds and invasive species on Dyess AFB and develop the ISMP to include control strategies for each species detected. Plan to re-survey the base on a five-year cycle to ensure early detection of incipient infestations and new introductions.

Project 3.5.2 Based on the control strategies developed under Project 3.5.1, initiate treatment of the highest-priority invasive species with repeated treatments planned as needed each year.

Project 3.5.3 Control field bindweed. Sow buffalograss along the south perimeter to compete with field bindweed. Apply glyphosate to the localized field bindweed infestation located adjacent to the paintball course.

Project 3.5.4 Control annual ball mustard base-wide. Physically pull whole plants and root systems when found and dispose in dumpster. Apply glyphosate to large infestations.

Project 3.5.5 Continue to monitor the diversion ditches for saltcedar, physically pull young plants, and apply Imazapyr to larger plants when found, with the target of maintaining the base as saltcedar-free.

Project 3.5.6 As part of yearly invasive species surveys, monitor wetlands and waters of the U.S. for invasive species.

Objective 3.6 Enhance wildlife habitat values of landscaping by making maximal use of native species, minimizing the use of pesticides in landscaping, and ensuring that all irrigation and maintenance practices are regionally appropriate and tolerant of increasing precipitation and temperatures

Project 3.6.1 Work closely with pest management and golf course management to minimize the use of chemical pesticides and select pesticides that have the lowest possible toxicity, degrade rapidly in the environment, minimize exposure to non-target organisms through strategic timing and location of application, and do not contribute to non-point source pollution. Reference the IPMP (see Section 15.5, *Tab 5—Integrated Pest Management Plan (IPMP)*) and the Mesquite Grove Golf Course environmental management plan

Project 3.6.2 Continue to identify and implement vegetation-enhancement projects in improved and semi-improved areas.

Project 3.6.3 Assess the grounds-maintenance program for use of native species, opportunities to reduce pesticides and make recommendations for improvements to the aesthetics of base landscaping, and maximize the benefit to native species.

Project 3.6.4 Coordinate with grounds maintenance to plant native milkweed and other pollinator-friendly forbs in landscaping.

Project 3.6.5 Review grounds maintenance procedures for disposing of organic material generated through routine tree/shrub pruning and replacement activities.

Project 3.6.6 Evaluate the feasibility, potential regulatory and/or mission constraints, and benefits of developing a watchable wildlife and native plant park to convert the semi-improved site to an improved site with significant recreational and wildlife value.

Project 3.6.7 Depending on the feasibility determined in Project 3.6.6, develop a plan for constructing an enclosed, captive prairie dog colony, translocating prairie dogs, and developing interpretive signage and outreach for the site.

Project 3.6.8 Develop a plan to use portions of the mowed area at the proposed captive prairie dog colony as a native plant display garden and work with local experts to design a sustainable and low-maintenance pollinator garden.

GOAL 4 PROVIDE QUALITY OUTDOOR RECREATION EXPERIENCES IN THE NATURAL ENVIRONMENT AND MAINTAIN OUTREACH AND EDUCATION OPPORTUNITIES WHILE PROTECTING RESOURCES FROM OVERUSE AND DAMAGE.

Objective 4.1 Maintain an active outreach program on and off base to educate and inform base residents, visitors, employees, and the public of natural resources program concerns and projects.

Project 4.1.1 Make the Dyess AFB Fish and Wildlife Regulations brochure available at the Outdoor Recreation Center.

Project 4.1.2 Prevent the introduction and distribution of invasive species by increasing awareness of base residents and employees regarding proper management of native vegetation and the need to avoid the introduction and spread of nonnative plant species.

Project 4.1.3 Increase public awareness by developing and distributing notices, pamphlets, and outreach events to minimize nuisance wildlife encounters or conflicts with pests or potentially dangerous wildlife species (e.g., feral hogs, rodents, rattlesnakes, skunks, coyotes).

Project 4.1.4 Increase the amount of organic material recycled on base by reusing mulch generated by making fuel breaks or other management activities.

Objective 4.2 Expand opportunities for the public to participate in the NR program to increase engagement with and appreciation of base resources and minimize conflicts between user groups.

Project 4.2.1 Initiate a monarch watch program for the public, DoD members, and their families at publically accessible recreational areas, such as the nature trail and Lake Amistad, to collect monarch data at little or no cost to the base, improve public relations, and to raise awareness of the need for monarch conservation.

Project 4.2.2 Host field trips for the Big Country Audubon Society, university ecology classes, elementary science classes, and other interested groups when such events will not conflict with the mission or raise security concerns.

Objective 4.3 Provide recreation areas and opportunities on base to meet resident needs without damaging resources or compromising mission accomplishment.

Project 4.3.1 Develop and implement a plan to provide trees, a covered area, and a parking area to develop the effluent hospital pond as a significant recreational area.

Project 4.3.2 Develop the recreational opportunities and native habitat at Lake Totten by planting additional native shade trees such as cottonwoods and maintaining shoreline access for fishing.

Project 4.3.3 Maintain recreational fisheries in ponds, track usage, assess fish population structure, and develop yearly harvest recommendations based on catch records and fish sampling.

Project 4.3.4 Establish interpretive trails in the wildlife habitat area north of the on-base family housing for the purpose of wildlife observation and nature study.

Project 4.3.5 Enhance the existing nature trails on base by providing identification tags for vegetation that base personnel can use to identify and learn about native flora.

Project 4.3.6 Develop volunteer opportunities for accomplishing base recreation projects.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

The 7 BW Commander is ultimately responsible for NR management at Dyess AFB.

The 7 CES is responsible for implementing the INRMP and for staffing the NRM position. Staffing, as defined in DoDI 4715.03, requires a professionally trained NRM with a degree in the natural sciences to develop and implement the installation INRMP. The NRM is part of the Environmental Section within the Installation Management Flight. From the squadron level, the reporting chain of command consists of the 7 CES Commander reporting to the 7th Mission Support Group (7 MSG) Commander, who in turn reports to the Wing Commander via annual review and coordination report to certify that NRs within the boundaries of Dyess AFB are managed properly. State and federal conservation agencies are involved in the annual implementation review process, and are signatories along with the 7 BW Commander on the five-year INRMP review as to operation and effect.

Dyess AFB eliminated the NRM position in 2013 due to mandatory personnel cuts; thus, the base was without an on-site NRM for four years and out of compliance with the Sikes Act (16 USC § 670a–670l, 74 Stat. 1052, as amended) and DoDI 4715.03. During the period of NRM vacancy, NRM duties were accomplished by Dyess AFB Environmental Program Managers and the AFCEC Installation Support Section (ISS)--Joint Base San Antonio (JBSA) NRM. Since that time, from 2017 to present, the on-site NRM position has been filled by three separate contracts.

The AFCEC ISS is providing qualified NR management support for Dyess AFB, pending a NRM position unit manning document (UMD) reinstatement at Dyess AFB.

9.2 Monitoring INRMP Implementation

Success criteria were developed to evaluate the success of achieving INRMP goals and objectives. Specific criteria were developed for each project listed with the purpose of tracking project progress. See Work Plans in Section 10.0, *ANNUAL WORK PLANS*.

9.3 Annual INRMP Review and Update Requirements

The INRMP must be reviewed as to operation and effect annually in coordination with internal and external stakeholders. Annual updates and work plan updates will also be approved by the AFCEC/ ISS NRM. All changes to the INRMP will also be approved by the AFCEC/ISS. Planning conflicts that arise and cannot be resolved through the NRM will be referred to the Dyess AFB Environmental, Safety, and Occupational Health Council (ESOHC).

Interagency Annual Review

Cooperative INRMP preparation and implementation requires mutual agreement and approval by field offices of the TPWD and the USFWS.

Actions proposed in an INRMP may constitute a major federal action, as defined in 40 CFR 1508.18(b) (2). As such, the plan requires consideration of potential environmental effects as described in 32 CFR, part 989. The EIAP was performed as required by the NEPA and AFI 32-7061 for the INRMP in 2016.

AFCEC reviews five-year INRMP updates and validates NR program funding requests.

Local field offices of state and federal conservation agencies may provide coordination and technical assistance on various NR projects. These agencies may include but are not limited to the NRCS, TCEQ, USDA WSD, Texas Forest Service, TPWD, and USFWS.

10.0 ANNUAL WORK PLANS

The INRMP Annual Work Plans are included in this section. These projects are listed by fiscal year, including the current year and four succeeding years. For each project and activity, a specific timeframe for implementation is provided (as applicable), as well as the appropriate funding source and priority for implementation. The work plans provide all the necessary information for building a budget within the USAF framework. Priorities are defined as follows.

- High—The INRMP signatories assert that, if the project is not funded, the INRMP is not being implemented and the USAF 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 Endangered Species Act (ESA) Sec 4(a)(3)(B)(i) critical habitat exemption.
- Medium—Project supports a specific INRMP goal and objective and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a NR law or by EO 13112, *Exotic and Invasive Species*; however, the INRMP signatories would not contend that the INRMP is not being implemented if not accomplished within the programmed year due to other priorities.
- Low—Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or supports long-term compliance with specific requirements within NR law but is not directly tied to specific compliance within the proposed year of execution.

Annual Work Plans—Work Plans should include the current year plus four additional years (2022-2026).

Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive Natural Resources staff.	Coordinate with the installation GIS analyst to maintain a comprehensive natural resources GIS database that is available to support development of the base General Plan, EAs/FONSIs/ FONPAs, EISs/RODs, Airfield Management Plan, BASH Reduction Plans and to support timely review of Militart Construction (MILCON) and O&M project planning and site selection and decision making.	Annually	2022–2026	AFCEC/ ISS	EQ	High			1.1.1	Develop a natural resources GIS database that holds both SDSFIE-compatible GeoBase data and installation-specific GIS data for resources management decision making at Dyess AFB.
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive Natural Resources staff.	Coordinate with the installation GIS analyst to maintain a comprehensive natural resources GIS database that is available to support	Annually	2022	7 CES/CE IE	EQ	High			1.1.2	Maintain and update digital spatial natural resources data as new information becomes available and expand natural resources data integration with the Dyess AFB Geo-database. Ensure that historic

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
		development of the base General Plan, EAs/FONSIs/ FONPAs, EISs/RODs, Airfield Management Plan, BASH Reduction Plans and to support timely review of MILCON and O&M project planning and site selection and decision making.									data referenced in the INRMP are fully transferred into GeoBase, including attributes
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive Natural Resources staff.	Coordinate with the installation GIS analyst to maintain a comprehensive natural resources GIS database that is available to support development of the base General Plan, EAs/FONSIs/ FONPAs, EISs/RODs, Airfield Management Plan, BASH Reduction Plans and to support timely review of	Once every five years	2022	7CES/CEIE	EQ	High			1.1.3	Maintain delineated wetland boundaries in the Dyess GIS system and transfer the 1995 wetland delineation data to GeoBase

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
		MILCON and O&M project planning and site selection and decision making.									
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive Natural Resources staff.	Ensure natural resources staff have the capability to conduct site surveys and review project documentation to support timely completion of base construction contracts and projects.	Annually	2022–2026	7CES/CEIE	EQ/In House	High			1.2.1	Conduct site-specific surveys to identify areas of potential conflict between projects outside of General Plan Development Areas and the protection of floodplains, wetlands, BASH issues, and protected species.
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive Natural Resources staff.	Ensure sufficient natural resources staffing, training, and resources to meet Dyess AFB mission needs.	Annually	2022–2026	7CES/CEIE	In House	Medium			1.3.1	Improve coordination between the NRM and other maintenance and management personnel by developing working groups and standard operating procedures that can be distributed as needed to the appropriate groups
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a	Ensure sufficient natural resources staffing, training, and resources to meet	Annually	2022–2026	7CES/CEIE	In House	High			1.3.2	Review the eDASH Natural Resources Training Matrix on an annual basis and ensure all natural resources staff can access course material relevant to their duties (e.g.,

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	responsive and proactive Natural Resources staff.	Dyess AFB mission needs.									Natural Resources Compliance Training, Pest Management Training, Natural Resources Awareness, Natural Resources Wetlands, etc.).
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive Natural Resources staff.	Maintain present Dyess AFB Land Management Plan compatibility with INRMP guidelines and philosophy (AFMAN32-7003), the Installation Pest Management Plan, mission requirements, and enhancement, maintenance, and restoration of ecosystem health.	Annually	2022–2026	7CES/CEIE	In House	High			1.4.1	Coordinate updates to the Land Management Plan in conjunction with INRMP updates and reviews, updates to associated plans, and as needed to ensure compatibility.
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive Natural Resources staff.	Support the flying mission of Dyess AFB by coordinating with the BASH team and wing safety to monitor hazards, modify habitat as required, and maintain compliance	Annually	2022–2026	7CES/CEOHP	Base Operations and Maintenance Funds	Medium			1.5.1	Reduce broadleaf weeds on the airfield seasonally or as needed to comply with Dyess AFB BASH Plan (OPLAN 91-212)—Appendix 1 to Annex 1, paragraph 8.7.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
		with Operational Plans.									
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive Natural Resources staff.	Support the flying mission of Dyess AFB by coordinating with the BASH team and wing safety to monitor hazards, modify habitat as required, and maintain compliance with Operational Plans.	Once every five years	2022–2026	7CES/CEOHP	Base Operations and Maintenance Funds	High			1.5.2	Reduce or eliminate standing water on the airfield as required under Dyess AFB OPLAN 91- 212 BASH—Appendix 1 to Annex 1, paragraph 8.7.
Natural Resource Program Support	Provide direct support and coordination services to Dyess AFB by maintaining natural resources databases and a responsive and proactive Natural Resources staff.	Support the flying mission of Dyess AFB by coordinating with the BASH team and wing safety to monitor hazards, modify habitat as required, and maintain compliance with Operational Plans.	Annually	2022–2026	7CES/CEOHP	Base Operations and Maintenance Funds	High			1.5.3	Remove snags (dead trees) that attract raptors from the airfield as required under Dyess AFB Bash Plan (OPLAN 91-212)—Appendix 1 to Annex 1, paragraph 8.7
Threatened and	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and	Protect federally and state listed threatened and endangered species and species of	Annually	2022–2026	7CES/CEIE	EQ/In House	High			2.1.1	Monitor the Federal Register to keep apprised on the USFWS proposed rules to federally list additional plant

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
Endangered Species	applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	concern under the terms of regulator agreements without compromising the military mission.									and animal species as either threatened or endangered.
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	Protect federally and state listed threatened and endangered species and species of concern under the terms of regulator agreements without compromising the military mission.	Annually	2022–2026	7CES/CEIE	EQ/In House	High			2.1.2	Maintain a current checklist of federal and state listed threatened, endangered, candidate, and species of concern as listed for Taylor County, Texas, and ensure the INRMP is updated with the most current species lists and correct ranking system.
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and	Protect federally and state listed threatened and endangered species and species of concern under the	Once every five years	2022–2026	7CES/CEIE	EQ/In House	High			2.1.3	Develop a plan for regular (yearly or at appropriate intervals by taxa group) surveys of Dyess AFB for federally and/or state listed

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	terms of regulator agreements without compromising the military mission.									mammals, reptiles, fish, birds, invertebrates, and plants, and determine the feasibility of conducting surveys either in-house or using contracts
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	Protect federally and state listed threatened and endangered species and species of concern under the terms of regulator agreements without compromising the military mission.	Once every five years	2022–2026	NRM Contract support	EQ	High			2.1.4	Conduct targeted surveys using appropriate protocols for tricolored bats, shiners, black-footed ferrets, desert massasauga, spot-tailed earless lizard, and monarchs to determine their status on base in anticipation of listing or status changes to these species
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations	Protect federally and state listed threatened and endangered species and species of concern under the terms of regulator	Once every five years	2022–2026	NRM contract Support	EQ/ In House	High			2.1.5	Develop and implement a plan to map and annually monitor suitable habitat for Texas horned lizard and black-tailed prairie dog

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	agreements without compromising the military mission.									
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	Protect federally and state listed threatened and endangered species and species of concern under the terms of regulator agreements without compromising the military mission.	Annually	2022–2026	7CES/CEIE	EQ/ In House	High			2.1.6	Improve habitat conditions for special-status species by evaluating opportunities to restore habitat or enhance existing services to wildlife and native plants under warmer and most likely wetter conditions, possibly interspersed with seasonal drought in the long-term.
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive	Protect federally and state listed threatened and endangered species and species of concern under the terms of regulator agreements without	Annually	2022–2026	7CES/CEIE	EQ	High			2.1.7	Conduct baseline surveys for invertebrates across all known vegetation types on Dyess AFB to determine if any federal or state listed species are present. Focus survey efforts on taxa that include

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	compromising the military mission.									sensitive species (e.g., pollinators).
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	Protect federally and state listed threatened and endangered species and species of concern under the terms of regulator agreements without compromising the military mission.	Annually	2022–2026	7CES/CEIE	EQ/ In House	High			2.1.8	Annually survey for monarch butterflies and monarch breeding activity on the base.
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and	Protect federally and state listed threatened and endangered species and species of concern under the terms of regulator agreements without	Every five years	2022–2026	7CES/CEIE	In House	Medium			2.1.9	Coordinate with regional pollinator experts to design native pollinator habitat that includes native milkweed species and other forbs visited by a wide array of pollinators.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	native species management while ensuring long-term availability of Dyess AFB's military resources.	compromising the military mission.									
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	Sustain, enhance, and monitor native wildlife and plants to support the military mission.	Annually	2022–2026	7CES/CEIE	In House	High			2.2.1	Monitor avian species in support of Partners In Flight and TPWD to determine the status of these species within various base habitats.
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species	Sustain, enhance, and monitor native wildlife and plants to support the military mission.	Annually	2022–2026	7CES/CEIE	In House	Medium			2.2.2	Maintain PIF priority bird checklist for the Rolling Plains geographic area.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	management while ensuring long-term availability of Dyess AFB's military resources.										
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	Sustain, enhance, and monitor native wildlife and plants to support the military mission.	Annually/Continues	2022–2026	7BW/SEF /USDA-WS	Base Operations and Maintenance funds	High			2.2.3	Monitor wildlife on the airfield in support of Dyess AFB BASH Plan (OPLAN 91-212).
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species management while	Sustain, enhance, and monitor native wildlife and plants to support the military mission.	Every other year	2022–2026	7CES/CEIE	EQ / In House	Medium			2.2.4	Monitor aquatic wildlife.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	ensuring long-term availability of Dyess AFB's military resources.										
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term availability of Dyess AFB's military resources.	Sustain, enhance, and monitor native wildlife and plants to support the military mission.	Once every five years	2022–2026	7CES/CEIE	EQ/ In House	Medium			2.2.5	Increase wood duck habitat at Lake Totten by constructing nesting boxes and planning for yearly maintenance of all bird nesting structures across the base.
Threatened and Endangered Species	Ensure compliance with the Sikes Act, ESA, MBTA, EO 13186 (migratory birds) and applicable federal and state laws and regulations related to sensitive species protection and native species management while ensuring long-term	Sustain, enhance, and monitor native wildlife and plants to support the military mission.	Once every five years	2022–2026	7CES/CEIE	In House	Medium			2.2.6	Conduct a survey of bird nesting boxes across the base, determine the need for maintenance, repairs or additional boxes, and develop a protocol for yearly surveys and maintenance prior to initiation of nesting season.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	availability of Dyess AFB's military resources.										
Fish and Wildlife and Habitat Management	Apply Best Management Practices (BMPs) and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Restore native communities damaged or otherwise impacted by human activities.	Once every five years	2022–2026	7CES/CEIE	In House	Medium			3.1.1	Establish a vegetation-monitoring program in all vegetation types on base and prioritize collecting data in prescribed burning units to establish baseline conditions prior to burning. As part of this effort, ensure that all vegetation-monitoring program data including plot locations and protocols are incorporated into the GeoBase system.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for	Restore native communities damaged or otherwise impacted by human activities.	Once every five years	2022–2026	7CES/CEIE	In House	Medium			3.1.2	Establish a schedule for visiting and recording data at all vegetation monitoring plots either yearly or in a rotation and analyze the data to detect trends in vegetation related to management or external factors such as increasing temperatures and precipitation.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	wildlife, residents, visitors, and base employees.										
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Restore native communities damaged or otherwise impacted by human activities.	Once every five years	2022–2026	7CES/CEIE	EQ/ In House	Medium			3.1.3	Develop a management plan for increasing healthy and diverse grasslands on Dyess AFB under projected wetter and hotter conditions.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Restore native communities damaged or otherwise impacted by human activities.	Once every five years	2022 / 2026	7CES/CEIE	EQ	Medium			3.1.4	Protect, restore, and maintain aquatic and riparian habitat along Little Elm Creek by establishing monitoring plots and condition thresholds that would indicate restoration is needed and to identify sites that may be threatened by erosion and increasing severity of storm events.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.										
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Restore native communities damaged or otherwise impacted by human activities.	Once every five years	2022026	7 CES CEIE	EQ/ In House	Medium			3.1.5	Based on results of vegetation monitoring, develop management recommendations for habitats identified as vulnerable in the climate change projections.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Provide for floodplain, wetland, and watershed protection and improved water quality through creation, updating, and implementation of adaptive management plans, monitoring, and restoration where required and not in	Every two years	2022–2026	7CES/CEIE	In House	Medium			3.2.1	Establish and maintain cooperative agreements with local, state, and federal water resources management agencies and groups to enhance and protect watersheds from increasingly severe storm events and higher yearly precipitation levels. Maintain copies of agreements and plans for implementation.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.	conflict with the mission or other natural resources objectives.									
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Provide for floodplain, wetland, and watershed protection and improved water quality through creation, updating, and implementation of adaptive management plans, monitoring, and restoration where required and not in conflict with the mission or other natural resources objectives.	Annually	2022–2026	7CES/CEIE	EQ/ In House	High			3.2.2	Establish an annual environmental compliance budget for watershed protection including funding for updating and maintaining associated plans and monitoring of watersheds that may suffer from increased erosion and flooding from extreme weather events.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity,	Provide for floodplain, wetland, and watershed protection and improved water quality through creation, updating, and implementation	Annually	2022–2026	/CES/CEIE	In House	High			3.2.3	Ensure that stormwater infrastructure is functioning properly with adequate drainage. Repair or conduct maintenance as needed yearly to accommodate increasingly severe precipitation events.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	of adaptive management plans, monitoring, and restoration where required and not in conflict with the mission or other natural resources objectives.									
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Provide for floodplain, wetland, and watershed protection and improved water quality through creation, updating, and implementation of adaptive management plans, monitoring, and restoration where required and not in conflict with the mission or other natural resources objectives.	Annually	2022–2026	7CES/CEIE	Operations and maintenance / In House	High			3.2.4	Maintain, update, and implement the Dyess AFB Stormwater Pollution Prevention Plan (SWPPP) and incorporate information on adapting to increasingly severe storms and potential for more erosion and flooding.
Fish and Wildlife and	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112	Provide for floodplain, wetland, and watershed	Once every five years	2022–2026	7CES/CEIE	EQ	Medium			3.2.5	Maintain baseline wetlands inventory from the 1995 USACE wetlands delineation

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
Habitat Management	(Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	protection and improved water quality through creation, updating, and implementation of adaptive management plans, monitoring, and restoration where required and not in conflict with the mission or other natural resources objectives.									report and regularly check wetland conditions trends and boundaries.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Provide for floodplain, wetland, and watershed protection and improved water quality through creation, updating, and implementation of adaptive management plans, monitoring, and restoration where required and not in conflict with the mission or other	Annually	2022–2026	7CES/CEIE	In House	High			3.2.6	Ensure that all applicable wetlands laws and AFIs are adhered to and the wetlands are protected.

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		natural resources objectives.									
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Provide for floodplain, wetland, and watershed protection and improved water quality through creation, updating, and implementation of adaptive management plans, monitoring, and restoration where required and not in conflict with the mission or other natural resources objectives.	Once every five years	2022–2026	7CES/CEIE	In House				3.2.7	Evaluate all Dyess AFB wetlands and waters of the U.S. impacted by invasive species and develop a plan to restore them with native vegetation
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and	Improve water quality on-base and downstream of base by minimizing soil erosion, decreasing pesticide and fertilizer use, and preventing water quality impacts from natural resources and	Annually	2022–2026	7CES/CEIE	In House	Medium			3.3.1	Evaluate land management activities, the grounds maintenance contract, and construction contracts to assess whether additional measures may be incorporated to minimize non-point source pollution as storm severity

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	attractive habitat for wildlife, residents, visitors, and base employees.	grounds management activities.									increases potential runoff amounts.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Improve water quality on-base and downstream of base by minimizing soil erosion, decreasing pesticide and fertilizer use, and preventing water quality impacts from natural resources and grounds management activities.	Once every five years	2022–2026	7CES/CEIE	In House	Medium			3.3.2	Implement measures to improve stormwater quality leaving the base, reduce downstream flooding, and improve riparian habitat.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for	Improve water quality on-base and downstream of base by minimizing soil erosion, decreasing pesticide and fertilizer use, and preventing water quality impacts from natural resources and	Once every five years	2022–2026	7CES/CEIE	In House	Medium			3.3.3	Evaluate Dyess AFB for erosion-prone sites that may experience increased soil loss as precipitation intensity and temperature increase and soil aggregate stability decreases.

Annual Work Plans—Work Plans should include the current year plus four additional years (2022-2026).

Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	wildlife, residents, visitors, and base employees.	grounds management activities.									
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Improve water quality on-base and downstream of base by minimizing soil erosion, decreasing pesticide and fertilizer use, and preventing water quality impacts from natural resources and grounds management activities.	Annually	2022–2026	7CES/CEIE	In House	Medium			3.3.4	Minimize non-point sources of water pollution that result from land management activities.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Support wildland fire management and develop a fire program that minimizes the risk of wildfire and maximizes the benefits to native habitats without compromising the military mission.	Annually	2022–2026	7CES/CEIE 7CES/CEOHP	In House	High			3.4.1	Protect and stabilize all perimeter and interior firebreaks from erosion and invasive species by establishing a regular schedule of surveys and maintenance for each firebreak.

Annual Work Plans—Work Plans should include the current year plus four additional years (2022-2026).

Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.										
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Support wildland fire management and develop a fire program that minimizes the risk of wildfire and maximizes the benefits to native habitats without compromising the military mission.	Annually	2022–2026	7CES/CEIE 7CES/CEOHP	In House	Medium			3.4.2	Maintain firebreaks by mowing 10-foot-wide center lane keeping grasses at a maximum height of 3 inches. Maintain native grasses for 5 feet of each side of the center 10 foot lane.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Support wildland fire management and develop a fire program that minimizes the risk of wildfire and maximizes the benefits to native habitats without compromising the military mission.	Annually	2022–2026	7CES/CEOHP 7CES/CEIE	In House	Medum			3.4.3	Review firebreak maps and plans periodically, maintain accurate maps, and provide up to date firebreak maps and additional maintenance requirements to the Grounds Maintenance QAE (7 CES/CEO) and any other users that require it.

Annual Work Plans—Work Plans should include the current year plus four additional years (2022-2026).

Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.										
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Support wildland fire management and develop a fire program that minimizes the risk of wildfire and maximizes the benefits to native habitats without compromising the military mission.	Annually	2022–2026	7CES/CEIE 7CES/CEF 7CES/CEOHP	In House	Medium			3.4.4	Protect firebreaks from unauthorized vehicular use with fencing, signage, and outreach including notification of penalties for misuse. Restrict firebreak access to fire department, grounds maintenance, and natural resources personnel and enforce violations as they occur.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Support wildland fire management and develop a fire program that minimizes the risk of wildfire and maximizes the benefits to native habitats without compromising the military mission.	Annually	2022–2026	7CES/CEIE 7CES/CEF USAF wildland fire team	In House	High			3.4.5	With the WFMP as a guide, use prescribed fire on a rotational basis to reduce fuel loading in burn units and provide benefits to natural resources management in areas where it is compatible with smoke management guidelines and the military mission.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.										
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Support wildland fire management and develop a fire program that minimizes the risk of wildfire and maximizes the benefits to native habitats without compromising the military mission.	Annually	2022–2026	7CES/CEIE	In House	Medium			3.4.6	Establish a schedule to burn all restored grasslands and mesquite savannah capable of sustaining prescribed burns on a 3- to 5-year rotational basis to maximize suppression of undesirable shrubs and establish or maintain native short and tall-grass prairie vegetation.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Support wildland fire management and develop a fire program that minimizes the risk of wildfire and maximizes the benefits to native habitats without compromising the military mission.	Once every five years	2022–2026	7CES/CEIE 7CES/CEF USAF Wildland fire team	EQ/ In House	Medium			3.4.7	In coordination with Project 3.4.6, develop a synchronized vegetation monitoring schedule for collecting data at established plots to evaluate the effects of burning and to support continued rotational burns.

Annual Work Plans—Work Plans should include the current year plus four additional years (2022-2026).

Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.										
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Support wildland fire management and develop a fire program that minimizes the risk of wildfire and maximizes the benefits to native habitats without compromising the military mission.	Annually	2022–2026	7CES/CEIE 7CE/CEF	In House	Medium			3.4.8	If unplanned ignitions occur, evaluate the potential to use them as a management tool if current and expected conditions fall within the parameters of management prescriptions for the area and adequate personnel and equipment are available to manage the fire as a prescribed burn.
Invasive Species Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Maintain a robust and nimble invasive species-monitoring and control program that is capable of detecting new introductions, monitoring existing infestations, and treating priority species for	Once every five years	2022–2026	7CES/CEIE Contracting?	EQ	High			3.5.1	Conduct a survey of noxious weeds and invasive species on Dyess AFB and develop the ISMP to include control strategies for each species detected. Plan to resurvey the base on a five-year cycle to ensure early detection of incipient infestations and new introductions.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.	eradication or long-term management.									
Invasive Species Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Maintain a robust and nimble invasive species-monitoring and control program that is capable of detecting new introductions, monitoring existing infestations, and treating priority species for eradication or long-term management.	Annually	2022–2026	7CES/CEIE Contractor??	EQ / In House	High			3.5.2	Based on the control strategies developed under Project 3.5.1, initiate treatment of the highest-priority invasive species with repeated treatments planned as needed each year.
Invasive Species Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Maintain a robust and nimble invasive species-monitoring and control program that is capable of detecting new introductions, monitoring existing infestations, and treating priority species for	Once every five years	2022–2026	Contracting	EQ/ In House	Medium			3.5.3	Control field bindweed. Sow buffalo grass along the south perimeter to compete with field bindweed infestation. Apply glyphosate to localized field bindweed infestation located adjacent to the paintball course.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.	eradication or long-term management.									
Invasive Species Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Maintain a robust and nimble invasive species-monitoring and control program that is capable of detecting new introductions, monitoring existing infestations, and treating priority species for eradication or long-term management.	Once every five years	2022–2026	Contracting??	EQ / In House	High			3.5.4	Control annual ball mustard base-wide. Physically pull whole plants and root system when found and dispose in dumpster. Apply glyphosate to large infestations.
Invasive Species Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Maintain a robust and nimble invasive species-monitoring and control program that is capable of detecting new introductions, monitoring existing infestations, and treating priority species for	Annually	2022–2026	7CES/CEIE	EQ / In House	High			3.5.5	Continue to monitor the diversion ditches for saltcedar, physically pull young plants, and apply Imazapyr to larger plants when found with the target of maintaining the base as saltcedar-free.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.	eradication or long-term management.									
Invasive Species Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Maintain a robust and nimble invasive species-monitoring and control program that is capable of detecting new introductions, monitoring existing infestations, and treating priority species for eradication or long-term management.	Annually	2022–2026	7CES/CEIE	EQ / In House	High			3.5.5	As part of yearly invasive species surveys, monitor wetlands and waters of the U.S. for invasive species.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Enhance wildlife habitat values of landscaping by making maximal use of native species, minimizing the use of pesticides in landscaping, and ensuring that all irrigation and maintenance practices are regionally	Annually	2022–2026	7CES/CEIE	In House	Medium			3.6.1	Work closely with pest management and golf course management to minimize the use of chemical pesticides and select pesticides that have the lowest possible toxicity, degrade rapidly in the environment, minimize exposure to non-target organisms through strategic timing and location of application, and do not contribute to non-point source

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.	appropriate and tolerant of increasing precipitation and temperatures.									pollution. Reference the IPMP (Section 15.5, *Tab 5—Integrated Pest Management Plan (IPMP)*) and the Mesquite Grove Golf Course Environmental Management Plan
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Enhance wildlife habitat values of landscaping by making maximal use of native species, minimizing the use of pesticides in landscaping, and ensuring that all irrigation and maintenance practices are regionally appropriate and tolerant of increasing precipitation and temperatures.	Annually	2022–2026	7CES/CEIE	EQ / In House	Medium			3.6.2	Continue to identify and implement vegetation enhancement projects in improved and semi-improved areas.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and	Enhance wildlife habitat values of landscaping by making maximal use of native species,	Annually	2022–2026	7CES/CEIE	In House	Low			3.6.3	Assess the grounds maintenance program for use of native species and opportunities to reduce pesticides and make

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	minimizing the use of pesticides in landscaping, and ensuring that all irrigation and maintenance practices are regionally appropriate and tolerant of increasing precipitation and temperatures.									recommendations for improvements to improve aesthetics of base landscaping and maximize the benefit to native species
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Enhance wildlife habitat values of landscaping by making maximal use of native species, minimizing the use of pesticides in landscaping, and ensuring that all irrigation and maintenance practices are regionally appropriate and tolerant of increasing precipitation and temperatures.	Annually	2022–2026	7CES/CEIE	In House	Low			3.6.4	Coordinate with grounds maintenance to plant native milkweed and other pollinator-friendly forbs in landscaping.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Enhance wildlife habitat values of landscaping by making maximal use of native species, minimizing the use of pesticides in landscaping, and ensuring that all irrigation and maintenance practices are regionally appropriate and tolerant of increasing precipitation and temperatures.	Annually	2022–2026	7CES/CEIE	In House	Low			3.6.5	Review grounds maintenance procedures for disposing of organic material generated through routine tree/shrub pruning and replacement activities.
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents,	Enhance wildlife habitat values of landscaping by making maximal use of native species, minimizing the use of pesticides in landscaping, and ensuring that all irrigation and maintenance practices are	Annually	2022–2026	7CES/CEIE	EQ/ In House	Medium			3.6.6	Evaluate the feasibility, potential regulatory and/or mission constraints, and benefits of developing a watchable wildlife and native plant park to convert the semi-improved site to an improved site with significant recreational and wildlife value

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	visitors, and base employees.	regionally appropriate and tolerant of increasing precipitation and temperatures.									
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	Enhance wildlife habitat values of landscaping by making maximal use of native species, minimizing the use of pesticides in landscaping, and ensuring that all irrigation and maintenance practices are regionally appropriate and tolerant of increasing precipitation and temperatures.	Physical Year 2022	2022	7CES/CEIE	EQ	Medium			3.6.7	Depending on the feasibility determined in Project 3.6.6, develop a plan for constructing an enclosed captive prairie dog colony, translocating prairie dogs, and developing interpretive signage and outreach for the site
Fish and Wildlife and Habitat Management	Apply BMPs and EOs 11990 (Wetlands), 11988 (Floodplains), and 13112 (Invasive species) to protect, restore, and maintain native habitats that contribute to	Enhance wildlife habitat values of landscaping by making maximal use of native species, minimizing the use of pesticides in	Physical Year 2022	2022	7CES/CEIE	EQ / In House	Medium			3.6.8	Develop a plan to use portions of the mowed area at the proposed captive prairie dog colony as a native plant display garden and work with local experts to design a

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	biological diversity, support the mission, and provide sustainable and attractive habitat for wildlife, residents, visitors, and base employees.	landscaping, and ensuring that all irrigation and maintenance practices are regionally appropriate and tolerant of increasing precipitation and temperatures.									sustainable and low-maintenance pollinator garden
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while protecting resources from overuse and damage.	Maintain an active outreach program on and off base to educate and inform base residents, visitors, employees, and the public of natural resources program concerns and projects.	Annually	2022–2026	7CES/CEIE	In House	Low			4.1.1	Make the Dyess AFB Fish and Wildlife Regulations brochure available at the Outdoor Recreation Center.
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while protecting resources from overuse and damage.	Maintain an active outreach program on and off base to educate and inform base residents, visitors, employees, and the public of natural resources	Annually	2022–2026	7CES/CEIE	In House	Medium				Prevent the introduction and distribution of invasive species by increasing awareness of base residents and employees regarding proper management of native vegetation and the need to avoid the introduction and

Annual Work Plans—Work Plans should include the current year plus four additional years (2022-2026).

Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
		program concerns and projects.									spread of nonnative plant species.
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while protecting resources from overuse and damage.	Maintain an active outreach program on and off base to educate and inform base residents, visitors, employees, and the public of natural resources program concerns and projects.	Annually	2022–2026	7CES/CEIE	In House	Low				Increase public awareness by developing and distributing notices, pamphlets, and outreach events to minimize nuisance wildlife encounters or conflicts with pests or potentially dangerous wildlife species (e.g., feral hogs, rodents, rattlesnakes, skunks, coyotes, etc.).
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while protecting resources from overuse and damage.	Maintain an active outreach program on and off base to educate and inform base residents, visitors, employees, and the public of natural resources program concerns and projects.	Annually	2022–2026	7CES/CEIE	In House	Low				Increase the amount of organic material recycled on base by reusing mulch generated by fuel breaks or other management activities.
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while	Provide recreation areas and opportunities on base to meet resident needs without damaging resources	Once every five years	2022–2026	7CES/CEIE	EQ	Medium			4.3.1	Develop and implement a plan to provide trees, a covered area, and a parking area to develop the effluent

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	protecting resources from overuse and damage.	or compromising mission accomplishment.									hospital pond as a significant recreational area.
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while protecting resources from overuse and damage.	Provide recreation areas and opportunities on base to meet resident needs without damaging resources or compromising mission accomplishment.	Once every five years	2022–2026	7CES/CEIE	EQ	Medium			4.3.2	Develop the recreational opportunities and native habitat at Lake Totten by planting additional native shade trees such as cottonwoods and maintaining shoreline access for fishing.
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while protecting resources from overuse and damage.	Provide recreation areas and opportunities on base to meet resident needs without damaging resources or compromising mission accomplishment.	Annually	2022–2026	7CES/CEIE	EQ	Medium			4.3.3	Maintain recreational fisheries in ponds, track usage, and determine fish population structure and yearly harvest recommendations based on catch records and fish sampling.
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while	Provide recreation areas and opportunities on base to meet resident needs without damaging resources or compromising	Once every five years	2022–2026	7CES/CEIE	EQ	Medium			4.3.4	Establish interpretive trails in the wildlife habitat area north of on-base family housing for the purpose of wildlife observation and nature study.

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Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code *	Standard Title*	Project Number	Description
	protecting resources from overuse and damage.	mission accomplishment.									
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while protecting resources from overuse and damage.	Provide recreation areas and opportunities on base to meet resident needs without damaging resources or compromising mission accomplishment.	Once every five years	2022–2026	7CES/CEIE	EQ	Medium			4.3.5	Enhance the existing nature trails on base by providing I.D. tags for vegetation that base personnel can use to identify and learn native flora.
Outdoor Recreation Outreach, and Education	Provide quality outdoor recreation experiences in the natural environment and maintain outreach and education opportunities while protecting resources from overuse and damage.	Provide recreation areas and opportunities on base to meet resident needs without damaging resources or compromising mission accomplishment.	Annually	2022–2026	7CES/CEIE		Low			4.3.6	Develop volunteer opportunities for accomplishing base recreation projects

***Natural Resources Standard Titles by PB28 Code (excluding CZT/CZC titles)**

INRP	MMA	T&E	MNRA	WTLD
P&F, CN	Mgt., Species	Mgt., Habitat	Compliance Public Notification	Mgt., Wetlands/Flood Plains
Interagency/Intraagency, Government, Sikes Act	Interagency/Intraagency, Government, Sikes Act	Mgt., Species	Plan Update, Other	Monitor Wetlands
Interagency/Intraagency, Government, Sikes Act, CLEO	Outsourced Environmental Services, CN	Mgt., Invasive Species	Recordkeeping, Other	Interagency/Intraagency, Government, Sikes Act
Outsourced Environmental Services, CN	Supplies, CN	Mgt., Nuisance Wildlife	Outreach	Outsourced Environmental Services, CN
Supplies, CN	Supplies, CN, CLEO	Interagency/Intraagency, Government, Sikes Act		
Supplies, CN, CLEO	Vehicle Leasing, CN	Interagency/Intraagency, Government, Sikes Act, CLEO		
Equipment Purchase/Maintain, CN		Outsourced Environmental Services, CN		
Vehicle Leasing, CN		Supplies, CN		
Vehicle Fuel & Maintenance, CN		Supplies, CN, CLEO		
Mgt., Wildland Fire		Equipment Purchase/Maintain, CN		
Plan Update, INRMP		Vehicle Leasing, CN		

INRP	MMA	T&E	MNRA	WTLD
Plan Update, Other		Vehicle Fuel & Maintenance, CN		
Mgt., Habitat		Plan Update, Other		
Mgt., Species		Environmental Services, CN		
Mgt., Invasive Species				
Mgt., Nuisance Wildlife				
Recordkeeping, Other				
Environmental Services, CN				

11.0 REFERENCES

11.1 Standard References (Applicable to all USAF installations)

- AFMAN 32-7003, Environmental Conservation
- Sikes Act
- eDASH Natural Resources Program Page
- Natural Resources Playbook
- DoDI 4715.03, Natural Resources Conservation Program
- AFI 32-1015, Integrated Installation Planning
- AFI 32-10112, Installation Geospatial Information and Services

11.2 Installation References

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12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to all USAF installations)

- eDASH Acronym Library
- Natural Resources Playbook—Acronym Section
- U.S. EPA Terms & Acronyms

12.2 Installation Acronyms

- **7 BW** 7th Bomb Wing
- 7 **CES** 7th Civil Engineer Squadron
- **7 FSS** 7th Force Support Squadron
- **7 MSG** 7th Mission Support Group
- **7 OSS/OSOR** 7th Operations Support Squadron/Operational Standoff Range
- **7 SFS** 7th Security Forces Specialist
- **12M/PLPCH** 12-month finding on a petition to list a given species and, if listing is warranted, the United States Fish and Wildlife Service generally intends to proceed with a concurrent proposed listing rule and proposed critical habitat designation, if critical habitat is prudent and determinable
- **AFB** Air Force Base
- **AFCEC** Air Force Civil Engineer Center
- **AFI** Air Force Instruction
- **AFMAN** Air Force Manual
- **AFPD** Air Force Policy Directive
- **APHIS** Animal and Plant Health Inspection Service
- **BASH** Bird/Wildlife Aircraft Strike Hazard
- **BGEPA** Bald and Golden Eagle Protection Act
- **BHCO** Brown-headed Cowbird
- **BMP** Best Management Practice
- **CATEX** Categorical Exclusion
- **CBC** Christmas Bird Count
- **CC** Commander
- **CCSM** Community Climate System Model
- **CECOS** Civil Engineer Corps Officers School
- **CEF** Civil Engineering Fire
- **CEIE** Global Strike Command/National Environmental Policy Act Manager
- **CEMML** Center for Environmental Management of Military Lands
- **CERCLA** Comprehensive Environmental Response, Compensation, and Liability Act
- **CES** Civil Engineering Squadron
- **CFR** Code of Federal Regulation
- **CLEO** Conservation Law Enforcement Officer
- **CSU** Colorado State University
- **CWA** Clean Water Act
- **CZ** Environmental Directorate
- **DoD** Department of Defense

- **DoDI** Department of Defense Instruction
- **EIAP** Environmental Impact Analysis Process
- **EIS** Environmental Impact Statement
- **EMP** Environmental Management Plan
- **EMS** Environmental Management System
- **EO** Executive Order
- **EPA** Environmental Protection Agency
- **ESA** Endangered Species Act
- **ESS** Electronic Scoring Site
- **ESOH** Environmental, Safety, and Occupational Health
- **ESOHCAMP** Environmental, Safety, and Occupational Health Compliance Assessment and Management Program
- **FEMA** Federal Emergency Management Agency
- **FONPA** Finding of No Practicable Alternative
- **FONSI** Finding of No Significant Impact
- **GAP** Gap Analysis Project
- **GDD** Growing Degree Days
- **GIS** Geographic Information Systems
- **GSC/A7** Global Strike Command/Command Civil Engineer
- **GSU** Geographically Separated Unit
- **IAW** In Accordance With
- **ICRMP** Integrated Cultural Resources Management Plan
- **IDP** Installation Development Plan
- **IGI&S** Installation Geospatial Information and Services
- **ILS** Instrument Landing System
- **INRMP** Integrated Natural Resources Management Plan
- **IPCC** Intergovernmental Panel on Climate Change
- **IPMP** Integrated Pest Management Plan
- **ISMP** Invasive Species Management Plan
- **IST** Installation Support Team
- **MBTA** Migratory Bird Treaty Act
- **MILCON** Militart Construction
- **MS4** Small Municipal Separate Storm Sewer System
- **NCAR** National Center for Atmospheric Research
- **NEPA** National Environmental Policy Act
- **NOAA** National Oceanic and Atmospheric Administration
- **NRCS** Natural Resources Conservation Service
- **NR** Natural Resources
- **NRM** Natural Resource Manager
- **NVC** National Vegetation Classification
- **O&M** Operations and Maintenance
- **OPLAN** Operation Plan
- **ORV** Off-road Vehicle
- **OSD** Office of the Secretary of Defense

- **PIF** Partners in Flight
- **P.L.** Public Law
- **POC** Point of Contact
- **PRECIP** Annual Average Precipitation
- **RBTI** Realistic Bomber Training Initiative
- **RCP** Representative Concentration Pathway
- **ROD** Record of Decision
- **SAC** Strategic Air Command
- **SCS** Soil Conservation Service (United States Department of Agriculture)
- **SDSFIE** Spatial Data Standards for Facilities, Infrastructure, and Environment
- **SFS** Security Forces Squadron
- **SGCN** Species of Greatest Conservation Need
- **SME** Subject Matter Expert
- **SWPPP** Stormwater Pollution Prevention Plan
- **TAG** Technical Advisory Group (for the Introduction of Biological Control Agents of Weeds of the United States Department of Agriculture, Animal and Plant Health Inspection Service)
- **TAVE** Annual Average Temperature
- **TCEQ** Texas Commission on Environmental Quality
- **TCES** Texas Cooperative Extension Service
- **TFS** Texas Forest Service
- **TMAX** Annual Average Maximum Temperature
- **TMIN** Annual Average Minimum Temperature
- **TNHP** Texas Natural Heritage Program
- **TPDES** Texas Pollutant Discharge Elimination System
- **TPWD** Texas Parks and Wildlife Department
- **TXARNG** Texas Army National Guard
- **UMD** Unit Manning Document
- **U.S.** United States
- **USACE** United States Army Corps of Engineers
- **USAF** United States Air Force
- **USARDC** United States Army Engineer Research and Development Center
- **USC** United States Code
- **USDA** United States Department of Agriculture
- **USGS** United States Geological Survey
- **WSD** Wildlife Services Division (of the United States Department of Agriculture, Animal and Plant Health Inspection Service)
- **USFWS** United States Fish & Wildlife Service
- **USGS** United States Geological Survey
- **WFMP** Wildland Fire Management Plan
- **WOTUS** Waters of the United States
- **WSA** Weapons Storage Area

13.0 DEFINITIONS

13.1 Standard Definitions (Applicable to all USAF installations)

- Natural Resources Playbook—Definitions Section

13.2 Installation Definitions

14.0 APPENDICES

14.1 Standard Appendices

14.1.1 Appendix A. Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP

Federal Public Laws and Executive Orders	
National Defense Authorization Act of 1989, Public Law (P.L.) 101-189; Volunteer Partnership Cost-Share Program	Amends two Acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, P.L. 101-511; Legacy Resource Management Program	Establishes the "Legacy Resource Management Program" for natural and cultural resources. Program emphasis is on inventory and stewardship responsibilities of biological, geophysical, cultural, and historic resources on DoD lands, including restoration of degraded or altered habitats.
EO 11514, *Protection and Enhancement of Environmental Quality*	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, *Protection and Enhancement of the Cultural Environment*	All Federal agencies are required to locate, identify, and record all cultural resources. Cultural resources include sites of archaeological, historical, or architectural significance.
EO 11987, *Exotic Organisms*	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters that they administer.
EO 11988, *Floodplain Management*	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state, territory and Federal review agencies for any construction within a 100-year floodplain and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for acquiring, managing and disposing of Federal lands and facilities.
EO 11989, *Off-Road vehicles on Public Lands*	Installations permitting off-road vehicles to designate and mark specific areas/trails to minimize damage and conflicts, publish information including maps, and monitor the effects of their use. Installations may close areas if adverse effects on natural, cultural, or historic resources are observed.
EO 11990, *Protection of Wetlands*	Requires Federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize harm to wetlands have been implemented and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Federal Public Laws and Executive Orders	
EO 12088, *Federal Compliance with Pollution Control Standards*	This EO delegates responsibility to the head of each executive agency for ensuring all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the U.S. Environmental Protection Agency (US EPA) authority to conduct reviews and inspections to monitor federal facility compliance with pollution control standards.
EO 12898, *Environmental Justice*	This EO requires certain federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.
EO 13112, *Invasive Species*	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.
EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*	The USFWS has the responsibility to administer, oversee, and enforce the conservation provisions of the Migratory Bird Treaty Act, which includes responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement.
United States Code	
Animal Damage Control Act (7 USC § 426-426b, 47 Stat. 1468)	Provides authority to the Secretary of Agriculture for investigation and control of mammalian predators, rodents, and birds. DoD installations may enter into cooperative agreements to conduct animal control projects.
Bald and Golden Eagle Protection Act of 1940, as amended; 16 USC 668-668c	This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Clean Air Act, (42 USC § 7401–7671q, 14 July 1955, as amended)	This Act, as amended, is known as the Clean Air Act of 1970. The amendments made in 1970 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country that do not meet federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (Superfund) (26 USC § 4611–4682, P.L. 96-510, 94 Stat. 2797), as amended	Authorizes and administers a program to assess damage, respond to releases of hazardous substances, fund cleanup, establish clean-up standards, assign liability, and other efforts to address environmental contaminants. Installation Restoration Program guides cleanups at DoD installations.

Federal Public Laws and Executive Orders	
Endangered Species Act (ESA) of 1973, as amended; P.L. 93-205, 16 USC § 1531 *et seq.*	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The ESA requires consultation with the USFWS and the National Oceanic and Atmospheric Administration Fisheries (National Marine Fisheries Service) and the preparation of a biological evaluation or a biological assessment may be required when such species are present in an area affected by government activities.
Federal Aid in Wildlife Restoration Act of 1937 (16 USC § 669–669i; 50 Stat. 917) (Pittman-Robertson Act)	Provides federal aid to states and territories for management and restoration of wildlife. Fund derives from sports tax on arms and ammunition. Projects include acquisition of wildlife habitat, wildlife research surveys, development of access facilities, and hunter education.
Federal Environmental Pesticide Act of 1972	Requires installations to ensure pesticides are used only in accordance with their label registrations and restricted-use pesticides are applied only by certified applicators.
Federal Land Use Policy and Management Act, 43 USC § 1701–1782	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values; as well as to preserve and protect certain lands in their natural condition for fish and wildlife habitat. This Act also requires consideration of commodity production such as timbering.
Federal Noxious Weed Act of 1974, 7 USC § 2801–2814	The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.
Federal Water Pollution Control Act (Clean Water Act [CWA]), 33 USC §1251–1387	The CWA is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Primary authority for the implementation and enforcement rests with the US EPA.
Fish and Wildlife Conservation Act (16 USC § 2901–2911; 94 Stat. 1322, PL 96-366)	Installations encouraged to use their authority to conserve and promote conservation of nongame fish and wildlife in their habitats.
Fish and Wildlife Coordination Act (16 USC § 661 *et seq.*)	Directs installations to consult with the USFWS, or state or territorial agencies to ascertain means to protect fish and wildlife resources related to actions resulting in the control or structural modification of any natural stream or body of water. Includes provisions for mitigation and reporting.
Lacey Act of 1900 (16 USC § 701, 702, 32 Stat. 187, 32 Stat. 285)	Prohibits the importation of wild animals or birds or parts thereof, taken, possessed, or exported in violation of the laws of the country or territory of origin. Provides enforcement and penalties for violation of wildlife related Acts or regulations.
Leases: Non-excess Property of Military Departments, 10 USC § 2667, as amended	Authorizes DoD to lease to commercial enterprises Federal land not currently needed for public use. Covers agricultural outleasing program.
Migratory Bird Treaty Act 16 USC § 703–712	The Act implements various treaties for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful without a valid permit.

Federal Public Laws and Executive Orders	
National Environmental Policy Act of 1969 (NEPA), as amended; P.L. 91-190, 42 USC § 4321 *et seq.*	Requires federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. Establishes the use of environmental impact statements. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. The Council of Environmental Quality created Regulations for Implementing the National Environmental Policy Act [40 CFR Parts 1500–1508], which provide regulations applicable to and binding on all Federal agencies for implementing the procedural provisions of NEPA, as amended.
National Historic Preservation Act, 16 USC § 470 *et seq.*	Requires federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the NRHP), and protection of historical and cultural properties of significance.
National Trails Systems Act (16 USC § 1241–1249)	Provides for the establishment of recreation and scenic trails.
National Wildlife Refuge Acts	Provides for establishment of National Wildlife Refuges through purchase, land transfer, donation, cooperative agreements, and other means.
National Wildlife Refuge System Administration Act of 1966 (16 USC § 668dd–668ee)	Provides guidelines and instructions for the administration of Wildlife Refuges and other conservation areas.
Native American Graves Protection and Repatriation Act of 1990 (25 USC § 3001–13; 104 Stat. 3042), as amended	Established requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal lands. Includes requirements on inventory, and notification.
Rivers and Harbors Act of 1899 (33 USC § 401 *et seq.*)	Makes it unlawful for the USAF to conduct any work or activity in navigable waters of the United States without a federal permit. Installations should coordinate with the U.S. Army Corps of Engineers to obtain permits for the discharge of refuse affecting navigable waters under National Pollutant Discharge Elimination System and should coordinate with the USFWS to review effects on fish and wildlife of work and activities to be undertaken as permitted by the USACE.
Sale of certain interests in land, 10 USC § 2665	Authorizes sale of forest products and reimbursement of the costs of management of forest resources.
Soil and Water Conservation Act (16 USC § 2001, P.L. 95-193)	Installations shall coordinate with the Secretary of Agriculture to appraise, on a continual basis, soil/water-related resources. Installations will develop and update a program for furthering the conservation, protection, and enhancement of these resources consistent with other federal and local programs.

Federal Public Laws and Executive Orders	
Sikes Act (16 USC § 670a–670l, 74 Stat. 1052), as amended	Provides for the cooperation of DoD, the USFWS, and the State Fish and Game Department in planning, developing, and maintaining fish and wildlife resources on a military installation. Requires development of an INRMP and public access to natural resources and allows collection of nominal hunting and fishing fees. NOTE: AFI 32-7064 sec 3.9. Staffing. As defined in DoDI 4715.03, use professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP. (T-0). 3.9.1. Outsourcing Natural Resources Management. As stipulated in the Sikes Act, 16 USC § 670 et. seq., the Office of Management and Budget Circular No. A-76, Performance of Commercial Activities, August 4, 1983 (Revised May 29, 2003) does not apply to the development, implementation and enforcement of INRMPs. Activities that require the exercise of discretion in making decisions regarding the management and disposition of government owned natural resources are inherently governmental. When it is not practicable to utilize DoD personnel to perform inherently governmental natural resources management duties, obtain these services from federal agencies having responsibilities for the conservation and management of natural resources.
DoD Policy, Directives, and Instructions	
DoD Instruction 4150.07 *DoD Pest Management Program* dated 29 May 2008	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.
DoD Instruction 4715.1, *Environmental Security*	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This instruction also ensures environmental factors are integrated into DoD decision-making processes that could impact the environment, and are given appropriate consideration along with other relevant factors.
DoD Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*	Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.
Office of the Secretary of Defense (OSD) Policy Memorandum, 17 May 2005—*Implementation of Sikes Act Improvement Amendments: Supplemental Guidance Concerning Leased Lands*	Provides supplemental guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. INRMPs must address the resource management on all lands for which the subject installation has real property accountability, including leased lands. Installation commanders may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation INRMP.

Federal Public Laws and Executive Orders	
OSD Policy Memorandum, 1 November 2004— *Implementation of Sikes Act Improvement Act Amendments: Supplemental Guidance Concerning INRMP Reviews*	Emphasizes implementing and improving the overall INRMP coordination process. Provides policy on scope of INRMP review, and public comment on INRMP review.
OSD Policy Memorandum, 10 October 2002— *Implementation of Sikes Act Improvement Act: Updated Guidance*	Provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD and replaces the 21 September 1998 guidance Implementation of the Sikes Act Improvement Amendments. Emphasizes implementing and improving the overall INRMP coordination process and focuses on coordinating with stakeholders, reporting requirements and metrics, budgeting for INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and facilitating the INRMP review process.
USAF Instructions and Directives	
32 CFR Part 989, as amended, and AFI 32-7061, Environmental Impact Analysis Process (EIAP)	Provides guidance and responsibilities in the EIAP for implementing INRMPs. Implementation of an INRMP constitutes a major federal action and therefore is subject to evaluation through an Environmental Assessment or an Environmental Impact Statement.
AFI 32-1015, *Integrated Installation Planning*	This publication establishes a comprehensive and integrated planning framework for development/redevelopment of Air Force installations.
AFMAN 32-7003, *Environmental Conservation*	Implements AFPD 32-70, *Environmental Quality;* DoDI 4715.03, *Natural Resources Conservation Program*; and DoDI 7310.5, *Accounting for Sale of Forest Products*. It explains how to manage natural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFMAN 32-7003, *Environmental Conservation*	This Manual implements AFPD 32-70 and DoDI 4710.1, *Archaeological and Historic Resources Management.* It explains how to manage cultural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFI 32-10112 *Installation Geospatial Information and Services*	This instruction implements Department of Defense Instruction (DoDI) 8130.01, Installation Geospatial Information and Services (IGI&S) by identifying the requirements to implement and maintain an Air Force Installation Geospatial Information and Services program and Air Force Policy Directive (AFPD) 32-10 Installations and Facilities.
AFPD 32-70, *Environmental Quality*	Outlines the USAF mission to achieve and maintain environmental quality on all USAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly the irreplaceable natural and cultural resources it holds in public trust and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.

Federal Public Laws and Executive Orders	
Policy Memo for Implementation of Sikes Act Improvement Amendments, HQ USAF Environmental Office (USAF/ILEB) on 29 January 1999	Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.

14.2 Installation Appendices

14.2.1 Appendix B. Emergency Contacts

Emergency Contacts

Spill/Fire (Fire Department)	7 CES/CEF	117
Law Enforcement (Security Forces)	7 SFS/Security Forces Operations Planning	696-2131

Environmental Contacts

Installation Management Flight Chief	7 CES/CEI	696-4027
Chief of Compliance	7 CES/CEIE	696-5664
Air Quality Engineer	7 CES/CEIE	696-1437
Water Quality Engineer	7 CES/CEIE	696-5663
Toxic Program Engineer	7 CES/CEIE	696-5648
Restoration Program Manager	7 CES/CEIE	696-5049
Waste Quality Engineer	7 CES/CEIE	696-6975
Natural Resource Manager	7 CES/CEIE	696-5958
Env Management System Coordinator	7 CES/CEIE	696-5664
NEPA Program Manager	7 CES/CEIE	696-2050
Projects Coordinator	7 CES/CEIE	696-5664
Pollution Prevention	7 CES/CEIE	696-6975
Quality Assurance Service Contracts	7 CES/CEO	696-8123
Base Environmental Training Manager	7 CES/CEIE	696-5664
Geobase Office	7 CES/CEPD	696-5646
Recycling Program Manager	7 CES/CEIE	696-6975
Pest Management	7 CES/CEOIE	696-1691
Bioenvironmental Engineer	7 ADOS/SGGB	696-2325
Radioactive Waste Manager	7 ADOS/SGGB	696-2325

14.2.2 Appendix C. Distribution List

7 BW/Commander (CC)

7 BW/Vice Commander

7 BW/Judge Advocate

7 BW/Public Affairs

7 MSG/CC

7 CES/CC

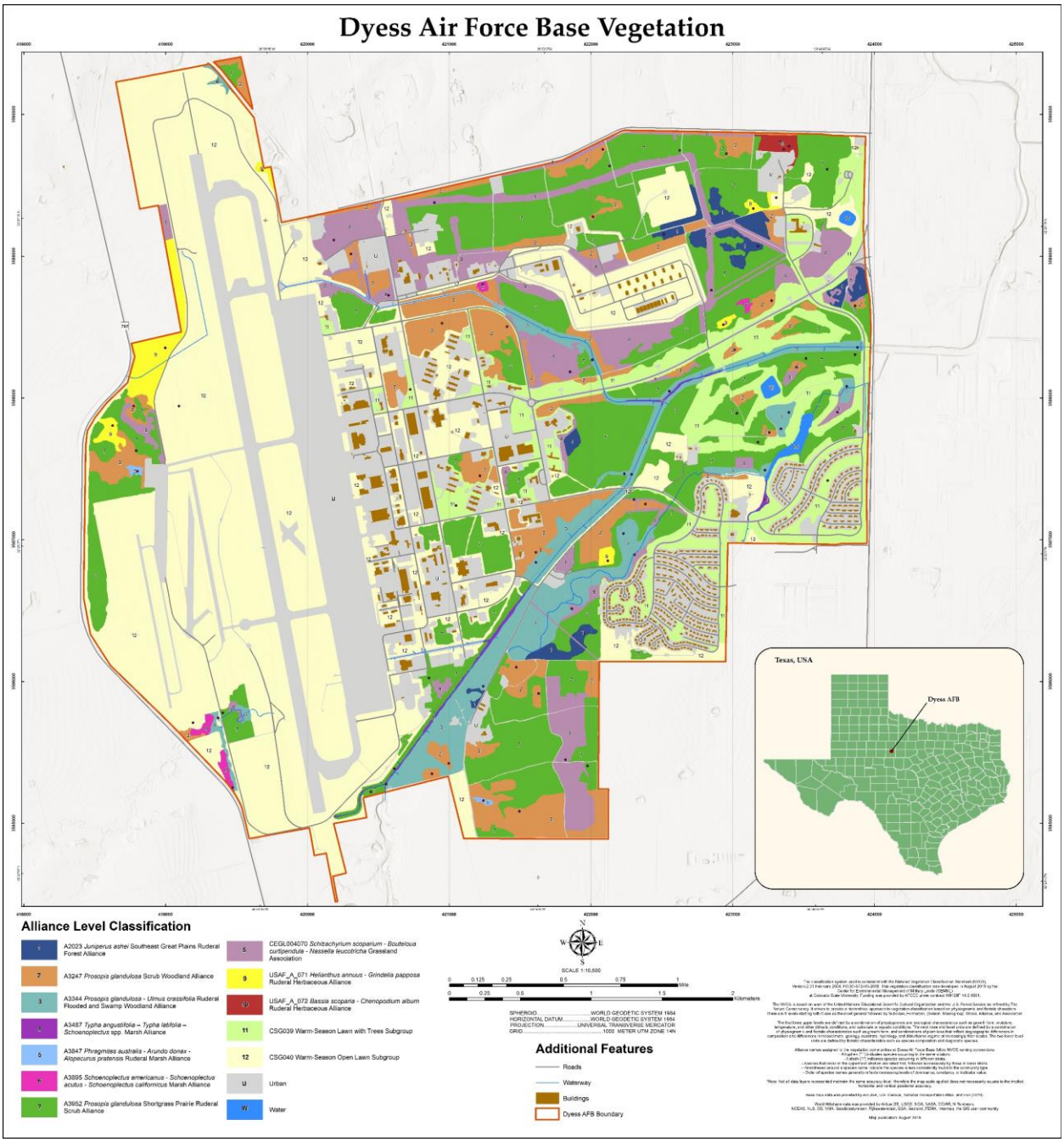
7 CES/CEA

7 CES/CEIE

USFWS Field Office

TPWD Field Office

14.2.3 Appendix D. Vegetation Maps



14.2.4 Appendix E. Riparian Plan

Contact the installation NRM (conner.cox.ctr@us.af.mil) for information about this plan

14.2.5 Appendix F. Fish and Wildlife Regulations

Contact the installation NRM (conner.cox.ctr@us.af.mil) for information about these regulations

14.2.6 Appendix G. Grassland Restoration/Avian Protection

Contact the installation NRM (conner.cox.ctr@us.af.mil) for information about this plan

14.2.7 Appendix H. Land Management Plan and Urban Forestry

Contact the installation NRM (conner.cox.ctr@us.af.mil) for information about this plan

14.2.8 Appendix I. Invasive Species Plan

Contact the installation NRM (conner.cox.ctr@us.af.mil) for information about this plan

15.0 ASSOCIATED PLANS

15.1 Tab 1—Wildland Fire Management Plan

15.2 Tab 2—Bird/Wildlife Aircraft Strike Hazard (BASH) Plan

15.3 Tab 3—Golf Environmental Management (GEM) Plan

15.4 Tab 4—Integrated Cultural Resources Management Plan (ICRMP)

15.5 Tab 5—Integrated Pest Management Plan (IPMP)