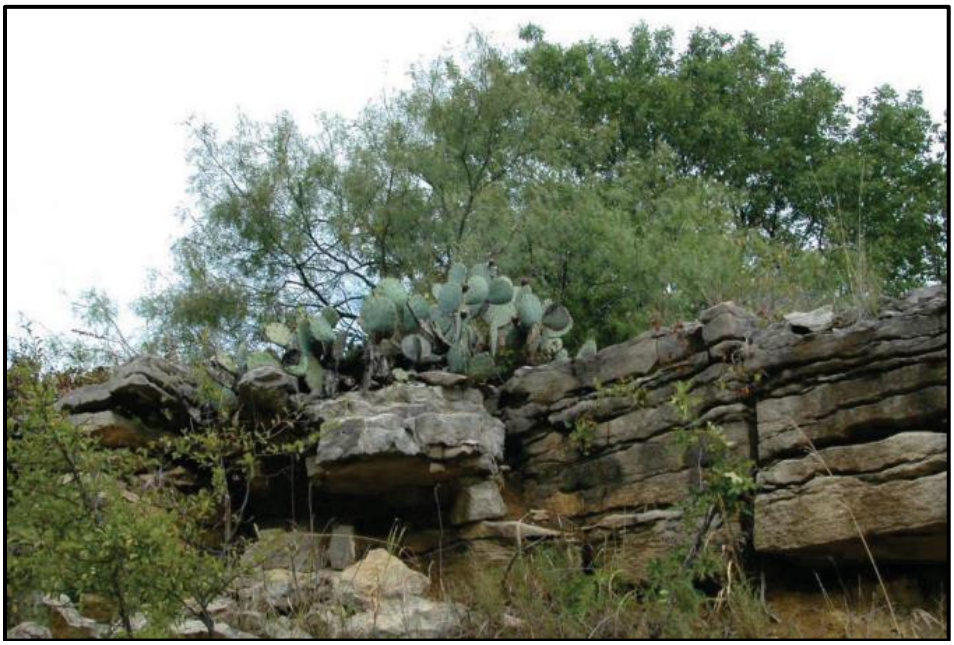
Fort Wolters
Mineral Wells, Texas
Parker and Palo Pinto Counties

Integrated Natural Resources Management Plan

2020



Rock outcropping from Rock Creek on Fort Wolters

Prepared by:
Natural Resources Environmental Branch
2200 West 35th Street
P.O. Box 5218
Austin, Texas 78763

Signature Page

This Updated Integrated Natural Resources Management Plan (INRMP) meets the requirements for INRMPs listed in the Sikes Act Improvement Amendments (16 U.S.C. 670a et seq.), AR 200-1, and Department of Defense Instruction 4715.03. It has set appropriate and adequate guidelines for conserving and protecting the natural resources of Fort Wolters.

_____ _____

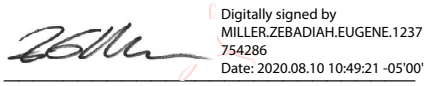
Date

Chief of Staff
I&E, Army National Guard

_____ _____

Date

Adjutant General
Texas Military Department



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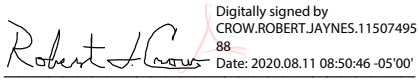
Date

Director of Facilities
Texas Military Department



_____ _____

Date

Base Operations Manager
TMD Training Centers Garrison Command
Texas Military Department

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Date

Base Operations Supervisor, Ft. Wolters
Texas Military Department

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Environmental Program Manager
Texas Military Department

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Date

Natural Resources Manager
Texas Military Department

Wildlife Agencies Signature Page

The U.S. Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife Department (TPWD) are both cooperating agencies in the development of INRMPs in Texas. An INRMP is not considered finalized until both agencies mutually agree to their respective components and it is signed by Army National Guard Directorate. The signatures below indicate the mutual agreement of each agency to the revised INRMP for Fort Wolters.

_____ _____
Date

Regional Director, Southwest Region
U.S. Fish and Wildlife Service

_____ _____
Date

Executive Director
Texas Parks and Wildlife Department

Annual Review and Coordination Page

This page provides for signatures and documentation of annual review and coordination for

Fort Wolters INRMP.

For Annual Review conducted on _____, 20____.

_____ _____
Date

Training Center Garrison Commander
Texas Military Department

_____ _____
Date

Construction and Facilities Maintenance Officer
Texas Military Department

_____ _____
Date

Environmental Program Manager
Texas Military Department

_____ _____
Date

Natural Resources Program Manager
Texas Military Department

_____ _____
Date

Sikes Act Coordinator
U.S. Fish and Wildlife Service

_____ _____
Date

Sikes Act Coordinator
Texas Parks and Wildlife Department

_____ _____
Date

Chief of Staff, I&E
Army National Guard

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Executive Summary

Fort Wolters is a 3,989-acre (1,614-ha) training site, located in north central Texas approximately one hour west of Fort Worth, licensed to the Texas Military Department (TMD) from the U.S. Army Corps of Engineers (USACE). Fort Wolters is used primarily for military training activities by the Texas Air and Army National Guard, ranging from billeting and small arms ranges to drop zones and helicopter landing areas. The majority of training activities are related to infantry training by the Texas Army National Guard (TXARNG) and drop zone use by the Texas Air National Guard (TXANG).

The purpose of this revised Integrated Natural Resources Management Plan (INRMP) is to support military training by guiding natural resources and land management at Ft. Wolters. The need for this INRMP is derived from the Sikes Act (16 USC 670a et seq.) and Army Regulation (AR) 200-1. This INRMP supports military training by identifying ways to support the sustainability of the training site and to provide information that facilitates those activities.

The INRMP goals are to support the TMD's mission of assisting with the compliance of relevant laws and regulations, support and enhance sustainability of TMD lands, and increase environmental awareness and training of soldiers, staff, and public. The objectives to meet these overall program goals include reviewing the INRMP annually, specifically the goals, objectives, targets, and projects with trainers, facility managers, and other agency personnel; revising the INRMP as needed or every 5 years (whichever is sooner); reducing the number of critical natural resource issues; and improving integration of natural resources data and guidelines with TMD planning. The mechanism for accomplishing these goals and objectives is identifying specific management areas and establishing specific goals and objectives for each of those areas and then implementing this plan.

The INRMP identifies the military mission and its effects on natural resources and vice versa. It also identifies resources and programs requiring natural resources management. The INRMP sets goals, objectives, and targets for that management and provides guidelines for natural resources and land management to maintain biodiversity and sustainability of Ft. Wolters with no net loss to the training mission. Furthermore, it describes the physical and biological conditions present at Ft. Wolters and provides an avenue for public involvement and coordination and cooperation with other agencies.

Chapter 1. Program Overview

1.1 Overall Natural Resources Program

1.1.1 Desired Future Condition

The desired future condition for the Natural Resources Program for Fort Wolters is an effective, robust program based on scientific principles and sound data that assists with land management planning and implementation and supports Master Planning for the installation for the long-term benefit and use of military training by integrating with the Integrated Training Area Management (ITAM) program and other facility maintenance functions.

1.1.2 Program Goals and Objectives

The overall program goals for natural resources management on TMD property are:

Goal 1: Support TMD mission
See all sections in this INRMP.

Goal 2: Assist TMD in complying with relevant laws and regulations
Obj 1: Review the INRMP annually, specifically goals, objectives, targets, and projects with trainers, facility managers, and other agency personnel.
Obj 2: Review the INRMP at least every 5 years for operation and effects and revise as needed.

Goal 3: Support and enhance sustainability of TMD lands
Obj 3: Reduce the number of critical natural resource issues.
Target: See all sections.
Obj 4: Improve integration of natural resources data and guidelines with TMD planning.
Target: Use Record of Environmental Consideration (REC) process to minimize impacts and improve integration.
https://portal.tx.ng.mil/arg/arg010/SitePages/env_rec.aspx

Goal 4: Increase environmental awareness and training of soldiers, staff, and public
See Section 3.2.
.

1.2 Design of the INRMP

1.2.1 Definitions of Key Terms

- Goal – broad summary of long-term intention
- Objective – specific item to be achieved that supports one or more Goals
- Target – measurable outcome with deadline to achieve Objective
- Project – specific activity derived from Targets; often a "project" is a "contract"; a "target" is sometimes a "project" as well

1.2.2 Plan Organization

This INRMP consists of 4 chapters and several appendices:

Chapter 1 provides an overview of the INRMP, including the overall goals and objectives, responsibilities, and compliance requirements.

Chapter 2 provides an overview of the current conditions and current use of the training site as well as a summary of projected changes.

Chapter 3 reviews each area of natural resource management and provides an overview of that program as well as identifying the goals, objectives, and targets associated with it.

Chapter 4 provides an overview of the implementation of the INRMP, including staffing, strategies, funding.

Appendices provide the supporting documentation in detail for readers interested in how the information presented in Chapters 1-4 was developed. Acronyms, Glossary, and Regulations are presented in Appendices A, B, and C, respectively. Standard Operating Procedures (SOPs) and Best Management Practices (BMPs) related to policy and programs are presented in Appendix D. The Environmental Assessment (EA) required to comply with National Environmental Policy Act (NEPA) requirements and the current REC are presented in Appendix E. (removed CR issue sentence) The summary goals, objectives, and targets table and a summary of Fiscal Year (FY)18-22 targets dates are found in Appendix F. A natural resources summary is presented in Appendix G. Complete species lists are presented in Appendix H. A complete summary of all reports generated from natural resources projects are presented in Appendix I. The complete written correspondence between TMD and other agencies during review of this INRMP are presented in Appendix J. A sample Prescribed Fire Plan is in Appendix K. Species summaries for priority invasive species management are in Appendix L. Species summaries for priority rare species management are in Appendix M.

1.2.3 Updating the INRMP

The INRMP is reviewed annually (see Chapter 4), and adjustments to the targets and project list are made accordingly. The INRMP is based on adaptive management, which requires regular and continual review of projects to verify they are meeting the targets summarized in Appendix F. Adjustments are made on a regular basis to continue moving toward those targets and objectives. Major revisions are made when substantial changes in natural resource management are needed, whether that is due to changes in mission, land condition, regulations, or another reason. This process follows the Environmental Management System (eMS) process – "Plan, Do, Check, and Act." "Plan" consists of the development of this INRMP. "Do" consists of accomplishing the targets and projects laid out in the INRMP. "Check" consists of analyzing the data from monitoring programs and from annual reviews with trainers, facility managers, the U.S. Fish and Wildlife Service (USFWS), and the Texas Parks and Wildlife Department (TPWD). "Act" consists of updating the targets and projects and revising SOPs and BMPs as necessary.

This revision of the INRMP is considered a major revision from the previous INRMP and required a complete review and NEPA process review. The revisions include the addition of goals and objectives, military transformation, new environmental review processes, organizational restructuring, changes in Army funding policy, and substantial increases in baseline information. This INRMP will undergo Annual Review by required parties (see Annual Review and Coordination Page) as well as a 5-year formal review to determine the need for revision.

The 5-year review consists of a formal review for operation and effect with the TMD, the USFWS, the TPWD, and the Army National Guard Installations and Environment Office (ARNG I&E), with a resulting determination to continue with the existing INRMP, update the existing INRMP, or revise the existing INRMP.

The targets will be updated annually to reflect completed projects and new information, based on Annual Review by the trainers, the USFWS, and the TPWD (see Section 4.3). Every 5 years during the Annual Review, the INRMP will be reviewed for operational effect, and a determination will be made whether a major revision is required per the Sikes Act, Sikes Act Improvement Act (SAIA), and associated Department of Defense (DoD) Policy.

1.3 Regulations and Policies

There are numerous regulations and policies that impact the development and implementation of the INRMP. Listed below are the key ones that shape this INRMP. Appendix C contains a complete list of environmental regulations and their purpose and applicability to the INRMP.

1.3.1 Sikes Act and Sikes Act Improvement Act

The Sikes Act and Sikes Act Improvement Act (SAIA) require development and implementation of an INRMP for appropriate DoD installations in cooperation with the USFWS and the state wildlife agency, TPWD. The Sikes Act requires that several elements be included in the plan, including goals and objectives, so the final result is no net loss of land to military training. The Sikes Act also requires an opportunity for public comment and annual reviews and reports of the implementation.

1.3.2 National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires federal agencies to consider the impact to the environment of any action. NEPA also requires public notification and public comment on the action under certain circumstances. This INRMP is accompanied by an EA and associated REC that can be found in Appendix E.

1.3.3 Endangered Species Act (ESA)

INRMP development and implementation are coordinated with the USFWS to satisfy Sikes Act requirements. Additionally, management of listed endangered and threatened species is discussed in Chapter 3, Section 3.11.

1.3.4 Army Regulation (AR) 200-1

AR 200-1 covers natural resources management. Army regulations guide environmental programs at Army installations including Army National Guard installations. Regulations cover water resources, land resources, endangered species, cultural resources, pollution prevention, and various other environmental programs.

1.4 Responsibilities

1.4.1 Installation Organizations

1.4.1.1 The Adjutant General (TAG)

TAG is the head of the TMD, which consists of the federal entities of the TXARNG and Texas Air National Guard (TXANG), as well as the state entities of the Texas State Guard (TXSG) and the Office of State Administration (OSA). TAG has the ultimate responsibility for operating and maintaining TMD facilities, including Ft. Wolters, and implementing the INRMP. In this capacity, TAG's responsibilities per AR 200-1 include the following:

- Ensure Base Support activities support military training in a manner conducive to environmental stewardship
- Ensure environmental requirements are identified and incorporated into the Master Plan and Range Complex Master Plan (RCMP)
- Implement and maintain a mission-focused eMS
- Ensure regular meetings of the Environmental Quality Control Committee (EQCC)
- Designate personnel responsible for major program requirements
- Ensure sufficient numbers of professionally trained Natural Resource personnel
- Hold tenants accountable

- Serves as chairman of both the EQCC and the Real Property Planning Board (RPPB)

1.4.1.2 Deputy Adjutant General for the Army (DAG-A)

The DAG-A has substantial oversight and responsibilities for ensuring that environmental considerations are incorporated at all levels of policy and project planning. The DAG-A is the chairman of the RPPWG and the delegated chairman of the EQCC board.

1.4.1.3 Operations and Training (J3/5/7)

J3/5/7 has primary responsibility for scheduling military training and ensuring the safety of all personnel while training is being conducted. J3/5/7 determines the training load at Camp Bowie based upon the force structure determined by the TAG, including developing a baseline of current and projected training requirements and facilities as well as planning for land use based on mission requirements while minimizing negative environmental effects. J3/5/7 is also responsible for allocating funds for and coordinating the ITAM Program through the Training Center Garrison Commander.

1.4.1.4 Training Center Garrison Command (TCGC)

TCGC and associated personnel are in charge of operations and maintenance of all training sites. TCGC personnel are key implementers of this INRMP. TCGC has direct oversight of the Range and Training Land Program (RTLP), the ITAM Program, and the ITAM Coordinator. The ITAM Program is responsible for some components of ecological restoration, erosion control, monitoring, and awareness. For more on the role of the ITAM Coordinator and Program, refer to Sections 1.5.1 and 4.2. TCGC also has direct oversight of the Training Site Manager for Ft. Wolters.

1.4.1.5 Base Operations Supervisor (Training Site Manager)

The Base Operations Supervisor of Ft. Wolters schedules training and other activities on site as well as supervises the day-to-day maintenance and repairs of facilities and training lands. The supervisor is also responsible for identifying and reporting impediments to training, ensuring that SOPs and BMPs are followed, protecting sensitive resources, and distributing Environmental Awareness materials to units and other users.

1.4.1.6 Director of Construction and Facilities Management Office (CFMO)

The CFMO provides a full range of facility planning, facility management, financial, and engineering disciplines for all TMD facilities. The CFMO is responsible for Master Planning, construction projects, and facility repair and maintenance funds. In conjunction with these roles, the CFMO is responsible for ensuring that all construction, repair, and maintenance projects comply with Environmental regulations and consult with Environmental prior to any construction projects. Repair and maintenance funds and projects are essential to the full implementation of this INRMP. The CFMO is also the Executive Secretary of the RPPB as well as a member of the RPPB (see Section 1.5.2).

1.4.1.7 Environmental Management Branch (Env Branch)

The Environmental Branch is organized within the CFMO and is responsible for supporting and ensuring compliance and conservation requirements, for all TXARNG facilities and training lands, comply with municipal, state and federal laws. The Env Branch has direct oversight of Natural Resources, Cultural Resources, Hazardous Material Compliance, RCRA, GIS, Training, Pest Management, JLUS, ACUB, eMS, and Stormwater/Clean Air/ Clean Water Programs. The organization also provides technical assistance to facilities maintenance and planning personnel by developing projects; securing permits; conducting field studies; providing Environmental Awareness materials; GIS mapping and monitoring natural and cultural areas; preparing and revising various plans; and providing oversight of the NEPA process. The Env Branch facilitates cooperation on environmental issues between military operations and other government agencies at the local, state, and federal levels.

1.4.1.8 Public Affairs Officer (PAO)

The PAO serves as the liaison with the public in public meetings, prepares press releases, and generally interacts with various neighbor and community groups.

1.4.1.9 Texas Military Department (TMD)

The TMD is the state of Texas landowner of Camp Bowie on behalf of the Adjutant General of Texas. The CFMO provides facility management, primarily repair and maintenance of buildings and real property actions, for TMD property. The TMD properties are maintained with a combination of state and federal fund.

1.4.2 ARMY National Guard Directorate

The Army National Guard Directorate (ARNG-D), a federal component of the National Guard Bureau (NGB), is the federal agency responsible for providing Army funds for facility and land management to the 54 state ARNGs. Installations and Environment (I&E) is the responsible office within ARNG-D for ensuring requirements of the Sikes Act are implemented. ARNG I&E reviews the INRMP and other plans, reviews and approves NEPA documents, reviews and approves environmental funding requests, and provides technical expertise and reporting tools. ARNG I&E coordinates and reviews proposed construction projects, reviews installation and engineering funding requests, and provides design and construction support through the CFMO. ARNG-D Training (TRS) coordinates the ITAM Program with other training support requirements, reviews and approves the ITAM work plan, and provides technical expertise.

1.4.2 U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department

The USFWS and the TPWD are cooperators in the development of and must mutually agree to the INRMP. In this capacity, the USFWS has the responsibility to review and comment on drafts of the INRMP. In their role during Section 7 consultations for the ESA, the USFWS has the responsibility to ensure no taking of threatened or endangered species or to issue biological opinions and permits, if applicable. In their roles as cooperators per the Sikes Act, USFWS and TPWD have the responsibility to provide input to the goals, objectives, and targets for the INRMP and either provide a signature or a letter of mutual agreement on the final INRMP. TPWD Game Wardens also assist with natural resources law enforcement when necessary. In addition, the USFWS and TPWD participate in an annual review of the INRMP and implementation progress and a formal 5-year review process to determine if the INRMP needs revision.

1.4.3 Native American Tribes and Texas Historic Commission (THC)

Federally recognized tribes with historic interests in Ft. Wolters are provided an opportunity to comment on the INRMP per DoD American Indian and Alaska Native Policy. Their comments can provide useful information and identify projects not recognized by other stakeholders. In addition to reviewing plans, TMD collaborates with interested tribes on various activities to achieve the goals identified in this INRMP. For example, the TMD can include tribal participation in deer harvesting and brush management to achieve specific targets. The THC is also given an opportunity to comment on the INRMP via the Section 106 process of the National Historic Preservation Act. The THC is the State Historic Preservation Office (SHPO) for Texas.

1.5 Integration with Other Programs

1.5.1 Sustainable Range Program

The Sustainable Range Program (SRP) is the Army's overall approach for improving the way in which it designs, manages, and uses its ranges to ensure long-term sustainability. Its core programs, the Range and Training Land Program RTLP and the Integrated Training Area Management ITAM Program, define the SRP. The RTLP integrates mission support, environmental stewardship, and economic feasibility and defines procedures for determining range projects and training land requirements to support live-fire and maneuver training. The ITAM is responsible for maintaining training land to help the Army meet its training requirements. The RTLP and ITAM Program are core programs managed by the TCGC. In addition, the RCMP is compiled by the TCGC as part of the SRP. The Range Complex Master Plan, RCMP, provides an overview of available assets, identifies users, and establishes training capabilities. The RCMP also provides short- and long-term project plans related to training assets.

The TCGC ITAM Program is completely integrated with the Natural Resources Program, and personnel from both organizations work together as the "Land Management Team." The ITAM Coordinator is involved in every step of the development of the INRMP and is a key player in project implementation. The ITAM Program consists of Land Rehabilitation and Maintenance (LRAM), Range and Training Land Assessment (RTLA), and Sustainable Range Awareness (SRA). LRAM is incorporated in the INRMP in the sections on erosion and sediment control (Section 3.4), fire management (Section 3.5), invasive species management (Section 3.6), and vegetation management (Section 3.8). RTLA is incorporated in the section on monitoring (Section 3.3). SRA is incorporated in the section on awareness (Section 3.2).

1.5.2 Real Property Planning Board and Master Planning

The RPPB is the primary means by which land use planning occurs in the TMD. It is chaired by the TAG, and it is organized by the CFMO. The DAG-A chairs the Real Property Planning Work Group. This board reviews projects from various proponents, prioritizes projects, and approves land use actions. The RPPB takes recommendations from 4 working groups, with 2 groups being critical to land management. The Range Utilization Board is a key group related to the development and oversight of implementation of the RCMP (see Section 1.5.1).

1.5.3 Other Environmental Programs

Natural Resources personnel coordinate daily with personnel from other Environmental Programs, including Cultural Resources, Clean Air, Clean Water, Hazardous Waste, and NEPA. The development of the INRMP involves input from both Natural and Cultural Resources Programs. Any natural resources actions that may affect cultural resources are coordinated through the Cultural Resources Manager and follow the ICRMP.

1.5.4 Neighbors/Regional Plans by Others

Interaction with neighbors and regional land use planning efforts is done by a variety of personnel, including staff in Environmental, TCGC, CFMO, PAO and the Command Group. Natural Resources personnel also will continue to provide input to the regional or statewide plans of other organizations, such as the TPWD and the Nature Conservancy.

1.5.5 Other Agencies, Non-governmental Organizations, and Public

When appropriate, Natural Resources personnel are involved with other organizations, such as Texas A&M Forest Service (TFS) and TPWD, in efforts to monitor and control invasive species, manage forests, and conduct ecological restoration. During the public comment period, drafts of this INRMP are sent to non-governmental organizations (NGOs), university staff, agricultural extension services, and other known interested parties. Additionally, the drafts are made available for comment from the public in

neighboring libraries, at the training site, and at the headquarters at Camp Mabry in Austin, Texas.

Chapter 2. Current Conditions and Current Use

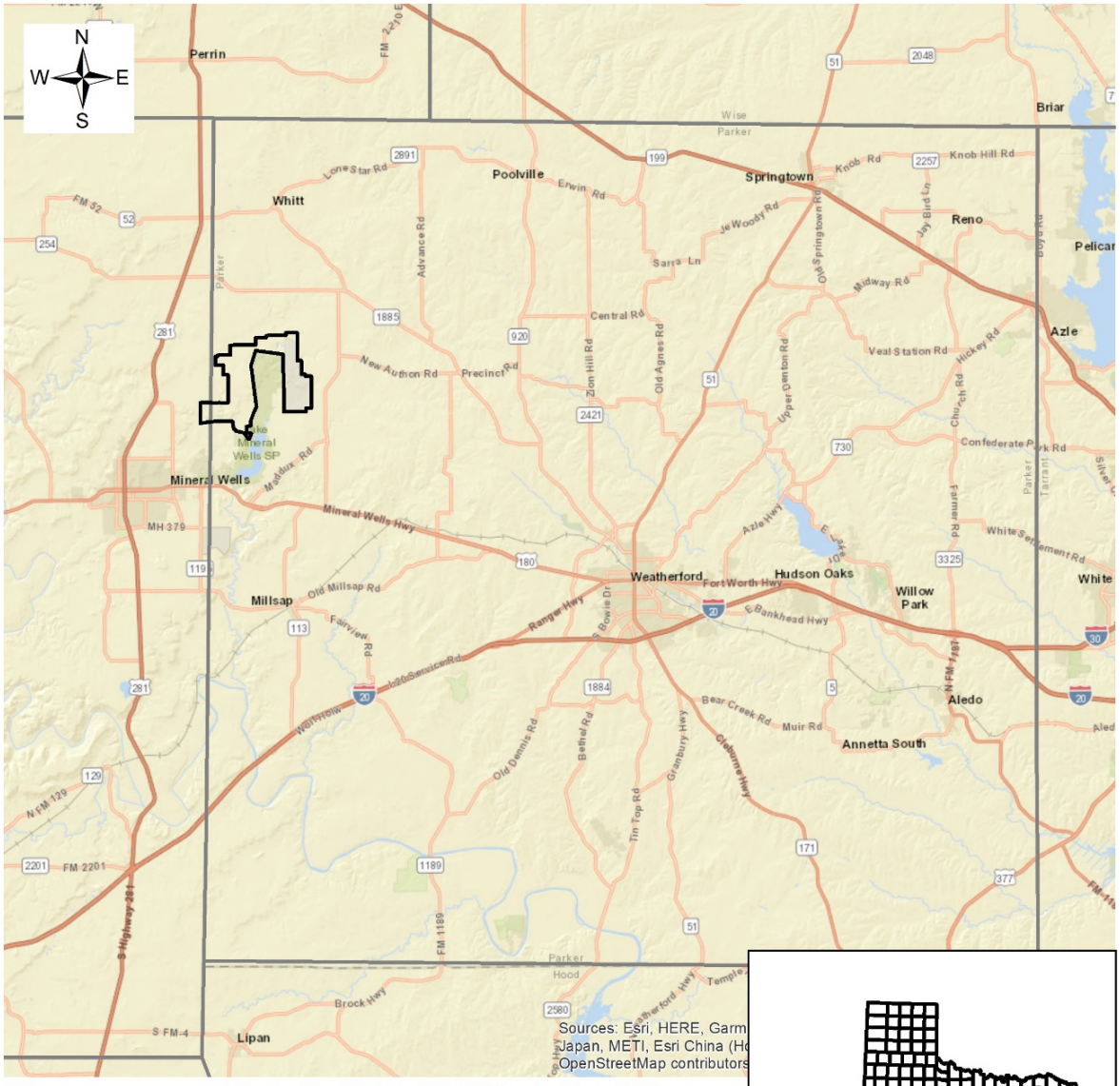
2.1 Site Description

2.1.1 Location, Map, Acreage, Boundary

Fort Wolters is a 3,989-acre (1,614-ha) TXARNG training site located in Parker and Palo Pinto Counties in north-central Texas, 3 miles (4.8 km) northeast of the city of Mineral Wells and approximately 1 hour west of Fort Worth (Figure 2-1). Four smaller communities, Peadenville, Salesville, Whitt, and Garner, are located within 3.5 miles (5.6 km) northwest of Fort Wolters. The site is a U-shaped tract that wraps around Lake Mineral Wells State Park at the transition between the Oak Woods and Prairies and Blackland Prairies Natural Regions of Texas in an ecoregion called the Western Cross Timbers.

2.1.2 Facilities, Ranges, and Infrastructure

Fort Wolters is federally owned by the Army Corps of Engineers and licensed to the TXARNG for use as a training site. Approximately 80 acres (33 ha) consists of improved grounds associated with buildings, 150 acres (61 ha) consist of range infrastructure (firing points, towers, and targets), and the remaining 3,759 acres (1521 ha) consist of primarily unimproved grounds. Current improvements consist of 2 cantonment areas with billets for over 400 soldiers and dining, administration, classrooms, and maintenance facilities. Approximately 1,767 acres (715 ha) are available for light maneuver training and 2,158 acres (873 ha) are available for heavy and light maneuver training. See Table 2-1 for complete list of support and training facilities available through the 7 training areas (TAs) at Fort Wolters (Figure 2-2). Bivouac sites are located throughout Fort Wolters.



This map was generated for the Fort Wolters INRMP by the Texas Military Department

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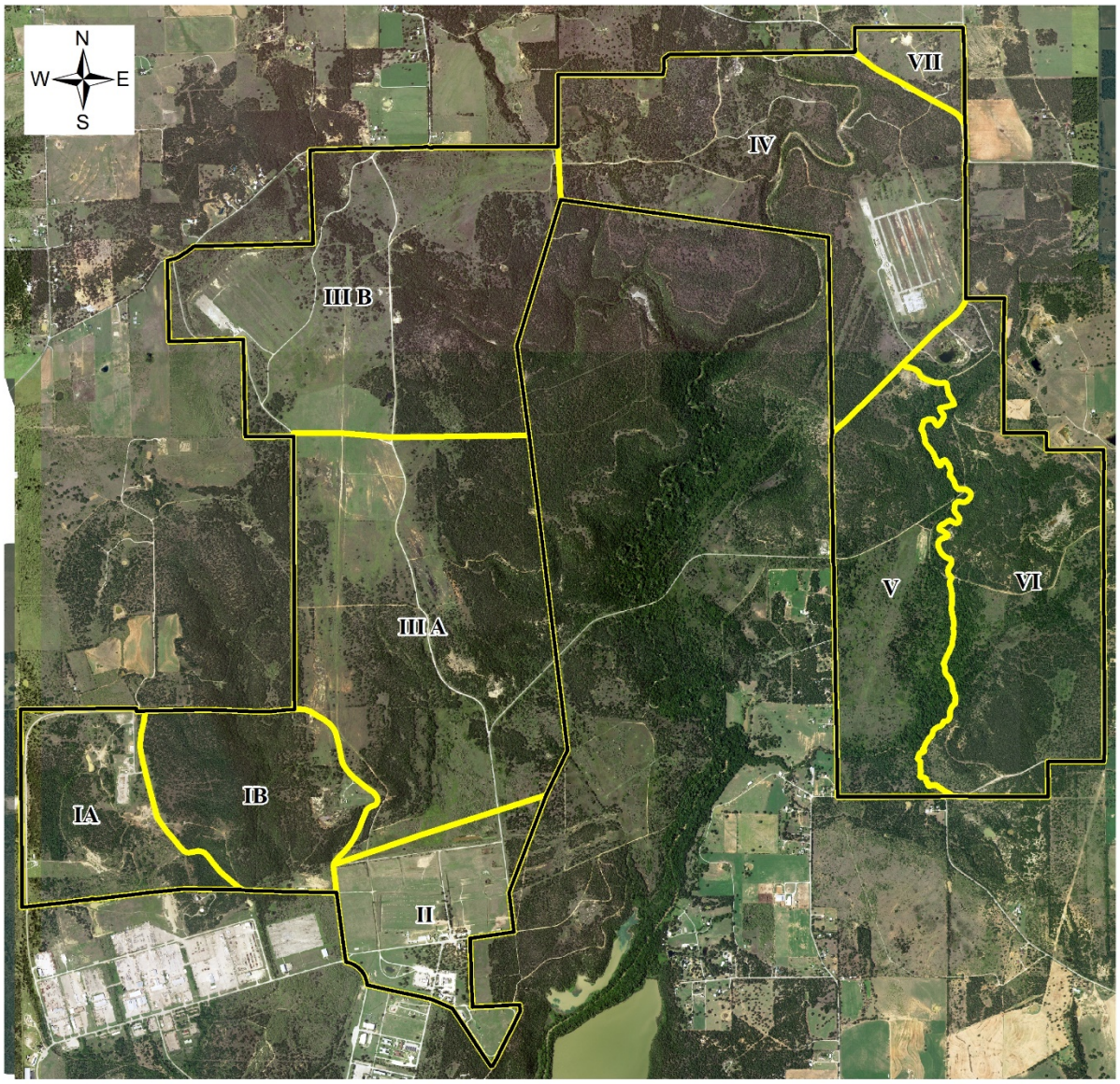
Natural Resources
NGTX-FE
30 Jan 2020

Figure 2-1. Map of Location of Fort Wolters

Support Facilities	TA	Live Fire Training Facilities	TA	Non-Live Fire Training Facilities	TA
Headquarters Building	II	10/25m Zero Rifle Range	II	Land Navigation Course-3	IV/V/ VII
Billets for 408 People	II	Modified Record Fire Rifle Range	II	Nuclear/Biological/ Chemical Course	II
Large Dining Facility	II	Combat Pistol Qualification Range	II	Mobile Operations in Urban Terrain Site	IV
Modular Billets for 175 People	II	Pistol/Submachine Gun Range	II	Personnel and Equipment Drop Zone (planned expansion)	IIIA
Small Dining Facility	II	Known Distance Range	II	Staging Fields (2)	IV/IIIB
Offices (3)	II	Grenade Launcher M203 Range	II	Improvised Explosive Device Defeat Lanes (under construction)	Multiple
Vehicle Washrack	II			Bivouac Sites	Various
Unit Training Equipment Site Facility	II			Hand Grenade Qualification Course	IB
Ammunition Supply Point	II			HMMWV Egress Assistance Trainer (HEAT)	II
Modular Classrooms	II				

Table 2-1. Summary of Support and Training Facilities Present at Fort Wolters



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Natural Resources
NGTX-FE
30 Jan 2020

0 2,000 4,000 Meters

Boundary
Training Area

Figure 2-2. Map of Fort Wolters Training Areas

2.2 Facility Use

2.2.1 Military Mission

Fort Wolters is part of a complex with Camp Bowie and the combined complex is classified as a Maneuver Training Center – Light. The Camp Bowie/Fort Wolters Complex is the primary site for pre-mobilization training (PMT) for all units stationed west of Interstate 35 and in the northern part of the state. Fort Wolters can accommodate 1 battalion. A significant component of the military training at Fort Wolters is associated with Special Forces, Airborne, and Joint Training operations to include Air drop/Air land. Approximately 3,835 acres (1,552 ha) of this land is available for light and, occasionally, heavy maneuver training as well as land navigation courses, drop zone, weapons qualification, combat engineering skills, and other training for combat readiness for platoons and companies.

2.2.2 Utilization

2.2.2.1 Military

All branches of the DoD, mostly Reserve units, use Fort Wolters. The primary TMD users are currently the 56th Infantry Brigade Combat Team and the 136th Air Guard with use by various TXARNG engineering battalions, aviation units, combat support battalions, and armored battalions. The 610th SFS of the Air Force have an agreement to build a cantonment area and are a key user of Fort Wolters. Reserve Officers' Training Corps (ROTC) groups from universities also utilize Fort Wolters.

The TXARNG have transformed from an armored division to an infantry division. This has resulted in limited use of tracked vehicle use, primarily by engineering units, and an increase in infantry training exercises, such as live fire range use, convoy operations, and small-scale field training exercises.

2.2.2.2 Non-military

There are also several non-military users, including the Texas State Rifle Association, Boy Scouts, Young Marines, and various state and local law enforcement groups.

2.3 Mission and Natural Resources

2.3.1 Mission Aspects and Impacts to Natural Resources

In general, physical impacts to natural resources can be minimized by limiting total use, redistributing use, modifying types of use, altering behavior of use, and/or manipulating the natural resources for increased durability. Modifying types of use and altering behavior of use are addressed throughout Chapter 3, particularly with regards to development of SOPs and BMPs and identifying new ways to accomplish tasks, particularly in facility management. The manipulation of natural resources to increase durability and resilience is addressed throughout Chapter 3, particularly in Sections 3.4 and 3.8.

Some key actions that can minimize impacts generally include avoiding repeated and unnecessary activity on wet soils, avoiding soil disturbance early in the non-growing season, which results in higher risk of erosion, using equipment appropriate for the task, minimizing damage to woody plants, and siting activities appropriate to the soil (e.g. digging activities on deep, productive, low erodibility soils).

Another key action is redistribution of use, which does not change the total amount of use or the types of land uses but reduces overutilization of some areas and underutilization of others. Section 3.1 identifies targets required to determine areas of over and underutilization and to determine actions needed to rectify any imbalances in use.

2.3.1.1 Facilities Maintenance

The first aspect of the mission that affects natural resources is the indirect avenue of facilities maintenance to support military training. Facilities Maintenance includes land management, such as grounds maintenance, road maintenance, pest management, brush management, fire management, and other related items as discussed in Chapter 3. The majority of negative impacts of these activities occur in the form of soil compaction, erosion and sediment loss, and changes to vegetation structure and related wildlife. Facilities management as identified in this INRMP also has many positive impacts as discussed in Chapter 3. These include building maintenance and other related activities that usually have minimal impacts on natural resources once the buildings are constructed.

The REC process captures potential impacts from facilities maintenance activities (see Section 1.5.3).

2.3.1.2 Military Training

The second aspect is military training itself, which can result in intensive land use. Overuse of training areas can result in loss of vegetative cover, rutting, soil compaction, and erosion. Military training often requires clearing and maintaining areas for landing zones, drop zones, bivouacs, and ranges. Wildfire risks are possible from live fire exercises, which can lead to habitat loss and soil disturbance during wildland fire operations (firebreak construction, heavy vehicle traffic). The majority of impacts from these activities occur in the form of soil compaction, erosion and sediment loss, and in changes in vegetation structure and related wildlife.

Military activities during periods of high soil moisture significantly increase the likelihood of damage, particularly from soil compaction. In the past, many trails were constructed with little regard to location, long-term stability, soil type, or erosion control. Once a trail was created, other vehicles often followed. This scenario eventually leads to a random network of trails, often in unsuitable locations, that lead to expanding and expensive erosion problems easily observed in aerial imagery. Section 3.3 in Appendix F identifies targets required to determine unsuitable areas for roads and trails and the actions needed to minimize future disturbances and damages at the training center.

2.3.2 Natural Resources Management Aspects and Impacts to Mission

The three aspects of natural resources management that impact the military mission are vegetation management (Section 3.8, including fire management Section 3.5), erosion and sediment control (Section 3.4), and invasive animal management (Section 3.6). Vegetation management opens the understory and reduces canopy cover, which facilitates most forms of training and can reduce vegetation loss due to soil compaction and erosion. Erosion and sediment control keeps training areas open to the military by stabilizing and restoring landscape. Invasive animal management protects soldiers by reducing their exposure to wild pigs.

2.4 Regional Land Use

Land around Fort Wolters has primarily been used for farming and ranching with associated residences. Weatherford College occupies an area southwest of the installation that was part of Fort Wolters during World War II. Lake Mineral Wells and Lake Mineral Wells State Park are located south and adjacent to the installation. Recent changes in land use mimic those across Texas with more urban residents acquiring land away from the city, either for full-time or part-time residences.

2.5 Site History

Land comprising Fort Wolters includes parcels acquired by the federal government in 1925 as part of 2,350 acres (951 ha) leased by the federal government for a National Guard training facility. During

World War II, the post was expanded to 7,500 acres (3,035 ha). After serving as a helicopter-training base during the Vietnam War, approximately half of the acreage and buildings were sold to individuals or given to the City of Mineral Wells and 3,982 acres (1,612 ha) were licensed to the TXARNG in 1973. Original buildings, including fueling and munitions sites, are now outside the training facility with the exception of 1 helicopter staging site and the Nike anti-ballistic missile site.

2.6 Physical Setting

Fort Wolters is located on the Pennsylvanian-age strata of the Strawn Group, with the Mineral Wells Formation as the only geologic unit exposed at the surface. Shale, sandstone, and limestone occur in bands throughout Fort Wolters as moderately deep sandy or loamy soils over sandstone or clay, falling into 2 major soil groups, Truce-Bonti and Chaney-Truce-Bonti. Typically, soils at Fort Wolters are either potentially highly erodible or highly erodible with K Factors between 0.25 and 0.36. The terrain ranges from nearly level to sloping with elevations from 870 to 1,030 ft. above sea level, with a few steep escarpments. There are 4 major watersheds present on Fort Wolters, which all drain into Rock Creek, then Lake Mineral Wells, and ultimately the Brazos River. There are approximately 24 acres (10 ha) of wetlands across 61 sites and approximately 11 acres (5 ha) of open water across 29 ponds. All the open water sites are man-made and mostly dry out during the summer. There are approximately 29 miles (46.7 km) of streams on Fort Wolters, with approximately 6 miles (9.7 km) of perennial streams and the remainder as intermittent streams. The climate is subtropical and subhumid with hot, humid summers and dry winters. The average winter high temperature is 61 °F, and the average winter low temperature is 36 °F. The average summer high temperature is 96 °F, and the average summer low temperature is 71°F. Average rainfall is 32 inches/year. Average first freeze is November 12, and average last freeze is March 20 (30 Year Average Climate Data from NOAA Climatic Summaries). See Appendix G, Environmental Overview, for complete details of the physical setting, including maps of all features.

2.7 Biological Setting

Fort Wolters is located in the Western Cross Timbers at the transition between the Oak Woods and Prairies and Blackland Prairies ecoregions of Texas. Plant communities present include Post Oak-Blackjack Oak Woodlands, Ashe Juniper-Oak Woodlands, Little Bluestem-Indiangrass Grasslands and Sugar hackberry-Elm Riparian Woodlands. Fort Wolters also has the potential to have vine mesquite (*Panicum obtusum*)-Buffalograss (*Bouteloua dactyloides*) Prairie in a few locations as well as sideoats grama (*Bouteloua curtipendula*) mixed with Post Oak Woodlands and Hackberry Woodlands. There are no listed species present, but there are at least 11 rare plant and 30 rare animal species documented at Fort Wolters, along with 42 non-native plant and 11 non-native animal species. There is a high diversity of plants (over 600 species), vertebrates (190 species), and invertebrates (at least 600 species across 116 families) at Fort Wolters. Baseline surveys have been completed for plants, reptiles, amphibians, birds, mammals, aquatic invertebrates, and insects (see Appendix H for species lists). See Appendix G Environmental Overview for complete details of the biological setting, including maps.

Chapter 3. Natural Resources Management

3.1 Management Framework

LEGAL AUTHORITIES: Sikes Act, DoD Instruction 4715.03, AR 200-1
PROPONENTS: Natural Resources, ITAM, GIS

3.1.1 State-and-Transition Model

A state-and-transition model identifies the possible types of plant communities for a given region and soils by describing vegetation patterns and hypothetical causes of change. The models also describe persistent transitions in vegetation as well as suggest the mechanisms underlying those dynamics. The formulation of a state-and-transition model involves identifying the vegetation states, determining which of the states are linked, and describing the transitions. The current state of the landscape depends on what "inputs" have occurred and what the starting point of the landscape was. Movement between some states occurs without any inputs other than time, while other transitions require substantial input. The boxes in the diagram (Figure 3-1) indicate greater or lesser amounts of energy or inputs needed to move the landscape from one state to another. It takes more inputs to move between the larger boxes than the smaller boxes. The standalone boxes take even more energy.

The following state-and-transition model is based on the National Resources Conservation Service (NRCS) models for the ecological sites present at Fort Wolters (see Appendix G for more details). Not all potential states are necessarily depicted here, and this model will be updated as more information becomes available. The information presented illustrates that changes in communities occur as a result of disturbance, management, and natural factors.

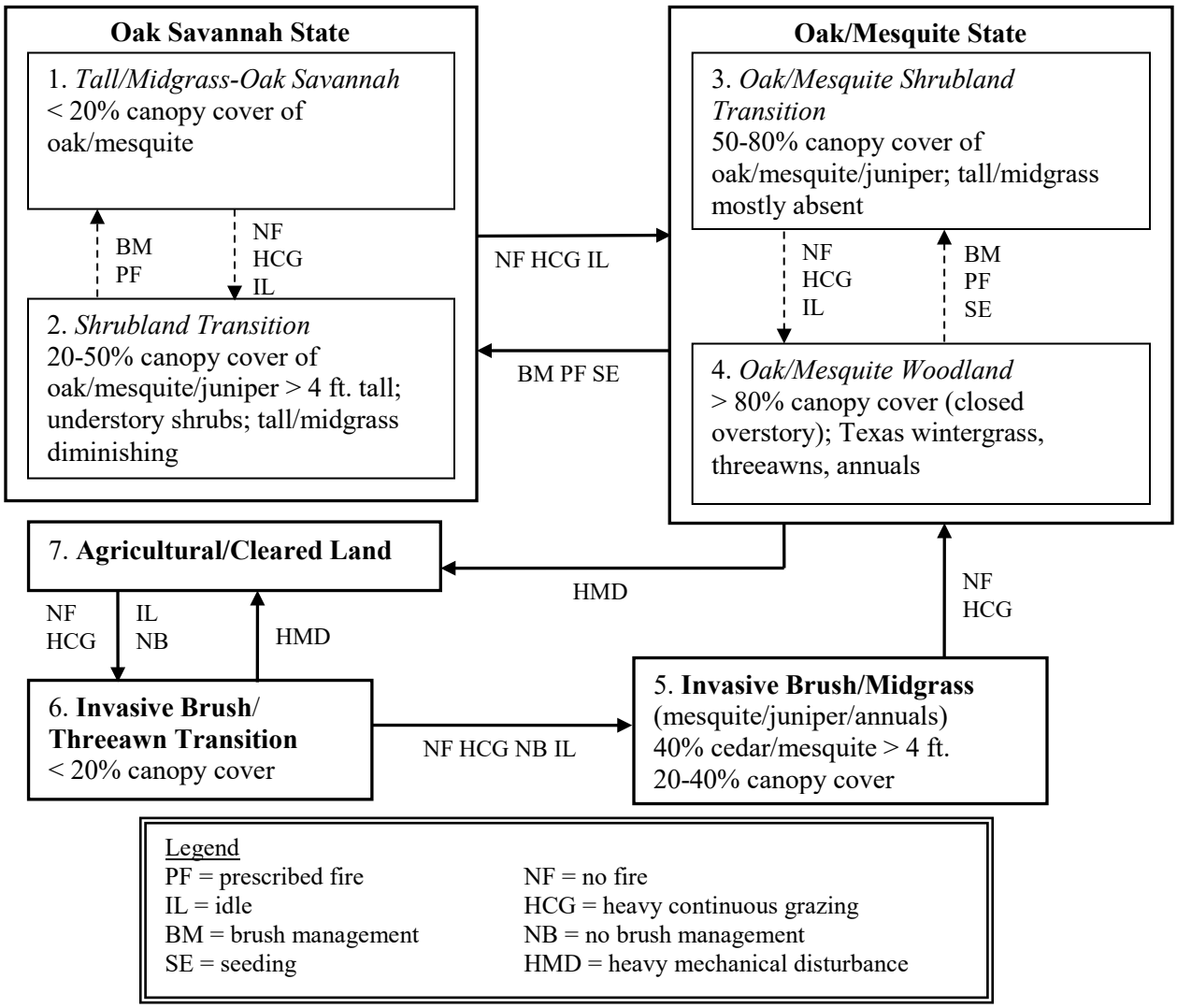

Figure 3-1. State-and-Transition Model for the Most Common Ecological Site at Fort Wolters
Sandy Loam PE 36-52 (Based on NRCS models)

3.1.2 Management Philosophy

The desired future condition of Fort Wolters is to provide the most land for training in the most sustainable way possible within the constraints of the habitats and ecosystem present, with a mosaic of habitat types linked by hydrologic flow, nutrient cycles, fire, animal movement, and transitional zones. To achieve this condition, ecosystem management and two related land management tools—adaptive management and watershed analysis—must be used.

Ecosystem management is "driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem structure and function" (Christensen et al. 1996). For example, the goals, objectives, and targets defined in this management plan will be accomplished by following the guidelines in the plan; all management actions will be monitored; and management will be adapted according to monitoring results—thus, an endless feedback loop. Ecosystem management is based on a holistic, systems-oriented approach and not on single species management or maximizing the prevalence of a small group of organisms. Rare species management should complement the conservation

of a healthy ecosystem.

The goal of ecosystem management on military training lands is to ensure that military lands support present and future training requirements while, as much as possible, preserving, improving, and enhancing an ecosystem's characteristics and communities of which it is comprised. Over the long term, that approach will maintain and improve the sustainability and biological function of ecosystems, while supporting sustainable economies, human use, and the environment required for realistic military training operations (DoD Instruction 4715.3).

Adaptive management is the process of linking ecological management within a learning framework. Monitoring is the cornerstone of adaptive management—the only way to evaluate, learn, and adapt. The characteristics of adaptive management include (Unnasch and Maddox 2005):

- Recognition of the low probability of predicting the future state of populations or systems and the complexity of natural systems
- Recognition that extrapolation is difficult
- Use of experience to learn incrementally, treating all conservation activities as experiments
- Minimization of risk to species, communities, and ecosystems
- Acknowledgement that local actions may have effects elsewhere, at different scales at different time lags
- Management that is cyclic and incremental in nature

Watershed analysis is one of the principal analyses that will be used to meet the ecosystem management objectives of this INRMP. Watershed analyses will be the mechanism to support ecosystem management based on sub-watersheds identified on site as well as the larger watershed that contains Fort Wolters. Watershed analysis will focus on collecting and compiling information within the watershed that is essential for making sound management decisions. It will serve as the basis for developing project-specific proposals and determining monitoring and restoration needs for a watershed.

3.1.2.1 References

Christensen NL, Bartuska AM, Brown JH, Carpenter S, D'Antonio C, Francis R, Franklin, JF, MacMahon JA, Noss RF, Parsons DJ, Peterson CH, Turner MG, Woodmansee RG. 1996. The report of the ecological society of America committee on the scientific basis for ecosystem management. Ecol. Appl. 6:665-691.

Unnasch R, Maddox D. 2005. Monitoring and assessment in support of military training. Boise (ID): Sound Science LLC.

3.2 Awareness

3.2.1 Program Summary

LEGAL AUTHORITIES: Sikes Act, DoD Instruction 4715.03, AR 200-1
PROPONENTS: ITAM, Natural Resources, Environmental

The Environmental Branch has responsibilities for educating soldiers and training site staff and headquarters staff about land management activities and issues. The Environmental Program produces and distributes environmental awareness materials and conducts environmental training for various personnel throughout the TMD using a variety of mechanisms.

The Sikes Act requires public access to the training site when appropriate and without affecting the military mission. Due to consistent heavy training activity at Ft. Wolters, public access for recreational or educational purposes is not practical.

3.3 Monitoring

3.3.1 Program Summary

LEGAL AUTHORITIES: Sikes Act, DoD Instruction 4715.03, AR 200-1
PROPONENTS: ITAM, Natural Resources

The Monitoring Program is designed to assess the impacts of the management actions taken on the landscape within the framework of the status and trends of the ecological communities. The results are used to assess and direct management activities and, therefore, are the primary data required for adaptive management.

In 2004, a project was initiated to identify insect indicator species for use in assessing changes in habitat due to training activities. Insects are generally good candidates due to high population numbers, high species diversity, short generation times, and mobility. In particular, ground beetles (Coleoptera: *Carabidae*) and ants (Hymenoptera: Formicidae) have been shown to be useful indicators in habitat assessment in other locations. Ft. Wolters has a high diversity of both groups based on surveys completed in 2010, and further data collection will be done through planning level surveys.

Every component of land management requires some level of monitoring. Some components only require minimal and qualitative monitoring, while other components require regular and quantitative monitoring. The initial task in the Monitoring Program is to identify which components need to be monitored and how they need to be monitored. These elements along with the others identified in Section 3.3.1 will contribute to the Monitoring Plan that will bring all the monitoring needs and protocols into one place.

3.4 Erosion and Sediment Control

3.4.1 Program Summary

LEGAL AUTHORITIES: Clean Water Act, Sikes Act, DoD Instruction 4715.03, AR 200-1
PROPONENTS: Facilities Maintainence, Engineering, Natural Resources, ITAM

Erosion is the detachment of particles of soil, sediments and rocks that occurs by hydrological (i.e. water-related) processes of sheet erosion, rilling, and gully erosion, and through mass wasting and the action of wind. Where land use causes soil disturbance, erosion may increase greatly above natural rates. Plant and litter cover protect the soil from raindrop impact and splash, tend to slow down the movement of surface runoff, and allow excess surface water to infiltrate. Soil erosion can both cause vegetation loss as well as be the result of vegetation loss. Vegetation loss results in greater stormwater runoff, which results in less water entering the ground, thus reducing plant productivity even further. Soil erosion also reduces basic nutrients needed for plant growth and survival, and it decreases the diversity and abundance of soil organisms.

Soil compaction is a key cause of soil erosion due to changes in soil strength, penetration potentials, water infiltration, aeration, erosion potentials, nutrient dynamics, and gaseous losses, most of which affect seedling establishment. Compaction can be defined as the application of forces to a soil mass, which results in increased soil density and strength. The susceptibility of a soil to compaction is primarily a function of soil moisture, texture, and organic matter content. Compaction contributes to erosion by reducing vegetative cover and reducing infiltration rates and, therefore, increasing overland flow and

erosion. Soil compaction is caused by facilities maintenance, former grazing and hunting leases, and training activities. If soil compaction is combined with activities on slopes greater than 12° and/or longer slopes, erosion problems increase exponentially.

Sediments in streams degrade water supplies and provide an important medium for a wide range of chemical pollutants that are readily absorbed on sediment surfaces. Soil erosion is an important ecological, social, and economic problem and an essential factor in assessing ecosystem health and function. Estimates of erosion are essential to land and water management, including sediment transport and storage in lowlands, reservoirs, estuaries, and irrigation and hydropower systems. Erosion is a fundamental and complex natural process that is strongly modified, usually increased, by human activities such as land clearing, agriculture, forestry, construction, surface mining, and urbanization. Erosion, once started, can become difficult and expensive to reverse with substantial loss of topsoil.

Managing existing erosion and preventing new erosion is a cooperative, coordinated effort among ITAM, Natural Resources, Environmental Branch-Compliance, and CFMO Programs. Each program has a portion of the funding and responsibility for addressing erosion. The basic foundation of the Sediment and Erosion Control Program is the prediction, prevention, quantification, and control of erosion.

Fort Wolters is located in a semi-arid environment with soils that are moderately erosive, resulting in a relatively inelastic ecosystem. The soils at Fort Wolters are generally problematic because they are sandy loam or loamy sand over clay subsoil. These soil conditions are relatively fragile, since sands erode relatively easily once vegetation cover is removed. Restoration of these soils, once erosion begins, is relatively difficult since precipitation events can erode soils faster than vegetation can colonize the sites (see Appendix G for a thorough discussion of soil types and potential for erosion of soils at Fort Wolters, as well as maps of soil types and existing erosion areas).

A watershed assessment was completed in 2005 that documented all the erosion sites and their current condition (see Table 3-1 for summary), as well as general watershed health. Prior to this assessment, several major erosion problems had been identified by ITAM and Natural Resources and addressed at various times. A complete prioritized list of erosion sites has not been compiled, but it is a key target for completion.

Watershed	Accelerating		Static/Unknown		Stabilizing		Total	
	No.	Area Acres (Ha)	No.	Area Acres (Ha)	No.	Area Acres (Ha)	No.	Area Acres (Ha)
1	0	0.0 (0)	3	4.0 (1.6)	1	0.5 (0.2)	4	4.6 (1.9)
2	2	0.4 (0.2)	11	21.1 (8.5)	6	1.4 (0.6)	19	22.9 (9.3)
3	0	0.0 (0)	0	0.0 (0)	1	0.4 (0.2)	1	0.4 (0.2)
4	0	0.0 (0)	7	6.7 (2.7)	4	1.6 (0.6)	11	8.3 (3.4)
5	1	2.5 (1)	4	2.3 (0.9)	0	0.0 (0)	5	4.8 (1.9)
6	0	0.0 (0)	7	44.4 (18)	4	10.7 (4.3)	11	55.1 (22.3)
7	0	0.0 (0)	5	1.7 (0.7)	2	0.7 (0.3)	7	2.4 (1)
8	2	0.5 (0.2)	13	10.7 (4.3)	12	2.8 (1.2)	27	14.0 (5.7)
9	0	0.0 (0)	10	8.2 (3.3)	4	0.6 (0.2)	14	8.8 (3.6)
10	5	2.1 (0.8)	13	11.4 (4.6)	7	6.6 (2.7)	25	20.0 (8.2)
Total	10	5.4 (2.2)	73	110.5 (44.7)	41	25.5 (10.3)	124	141.4 (57.2)

Table 3-1. Summary of Known Erosion Sites and Their Current Condition by Watershed
See Appendix G for map of watersheds and erosion sites.

3.5 Fire Management

3.5.1 Program Summary

LEGAL AUTHORITIES: DoD Instruction 4715.3, AR 200-1
PROPONENTS: Facilities Maintenance, Natural Resources

Fire management encompasses both wildfire and prescribed fire programs. There are several benefits of proactive wildland fire management. Primarily, proper fire management can maintain and open training areas by minimizing the dense understory and shrub growth that can reduce the utility of training areas. Fire management serves to reduce hazardous fuel loads and wildfires. The training areas and areas adjacent to them can rapidly accumulate abundant, dense, flammable vegetation that would present significant control problems during wildfires.

Fire plays a significant role in maintaining biodiversity and habitat of rare species, and it is critical for maintaining ecosystem health and wildlife habitat. Most native plant communities, including those at Ft. Wolters, are adapted to fire. Prescribed fires can increase the edge effect and amount of browse material, improving conditions for deer and other wildlife. For example, quail and turkey favor forage plants and semi-open and open conditions that can be created and maintained by burning. Fire can be used to reduce certain non-native species that have not evolved in an environment of regular exposure to fire and are consequently not adapted to fire. Due to the fact that fire is used in many program areas such as invasive species, vegetation, and wildlife, the goals, objectives, and targets associated with fire management are consolidated in the fire management program (see Appendix F, Section 3.5). It is important for a prescribed fire program to be able to vary the seasonality and spatial extent of fires that are applied to the landscape. Small, patchy fires applied at varying times of the year, including summer, will be most beneficial to maintain diversity and sustainability of the landscape and the wildlife. Most prescribed burns

occur in the winter, but it is important for a prescribed fire program to be able to vary the seasonality whenever possible. All prescribed fires will go through a review of environmental concerns to mitigate the effects on matters such as migratory birds especially during March 1st through August 31st breeding seasons and sensitive plants, as well as avoid cultural resources and specific training times for Soldiers.

Most vegetation types on Ft. Wolters require fire to maintain composition and structure and to prevent substantial encroachment from eastern red cedar (*Juniperus virginiana*) and honey mesquite (*Prosopis glandulosa*). In general, fuel models present at Ft. Wolters include grass (GR), grass-shrub (GS), shrub (SH), timber litter (TL), and timber understory (TU) (see Table 3-2). These are the newest fuel models used by the National Forest Service and more accurately represent the vegetation than the older models (see Figure 3-2 for Burn Units and Fuel Models at Ft. Wolters).

Fuel Model Descriptions	Fuel Model	Acres	Ha
Short, Sparse Dry Climate Grass (Dynamic)	GR1	338	137
Low Load, Dry Climate Grass (Dynamic)	GR2	116	47
Moderate Load, Dry Climate Grass (Dynamic)	GR4	11	4
High Load, Dry Climate Grass (Dynamic)	GR7	387	156
Moderate Load, Dry Climate Grass-Shrub (Dynamic)	GS2	602	244
Moderate Load, Humid Climate Grass-Shrub (Dynamic)	GS3	576	233
Non-burnable Water	NB8	10	4
Non-burnable Bare Ground	NB9	6	3
Moderate Load, Conifer Litter	TL3	1	0.5
Moderate Load, Broadleaf Litter	TL6	30	12
Moderate Load, Humid Climate Timber-Shrub	TU2	1441	583
Moderate Load, Humid Climate Timber-Grass-Shrub	TU3	561	227

Table 3-2. Fuel Models Present at Fort Wolters

Annually, it is expected that at least 600 acres (243 ha) will be burned with a target of 600-1,200 acres (243-486 ha) depending on weather and trained personnel across 18 burn units (see Figure 3-2). Typically, prescribed fires are initiated with conventional drip torches. Roads, natural barriers (e.g. streams), and firebreaks are used as primary fire lines and also define burn units. Burn unit boundaries are flexible depending on environmental conditions, smoke management issues, and resource objectives. Construction of new firebreaks or reclamation of unmaintained firebreaks must be coordinated with Natural Resources to ensure that placement and methods used for clearing and subsequent maintenance will not cause erosion and are consistent with the Integrated Wildland Fire Management Plan (IWFMP) on file and available from TXARNG ENV Natural Resources. Brush piles are generally discouraged due to potential for prolonged smoke production, spotting, escape, and soil sterilization (see Appendix D, SOP on Protocol for Brush Piles). The size of brush piles must be kept as small as possible. No brush piles will be created within 300 ft. of any property boundary. A prescription must be on file in order to burn a brush pile, and a brush pile burn will be treated as all other prescribed fires as outlined in the IWFMP.

Details regarding staffing, training, and other wildfire and Prescribed Fire Program logistics are addressed in detail in the IWFMP. The IWFMP identifies all the procedures, protocols, training, burn units, and other relevant details associated with wildland fire. Prescribed fire operations are conducted by the Tx Forest Service (TFS) or through Tx Parks and Wildlife Department(TPWD) through the Memorandums of Understanding (MOUs) with each agency. The TFS MOU also allows for National Wildfire Coordinating Group training for training center personnel at least once per year. No staff currently

employed at the training center is qualified to conduct prescribed fire operations in-house without assistance but with proper training and experience this is a possibility.

Prescribed fire prescriptions must be on file prior to ignition and signed off by qualified personnel. Prescribed fires must follow the Texas Commission on Environmental Quality (TCEQ) regulations (RG-049, 2008). An important factor considered when conducting a prescribed fire is smoke production. Proper smoke management will likely be the most important aspect for the future of prescribed fires in Texas. Buildings that contain smoke sensitive receptors must be identified prior to each prescribed fire in the prescription (see Appendix K), which minimizes the chance of causing a nuisance or other damage. According to the TCEQ Outdoor Burning Rule, Title 30 Texas Administrative Code, Sections 111.201 through 111.221 (2017), buildings that contain sensitive smoke receptors must not be downwind of or must be at least 300 ft. from the fire. An exception to this rule can be obtained with written permission from the landowner. The boundaries of Ft. Wolters are adjacent to housing developments, ranches, farms, and industry. Sensitive smoke receptors near Ft. Wolters include FM 2336 along the southeastern boundary, US 290 along part of the northern boundary, US 95 along the western boundary, McDade to the north, Butler to the northwest, and Griffen Industry to the south. A map of sensitive receptors, as well as other smoke management techniques, can be found in the IWFMP. A common prescription for smoke disbursement is in the sample prescription (Appendix K) or in the IWFMP. This sample prescription does not necessarily reflect requirements for TFS prescribed fire operations.

Other areas to avoid and/or protect during prescribed fire operations vary with the burn unit in question. These issues must be listed in the prescription itself (see Appendix K for a sample) and can include, but are not limited to, sensitive habitat, cultural resources, erosion sites, invasive species, structures, telephone lines, and fences. Coordination with Cultural Resources and other TMD entities will occur through the NEPA process..

Wildfire frequency varies with weather conditions and training exercises but around 1-2 wildfires occur per year that, on average, do not exceed 2-5 acres (0.8-2 ha). The training center staff responds to on-site wildfires as first responders. The procedures for wildfire response are outlined in the IWFMP. Currently, no wildfire response or assistance off site with training center equipment or training center personnel is permitted, but the training center has requested the development of a Mutual Aid Agreement with at least 1 local volunteer fire department. This request will be coordinated with the Fire and Emergency Services representative.

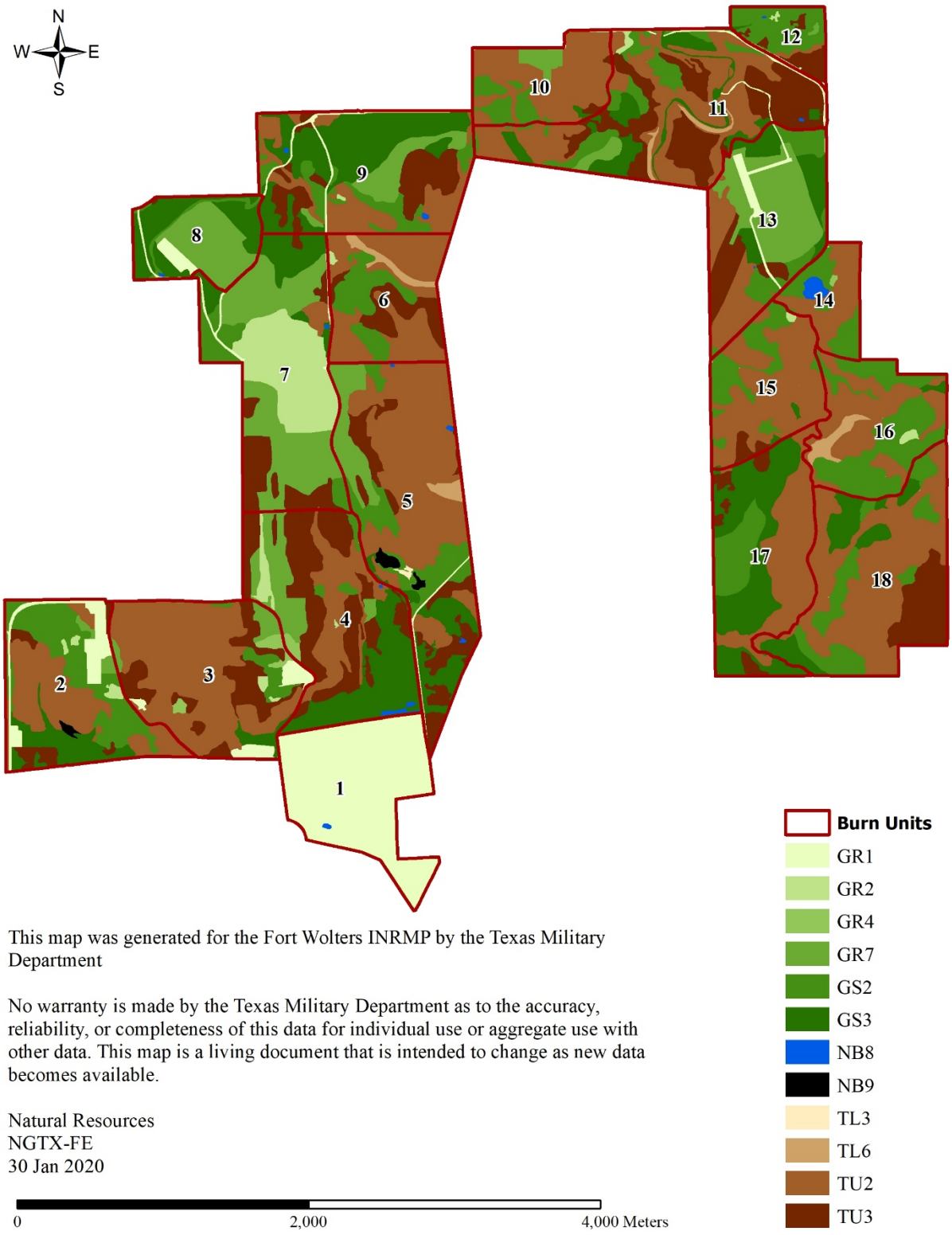

Figure 3-2. Fuel Models and Burn Units of Fort Wolters

3.6 Invasive Species Control and Pest Management

3.6.1 Program Summary

LEGAL AUTHORITIES: EO 13112, Federal Insecticide, Fungicide, and Rodenticide Act, Federal Noxious Weed Act, AR 200-1, Texas Agricultural Code - Chapter 19, DoD Instruction 4715.03
PROPONENTS: Facilities Maintenance, Natural Resources, ITAM

An invasive species is a non-native species to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can cause serious ecological and economic damage and require control measures and monitoring to manage their populations. Invasive species management plays a significant role in maintaining biodiversity and habitat of rare species and is critical for maintaining ecosystem health. Non-native species are considered the primary reason approximately 400 of the 958 threatened or endangered species are listed under the ESA. One of the most serious problems threatening biological communities in Texas is loss of heterogeneity through invasive plant establishment, spread, and eventual dominance. This loss of heterogeneity can occur on many different spatial scales, from statewide to individual training sites. Without proper management and control of invasive species, areas that are now relatively healthy may degrade in quality and ultimately jeopardize the sustainability of the military training lands.

An invasive plant survey was completed in 2003 that documented the locations and extent of invasive plant species at Fort Wolters. Based on this survey, planning level surveys, and other data, 44 invasive plant species have been documented at Fort Wolters. However, only approximately 8-9% of the overall flora at Fort Wolters is introduced from outside of the United States, compared to about 23% of the entire flora covered by the Illustrated Flora of North Central Texas. Tamarisk (*Tamarix ramosissima*), Johnsongrass (*Sorghum halapense*), and King Ranch bluestem (*Bothriochloa ischaemum*) have been identified as priorities for control, primarily due to their potential impacts to the ecosystem. Japanese honeysuckle (*Lonicera japonica*) and sericea lespedeza (*Lespedeza cuneata*) will be monitored and, if the rate of spread increases, action will be taken. Other invasive plants will be addressed when appropriate and as time permits. See Table G-8 Invasive Plants of Fort Wolters for a complete list of non-native, invasive plants and Figure G-9 for a map of the locations of the priority invasive plants.

In addition to invasive plants, there are also invasive animals present at Fort Wolters, notably red imported fire ants and wild pigs. See Table G-10 Invasive Animals of Fort Wolters for a complete list. For the past several years, there have been ongoing efforts to reduce the area affected by red imported fire ants. These efforts have reduced the level of red imported fire ants on the ranges. Unfortunately, outside of the ranges and cantonment area, the area affected by red imported fire ants is small.

Wild pigs pose a risk at Fort Wolters and were first documented by training site staff in October 2005. There is an eradication program in place that is coordinated between the Training Site Manager and Natural Resources personnel. They compete for food with native wildlife, kill ground nesting birds and destroy their habitat, damage riparian areas while creating erosion and increased sedimentation, prey on small animals such as young wildlife and domestic animals, and carry various diseases and parasites.

There is also a risk of oak wilt occurring at Fort Wolters although it is not presently documented there. To minimize the chance of oak wilt, there is an SOP for Tree Management that minimizes risk due to tree trimming and tree removal (see Appendix D). Steps are being taken to educate the training site staff and units training at Fort Wolters to recognize the effects of oak wilt and understand its implications to the health of the landscape.

In addition to planning for invasive species control, this section includes goals and objectives for land

management aspects of the Integrated Pest Management Program (see Appendix F, Section 3.6). This program is presented in its entirety in the Integrated Pest Management Plan (IPMP), but portions related to land management are included here to facilitate integration between the programs. Integrated pest management is the judicious use of both non-chemical and chemical control to suppress or prevent pests from exceeding an acceptable population or damage threshold. Emphasis is placed on minimizing environmental disruption and being in full compliance with environmental regulations. Integrated pest management strategies depend on monitoring to establish the need for control and to establish the effectiveness of management efforts. Any use of chemicals for pest or invasive species management must be conducted by certified personnel and reported to the Integrated Pest Management Coordinator as specified in the IPMP.

3.7 Wetlands, Ponds, and Riparian Areas

3.7.1 Program Summary

LEGAL AUTHORITIES: Clean Water Act, Sikes Act, DoD Instruction 4715.03, AR 200-1, Executive Order (EO) 11988, EO 11990
PROPONENTS: Facilities Maintenance, Engineering, Natural Resources

Wetlands, ponds, and streams were originally identified in 1999 and updated with increased GIS documentation and a condition assessment in 2005. Official wetland delineations according to Army Corps of Engineers standards have not been completed and are only done when a specific project requires delineation. The only (nearly) perennial water on Fort Wolters is Rock Creek and Engineering Pond. Almost all other water resources are intermittent in nature, with 35 acres (14 ha) of surface water, with 29 ponds comprising approximately 11 acres (5 ha) and 61 wetlands comprising approximately 24 acres (10 ha), and 29 miles (46.7 km) of streams. See Appendix G for more details on available water resources and maps of their locations.

Wetlands, ponds, and streams, and their associated vegetation are all important habitat elements for both native plants and animals. They are also the areas most frequently affected by invasive plants and animals because of the availability of water. See Section 3.6 for more on targets for invasive species and Sections 3.8, 3.10, and 3.11 on targets for native species.

Aquatic plants, as opposed to riparian plants, have a major role in maintaining the integrity of lakes, ponds, streams, and rivers for fish, wildlife, other organisms, and human enjoyment. Specific roles of aquatic plants include:

- Habitat and food for fish, invertebrates, amphibians, and waterfowl
- Food for other wildlife and mammals
- Spawning medium for many fish, invertebrates, and amphibians
- Production of oxygen
- Protection of stream river banks, lake and reservoir beds, and shorelines
- Stabilization of temperature, light, and functioning of a diverse aquatic ecosystem
- Recycle nutrients and reduce sediment transport
- Plant biomass is correlated with aquatic invertebrates and ultimately fish productivity

Riparian areas and vegetative buffers around wetlands and ponds are important features of a training site because they intercept overland drainage, reduce bank erosion, help trap sediments and nutrients, filter water, replenish groundwater reserves, and moderate flooding. They are also important habitat areas because the vegetation they support is often unique and diverse, and they provide critical habitat or

corridors for wildlife.

Invasive, non-native plants can disrupt the balance of vegetation and aquatic organisms in and near lakes, streams, or rivers. In some circumstances, even native vegetation can grow to nuisance levels, and these plants require control and/or management practices. It is usually obvious when a dense bed of a single species becomes a nuisance. Under these conditions, fish and wildlife habitat and activities are altered.

Problems with invasive aquatic plants occur primarily because their growth habits enable them to rapidly reach very large and dense population levels. Excessive growth of many of these invasive aquatic species often is responsible for:

- Deterioration of fish and wildlife habitat
- Potential loss of habitat for threatened and endangered fish, wildlife, and other aquatic species
- Deterioration of wetlands and water quality
- Reduction of the area for recreational activities such as fishing and boating
- Reduction of property value adjacent to the deteriorated aquatic habitat
- Impeding commercial navigation
- Blocking pumps, sluices, and industrial, agricultural, and domestic water supply intakes
- Flooding, increased silting, and reduced reservoir capacity

In general, activities within wetlands and streams and associated buffers and riparian areas are limited due to the saturated nature of the soils as well as the topography. Most activities occur well outside a 100-ft. buffer around any water resources, exceptions being travel on established stream crossings, roads, and trails.

Management of floodplains and waters of the United States, including wetlands, is subject to the provisions of Executive Order (EO) 11988, EO 11990, and Section 404 of the Clean Water Act. Any changes or impacts to these water resources must comply with Section 401 and 404 of the Clean Water Act. Most construction activities are required to either have a Stormwater Pollution Prevention Plan and/or follow BMPs per Section 401 of the Clean Water Act as defined by the USACOE and the TCEQ. Construction activities that occur on or around waterbodies or streams may require a 404 Permit from USACOE and like any construction project must be reviewed through the TXARNG REC system. The REC forms and review system can be found on the CFMO Page of the Lonestar Portal.
https://portal.tx.ng.mil/arg/arg010/SitePages/env_rec.aspx

3.8 Vegetation Management

3.8.1 Program Summary

LEGAL AUTHORITIES: Sikes Act, DoD Instruction 4715.03, AR 200-1
PROPONENTS: Facilities Maintenance, Natural Resources, ITAM

Vegetation management covers many aspects of land management, including prescribed fire, invasive plants, woody brush encroachment, maintaining intact old growth forests, and maintaining ground cover. Brush management plays a significant role in maintaining biodiversity and habitat of rare species and is critical for maintaining ecosystem health. The Brush Management Program at Ft. Wolters is prioritized based on training needs, economic and environmental analyses of the potential solutions. Any brush management or revegetation activities at Ft. Wolters must be reviewed and approved through the NEPA process.

There is usually a negative response by perennial vegetation to most types and degrees of vehicle use, with the degree of negative impact on plants varying with conditions and intensity of use (Blackburn et al. 1992; Lathrop 1983; Thurow 1991; Thurow et al. 1986). The immediate effect tends to be a reduction of warm-season grasses followed by the invasion of annual cool-season grasses and annual warm-season forbs. Although these annuals provide some cover when spring precipitation patterns are near and above normal, they do not become established in the disturbed areas when precipitation is below normal levels. Thus, in droughty areas, there will be a further reduction in vegetative cover and an increased potential for erosion. For lands sensitive to erosion, management should not depend on annual plant cover to maintain soil erosion rates at an acceptable level. Below-normal precipitation or an extended drought would mean the loss of this annual cover, and soils would be subject to excessive erosion. In addition, annuals that invade these areas usually have a single stem growth form that is less obstructive to overland water flow and erosion than bunchgrass clumps and other perennial vegetation.

In the past, methods such as bull dozing vegetation and root plowing were used to clear and maintain areas for training. These methods were found to inflict too much disturbance on the landscape. Recently, juniper (*Juniperus* spp.) and honey mesquite (*Prosopis glandulosa*) encroachment have been managed using low disturbance methodologies (Figure 3-3). The Brush Management Program at Fort Wolters is prioritized based on training needs, habitat improvement, and wildfire hazard reduction. Economic and environmental analyses of the potential solutions are used to determine where, when, and how to implement projects. Brush management plays a significant role in maintaining biodiversity and habitat of rare species, and it is critical for maintaining ecosystem health. Any brush management or revegetation activities at Fort Wolters must be reviewed and approved through the REC process.

Brush management is an integral aspect of land management in Texas. Brush, mainly mesquite and juniper, has increased in density and distribution in areas that were once open grasslands due to past land use, management practices, and lack of fire over the last 100 years. Although mesquite and juniper both belong as a component of the native landscape, fire suppression and past land use have allowed them to outcompete the native grasses, and they have established as the dominant species in some areas. The management of these brush species must be approached with a multidisciplinary understanding of the landscape along with a focus on land management goals and objectives. An ideal native landscape and military training ground has a mosaic of habitat types. This mosaic can be created and maintained with an integration of many brush management tools. An Integrated Brush Management Program uses fire, mechanical practices, and wildlife management to address brush management issues.

The methods selected for brush management for a specific project will consider the following (Hanselka et al. 1999):

- Degree of control of brush expected
- Target brush species characteristics and weaknesses
- Expected life of the treatment applied and need for maintenance treatments
- Possible secondary effects of the treatment (soil loss, erosion, invasive plants, etc.)
- Requirements of the chosen application (equipment, certifications, etc.)
- Timing of the treatment (seasonality and access)
- Effect on wildlife habitat (rare species)
- Cost versus benefit analysis
- Safety of military users and those implementing the brush management

Prescribed fire will be the primary maintenance method once high densities of large individuals are reduced. Mechanical methods are used to accomplish pre-fire thinning or in areas where prescribed fires are not feasible. Mechanical methods of removal for juniper and mesquite typically involve the use of a

tree shear or a trackhoe, respectively. This equipment greatly reduces the amount of soil disturbance and loss of topsoil that can result from traditional brush management techniques and greatly reduces the amount of mesquite that resprout. Herbicide applications are used only when other methods are not viable for a given project or species. No aerial application of herbicides is currently permitted at Fort Wolters according to the Texas National Guard IPMP 2018.

In addition to these common brush management issues, vegetation management and all other management and training activities must take into consideration effects on recently identified ancient remnants of the western Cross Timbers. In 2007, the University of Arkansas Tree-Ring Laboratory (Ancient Cross Timbers Consortium) completed a project designed to identify, accurately map, and describe any ancient remnants of the western Cross Timbers that might still survive at Fort Wolters. Several areas of ancient forests with 150- to 250-year old post oak trees were located. This research is significant because relatively undisturbed old growth forests have become exceedingly rare across the landscape. Old, dry site Cross Timber woodlands have high ecological integrity and preserve vital components of our eroding biodiversity. They form a key link in the oak archipelago that extends from Central America into southeastern Canada, and provide essential habitat for many species, including neotropical migratory birds. The relict stands of old growth that have been found on Fort Wolters warrant special management status (Stahle 2005 personal communication).

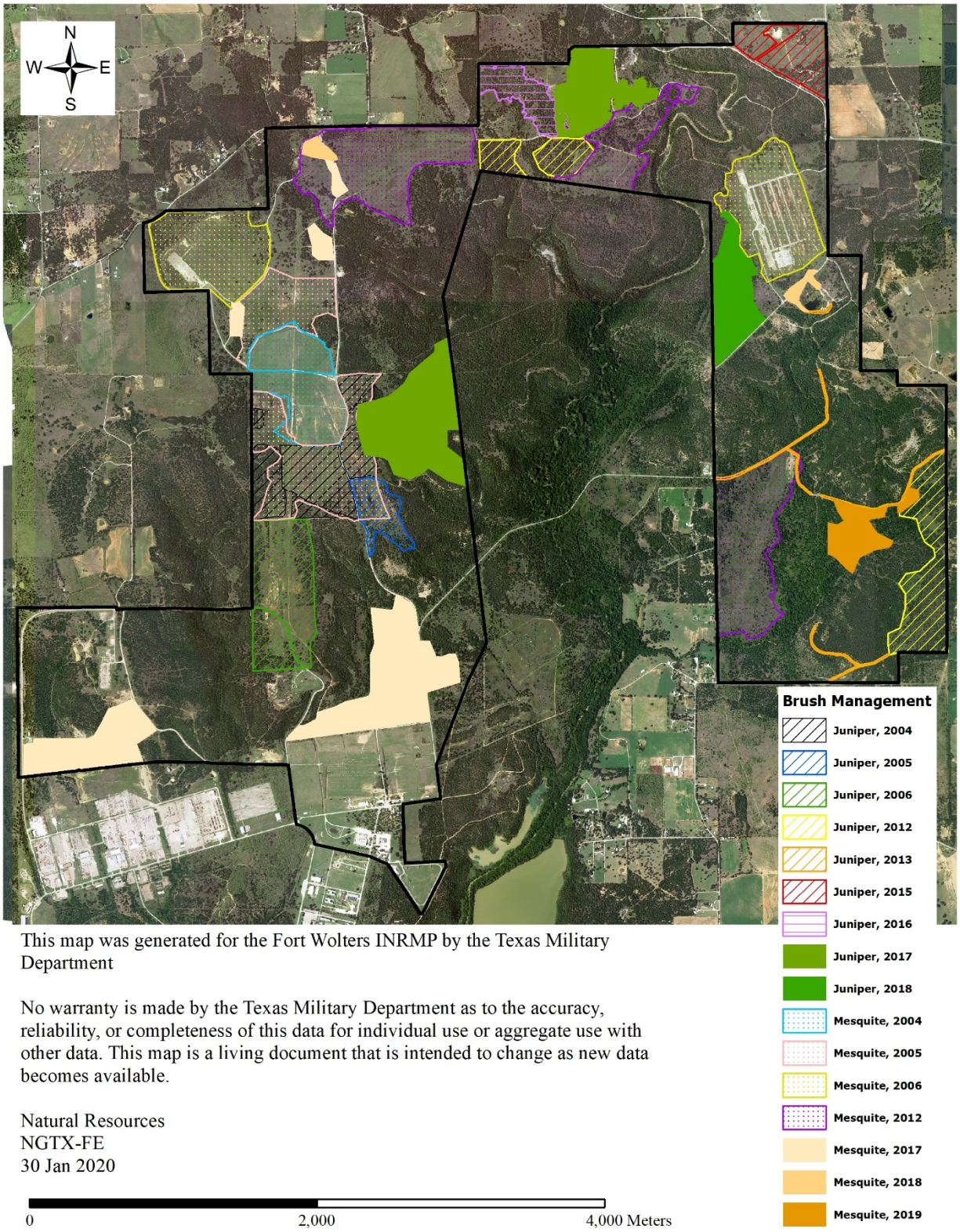

Figure 3-3. Brush Management at Fort Wolters since 2004

3.8.1.1 References
Blackburn WH, Pierson FB, Hanson CL, Thurow TL, Hanson AL. 1992. Spatial and temporal influence of vegetation on surface soil factors of semiarid rangelands. ASAgEng. 35:479-486.

Hanselka CW, Hamilton WT, Rector BS. 1999. Integrated brush management systems for Texas. College Station (TX): Texas Agricultural Extension Service, Texas A&M University. Report no. E-56.

Lathrop EW. 1983. Recovery of perennial vegetation in military maneuver areas. In: Webb RH, and Wilshire HG, editors. Environmental effects of off-road vehicles. New York (NY): Springer-Verlag. p. 103-110.

Thurow TL, Blackburn WH, Taylor Jr CA. 1986. Hydrologic characteristics of vegetation types as affected by livestock grazing systems, Edwards Plateau, Texas. JRMngt. 39:505-509.

Thurow TL, Warren SD, Carlson DH. 1993. Tracked vehicle traffic effects on the hydrologic characteristics of central Texas rangelands. ASAgEng. 36:1645-1650.

3.9 Landscaping and Grounds Maintenance

3.9.1 Program Summary

LEGAL AUTHORITIES: EO 13423, DoD Instruction 4715.03, AR 200-1, AR 420-10
PROPONENTS: Facilities Maintenance, Natural Resources

Xeriscaping and wise placement of trees can conserve energy, reduce heat island effects, and reduce maintenance time and costs, as well as increase biodiversity. Landscaping and grounds maintenance are activities that primarily occur in the cantonment area, although grounds maintenance also occurs on ranges. The CFMO Facilities Management team handles these activities for Ft. Wolters. Landscaping is generally present in some form on improved grounds (i.e. cantonment area), while ground maintenance occurs on improved, semi-improved, and unimproved grounds. Grounds maintenance outside of the improved areas is required to go through the NEPA process a review of environmental concerns where recommendations to minimize impacts on flora and fauna will be made. Both activities can generate substantial impacts on nearby areas through erosion, invasive species, and pesticide use. Natural Resources and ITAM personnel work closely with Facilities Maintenance personnel to troubleshoot and determine new products and methods for minimizing these impacts. Table 3-3 identifies non-native plants that are prohibited from all landscape plantings.

Habitat	Common Name	Scientific Name
Terrestrial	Tree of Heaven	*Ailanthus altissima*
	Giant reed	*Arundo donax*
	Thorny olive	*Elaeagnus pungens*
	Euonymus	*Euonymus alata/fortunei*
	Wax-leaf ligustrum	*Ligustrum japonicum/lucidum*
	Privet	*Ligustrum sinense/vulgare*
	Japanese honeysuckle	*Lonicera japonica*
	Chinaberry	*Melia azedarach*
	Heavenly bamboo	*Nandina domestica*
	Red-tipped photinia	*Photinia serratifolia*
	Bamboo	*Phyllostachys/Bambusa* spp.
	Pyracantha	*Pyracantha koidzumii*
	Salt cedar	*Tamarix ramosissima*
	Asian jasmine	*Trachelospermum asiaticum*
	Chinese tallow	*Triadica sebifera*
Aquatic	Alligatorweed	*Alternanthera philoxeroides*
	Water hyacinth	*Eichhornia crassipes*
	Hydrilla	*Hydrilla verticillata*
	Water spinach	*Ipomoea aquatica*
	Eurasian watermilfoil	*Myriophyllum spicatum*
	Water lettuce	*Pistia stratiotes*
	Giant salvinia	*Salvinia molesta*

Table 3-3. Prohibited Aquatic and Terrestrial Invasive Plants
These plants cannot be used in landscape plantings.

3.10 Fish and Wildlife Management

3.10.1 Program Summary

LEGAL AUTHORITIES: Sikes Act, DoD Instruction 4715.03, AR 200-1
PROPONENTS: Natural Resources

Fish and wildlife management has historically been a secondary function of natural resources management at Ft. Wolters. There are stable populations of deer at Ft. Wolters. Wildlife monitoring has occurred both in-house by trained Natural Resources personnel and professional contractors with oversight from the Natural Resources Office. This monitoring has included deer surveys and maintenance of a sightings database. Planning level surveys are conducted as required by AR 200-1 and DoD Policy.

All wildlife currently has free movement with neighboring properties to prevent any inbreeding depression and allows for movement across the landscape over seasons and life cycles. Occasionally, specimens and DNA samples may be collected for research purposes. Every effort will be made to coordinate with state and federal agencies to accommodate needs regarding wildlife management as they arise.

Any hunting activities and wild pig management must be coordinated with and reported to Natural Resources. Any new activities not covered in this INRMP must be reviewed and approved by Natural Resources management and TCGC. The results of the deer-harvesting program and changes to the program will be reviewed and approved by the TCGC and TxPWD yearly. Any other harvesting, fishing, or fish stocking activities on the federal side must be coordinated with and reported to Natural Resources.

3.11 Endangered, Threatened, and Rare Species Management

3.11.1 Program Summary

LEGAL AUTHORITIES: ESA, Migratory Bird Treaty Act, DoD Instruction 4715.03, AR 200-1, Texas Parks and Wildlife Code, Chapters 68 and 88
PROPONENTS: Natural Resources

Based on past surveys, there is one federally listed threatened or endangered species known to occur within Fort Wolters. Earth fruit, *Geocarpon minimum*, was identified on Fort Wolters in the spring of 2019 during a rare plant survey. There were 3 populations located in March and April on the west side of the installation. Earth fruit is federally and state listed as threatened.

Bald Eagles, Black-capped Vireos, Golden-cheeked Warblers, and Whooping Cranes are known to occur in either Parker or Palo Pinto Counties. Fort Wolters, however, does not currently have suitable habitat for any of these species, except possibly the Bald Eagle and Golden-cheeked Warbler. Bald Eagles may use Fort Wolters occasionally, but there are no documented nest sites. Both Black-capped Vireos and Whooping Cranes require specific types of habitats that are not present at Fort Wolters at this time and are not likely to occur in the future. Golden-cheeked Warbler habitat is developing on the steeper slopes and should remain undisturbed, and left to become mature.

The only state-listed species is the Texas Horned Lizard, which is considered “threatened.” There are several rare species, however, that will be appropriately monitored, managed, and/or protected. Rare species are defined as being either globally or regionally rare with a ranking of G2 or S2 or lower. G3 or S3 indicates a species vulnerable to further declines. Occasionally, a species with S4 rank may be monitored closely because of known rapid declines either globally or regionally.

Management of most rare species consists of regular updates to the planning level surveys to document any new occurrences, monitoring existing known populations, and managing invasive species. The control of fire ants and wild pigs is critical for managing rare species. Both invasive animals can have far reaching effects on an ecosystem and cause declines in a wide variety of species, particularly ground nesting birds. For the Invasive Species Control Program, refer to Section 3.6.

For a complete list of rare plants and animals, refer to Appendix G, Section G.2 and Tables G-7 and G-9.

3.12 Climate Change

3.12.1 Program Summary

LEGAL AUTHORITIES: ESA, EO 13186, DoD Instruction 4715.03, DoD Manual 4715.03, AR 200-1, Texas Parks and Wildlife Code, Chapters 68 and 88
PROPONENTS: Natural Resources, Training Center Garrison Command

Mean global temperatures have been increasing over the past century and will likely continue to rise. It is predicted that the climate in Texas will continue to become hotter (3-10 °F average) and drier over the next 50-100 years. It is also predicted that while lakes and streams will hold less water, the declining

number of annual precipitation events will become more extreme, accentuating erosion and flooding issues. The changing climate will likely result in changes in plant and animal communities, and may impact rare and endangered species on the installation. The TMD will implement adaptive management strategies on Fort Wolters to meet its combat readiness mission of providing realistic training environments while simultaneously assuring the long-term sustainability of the natural environment and species of concern.

Climate change and its impacts on natural resources are expected to occur gradually over the next 50-100 years. There are uncertainties associated with all aspects of the predicted changes (i.e. societal actions to reduce change, timing, magnitude, etc.). Adaptively managing Fort Wolters natural resources in the face of climate change and associated uncertainties will require thorough periodic reviews of monitoring data (plants, animals, and their communities, etc.), evaluations of species and community vulnerability, and adjustment of long-term management plans. Fort Wolters will initiate periodic vulnerability assessments of its natural resources in cooperation with the USFWS, TPWD, and other military installations. Periodic planning level surveys of plant and animal species as well as their communities will be conducted for use with vulnerability assessments and long-term management planning as needed.

Long-term management actions will require gradual incremental efforts and redirections, implemented as plant and animal communities change. For example, invasive plants will be removed to reduce competition with native species for declining resources. Revegetation plantings where invasive species have been removed will include drought tolerant native species to ensure appropriate species are present to fill new niches as less tolerant native species decline. Native drought tolerant riparian species will be established along streams to reduce erosion in the face of the predicted increase in extreme runoff events. Appropriate native species may also be established in the uplands to increase absorption and retention of precipitation, reducing the occurrence of flooding.

As competition for declining stored-water resources in reservoirs and aquifers increases, resource management agencies will likely restrict nonessential water uses (landscaping) in favor of essential uses (drinking water). Educating Fort Wolters staff will be critical to helping them adjust to reductions in water availability. Educating Facilities Maintenance staff on xeriscaping concepts will aid them in planning landscape design and proper plant selection in dealing with reduced water availability. Educating staff about rainwater capture from roofs and other sources for use in meeting remaining landscape watering and other needs will be necessary as well."

Chapter 4. Plan Implementation

4.1 Coordination

Implementation of the INRMP is the final step in the planning process. Successful INRMP implementation involves public review and support, staffing, funding, revision plans, cooperation and coordination within the TMD and other outside agencies. INRMP coordination within the TMD includes review and guidance from the Command Group, Staff Judge Advocate, CFMO Master Planning, Environmental, J5 Plans, J3 Operations and Training, TCGC, ITAM, Public Affairs, and Army and Air National Guard decision makers. Outside agency coordination on land management includes USFWS, TPWD, and TFS.

4.2 Staffing

4.2.1 Environmental and Natural Resources

Environmental personnel, other than Natural Resources, who support implementation include the NEPA manager, hazardous waste manager, environmental engineer, cultural resources manager, and GIS technician. Natural Resources personnel consist of a natural resources manager, plant ecologist, wildlife biologist, pest coordinator, and a field biologist. They are responsible for conducting surveys and monitoring and providing expertise in brush management, ecological restoration, wildlife management, pest management, fire management, wetlands management, and rare species management.

4.2.2 Integrated Training Area Management (ITAM)

The ITAM Program currently has an ITAM Coordinator and a RTLA/LRAM Coordinator with the option to hire seasonal crews and other additional personnel if needed. The ITAM Coordinator has oversight of projects related to soldier training, including Environmental Awareness materials, monitoring, ecological restoration, erosion repair and control, and vegetation management. The RTLA/LRAM Coordinator has oversight of projects related to monitoring, ecological restoration, erosion repair and control, and vegetation management.

4.2.3 Training Center Staff

Some projects, particularly ITAM and maintenance projects, are managed by TCGC staff and completed through the state maintenance shop. These projects include road and range maintenance, small scale vegetation and erosion management, observation of buffer zones, identification of land management needs, and use of BMPs. The Base Operations Supervisor is responsible for managing incoming facility users, while avoiding conflicting land uses. Therefore, the Base Operations Supervisor is a key implementer of the policies described in this INRMP.

4.2.4 State Universities

The majority of survey and rare species projects are completed through agreements with state universities. The professors and graduate students at state universities are often the best experts for their fields in the state and can provide highly skilled crews for a variety of projects. Faculty, staff, and students at state universities are often involved in various contracted projects outside surveys and rare species as well. University faculty are also encouraged to develop cost-share research projects using TMD training sites when such projects do not interfere with military training. TMD sites are often excellent places to conduct research due to controlled access and healthy ecosystems, particularly the regular presence of fires.

4.2.5 Contractors

Contractors are employed for larger projects whose scope is beyond in-house capabilities of the TMD.

Contracts are let through a variety of mechanisms using either state or federal contracting procedures.

4.3 Annual Coordination

The primary means of annual review of INRMP implementation with trainers and facility managers will be through an annual coordination meeting involving all stakeholders. Regular updates are given at the Real Property Planning Board (RPPB) and/or through the Environmental Quality Control Committee (EQCC) and Quarterly Training Center Garrison Command TCGC briefings. At these reviews, the projects implemented in the last year and priorities for future projects will be reviewed and updated based on input from attendees using the table presented in Appendix F. In some cases, the USFWS and TPWD may be present at these meetings or separate reviews will be conducted with those agencies, depending on scheduling and availability of personnel. Every 5 years, a complete review for operational effect will be conducted with the same group to determine if major revision is required per the Sikes Act, SAIA, and associated DoD Policy (see Section 1.2.3).

4.4 Strategies for Implementation

There are 3 primary requirements for successful implementation: personnel, processes, and funding. Personnel are discussed above in Section 4.2. Processes include the RPPB, EQCC, REC, and Master Planning. These processes are all critical for incorporating natural resources needs and impacts in the planning for the TMD. They are also critical for prioritizing natural resources and land management projects and ensuring SOPs and BMPs are followed. These processes ensure that any land management supports the TMD mission and supports the sustainability of the TMD training lands. Any new land management activities not covered by this INRMP must be approved through the annual review meetings and may require additional NEPA analysis.

Funding comes from 3 primary sources: Environmental, ITAM, and CFMO (see Table 4-1). Environmental funding generally covers listed species management, ecosystem management, planning level surveys, monitoring, and GIS requirements for natural and cultural resources, INRMP revisions, and salaries for Natural and Cultural Resources personnel. ITAM funding generally covers vegetation management to make land more suitable for training, ecological restoration needed as a result of training, erosion control and stream crossings needed for training, trail construction and maintenance, cultural site protection from training, monitoring of training impacts, and Environmental Awareness materials for soldiers. Installations funding generally covers facility maintenance, road construction and maintenance, landscaping, erosion recovery, BMPs, as well as some prescribed fire, wetland protection, and invasive species control projects

Funding Source	Responsibilities
Environmental Conservation (VENQ)	Primary responsibility and funding for all land-management-related surveys and management of habitats, threatened and endangered species management, and INRMP, ICRMP, IPMP development.
Environmental Compliance (VENC)	Primary responsibility for clean air and clean water, pollution prevention, hazardous waste, and hazardous materials.
SRP – ITAM	Primary responsibility and funding for recovering training damage, monitoring impacts of training, providing environmental awareness to soldiers training at sites, and preparing areas for training. In particular, responsible for removal of vegetation that inhibits training activities, creating and maintaining maneuver trails and hardened water crossings for tactical vehicles, and clearing other natural or man-made material to open land to maneuver and training. Does not pay for roads or naturally caused erosion within the training area.
SRM – Sustainment and Modernization	Primary responsibility and funding for improvements and maintenance of structures, such as bridges, buildings, etc.
Construction Facility Management Office-Facility Maintenance	Primary responsibility and funding for facility maintenance and repairs, which can include erosion repair, invasive species control, pest control, brush management, prescribed fires.
MWR – Morale, Welfare, and Recreation	MWR funds are the only TMD source of fishing docks, hike/bike trails, and other outdoor recreation facilities.

Table 4-1. Summary of Potential Funding Sources for Land Management from Army National Guard Funding Pathways
This does not include special funds that require grant writing or special application procedures from other elements within the DoD.

Appendix A. Acronyms

AR	Army Regulation
ARNG-D	Army National Guard Directorate
ARNG I&E	Army National Guard Installations and Environment Office
ASSON	Aerial Application Statement of Need
BMP	Best Management Practice
CFMO	Construction and Facilities Management Office
CFR	Code of Federal Regulations
CRM	Cultural Resources Management
DA	Department of the Army
DAG-A	Deputy Adjutant General-Army
DoD	Department of Defense
DPW	Department of Public Works
EA	Environmental Assessment
eMS	Environmental Management System
EO	Executive Order
EQCC	Environmental Quality Control Committee
ESA	Endangered Species Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FNSI	Finding of No Significant Impact
FY	Fiscal Year
G3/5	Operations and Training
GIS	Geographical Information System
HEAT	HMMWV Egress Assistance Trainer
HEL	Highly Erodible Lands
HUC	Hydrolic Unit Classification
IC	Incident Command
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IPMC	Integrated Pest Management Coordinator
IPMP	Integrated Pest Management Plan
ITAM	Integrated Training Area Management
IWFMP	Integrated Wildland Fire Management Plan
MOU	Memorandum of Understanding
MWR	Morale, Welfare, and Recreation
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NGO	Non-governmental Organization
NGTX-FE	Environmental Management Branch
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OED	Office of the Executive Director
PAO	Public Affairs Officer
PLS	Planning Level Survey
PMC	Pest Management Coordinator
POC	Point of Contact
POW	Prisoner of War

RCMP	Range Complex Master Plan
REC	Record of Environmental Consideration
RIFA	Red Imported Fire Ant
ROTC	Reserve Officer Training Corps
RPPB	Real Property Planning Board
RTLA	Range and Training Land Assessment
RTLP	Range and Training Land Program
Rx	Prescription
SAIA	Sikes Act Improvement Act
SHPO	State Historic Preservation Office
SO	Safety Officer
SOP	Standard Operating Procedure
SRA	Sustainable Range Awareness
SRP	Sustainable Range Program
TA	Training Area
TAG	Adjutant General
TCEQ	Texas Commission for Environmental Quality
TCGC	Training Center Garrison Command
TFS	Texas A&M Forest Service
THC	Texas Historical Commission
TMD	Texas Military Department
TPWD	Texas Parks and Wildlife Department
TRI	Training Requirements Integration
TRS	Training
TXANG	Texas Air National Guard
TXARNG	Texas Army National Guard
TXSG	Texas State Guard
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service

Appendix B. Glossary

Adaptive management – A systematic process for continually improving management policies and practices by learning from the outcomes of operational programs.

Billet – A shelter for troops or the act of sheltering troops.

Biological opinion – The document that states the opinion of the USFWS as to whether or not the federal agency action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

Bivouac – A temporary military encampment that is usually formed in an unsheltered area.

Conservation – The wise use and scientific management of natural resources according to principles that provide optimum public benefit, continued productivity for present and future generations, and support of the military mission.

Critical habitat – Specific areas within the geographical area occupied by the species at the time it is listed in accordance with the ESA, on which are found those physical or biological features (1) essential to the conservation of the species and (2) which may require special management considerations or protection. It includes specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the ESA, upon a determination by the Secretary of the Interior or Commerce that such areas are essential for the conservation of the species.

The areas formally designated as critical habitat by the USFWS are listed in 50 CFR 17 and 226.

Cultural Resources management – Similar to Natural Resources management but for cultural resources, which include Native American archeological sites and traditional cultural properties, historic archeological sites, and buildings potentially eligible for the National Register of Historic Places.

Cumulative effects – Effects of future state or private activities, not including federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation.

Destruction – The direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and the recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.

Ecosystem – An interconnected and symbiotic grouping of animals, plants, fungi, and microorganisms.

Ecosystem management – A strategy or plan to manage ecosystems to provide for all associated organisms, as opposed to a strategy or plan for managing individual species.

Endangered species – A species that is in danger of extinction throughout all or a significant part of its range; a species on a federal or state endangered species list.

Endemic – A species restricted to and native to a particular geographic area.

Environmental Assessment – A document required by NEPA if there is the potential for environmental impact as a result of federally funded activities.

Environmental quality – The development and maintenance of harmonious interaction between man and that part of the world in which living organisms can sustain their kind.

Fauna – The total animal population that inhabits an area.

Fire management –Managing fire on a given landscape, both in carrying out prescribed fires and in deciding which wildfires to fight and which to contain but let burn.

Flora – The total vegetation assemblage that inhabits an area.

Forest management – The science, the art, and the practice of managing the natural resources that occur on or in association with forest lands. The achievement of management goals will result in optimal benefits to humankind and indigenous forest ecosystem inhabitants.

Goal – Broad summary of long-term intention.

Grounds – The term is used to classify installation acreage according to the level of grounds maintenance required and includes all land and water acreage for which an installation commander has responsibility (including satellite areas). See improved grounds and unimproved grounds.

Habitat – An area where a plant or animal species lives, grows, and reproduces, and the environment that satisfies any of its life requirements.

Habitat heterogeneity – Variation in habitat types present in a location; typically, more heterogeneity means higher species richness partially due to more microclimates.

Heavy maneuver training – Training that utilizes heavy equipment, usually tracked vehicles such as tanks and Bradleys, during exercises.

Hydrology – Scientific study of the properties, distribution, and effects of water on the Earth's surface, in the soil and underlying rocks, and in the atmosphere.

Improved grounds – This category includes acreage on which intensive grounds maintenance activity must be planned and performed annually as fixed requirements. Activities include mowing, irrigation, fertilization, cultivation, aeration, seeding, sodding, spraying, pruning, and trimming; weed, dust, and erosion control; drainage, planting for landscape effect, wind and sound abatement, and other intensive practices. See grounds and unimproved grounds.

Informal consultation – An optional process that includes all discussions, correspondence, etc. between the USFWS and a federal agency prior to formal consultation, if required.

Integrated Training Area Management (ITAM) Program – An Army program for the management of military training and testing lands and other land uses.

Invasive species – Non-native species of plants or animals that out-compete native species in a specific habitat.

Land management – The planning and execution of programs to improve, utilize, and maintain all land and water areas for the greatest long-term net public benefit while supporting the military mission.

Included are subordinate land uses that are mutually compatible and consistent with maintaining environmental qualities.

Light maneuver training – Military training exercises that involve maneuvering across the landscape, but without the use of heavy equipment or tracked vehicles.

Listed species – Any species of fish, wildlife, or plant that has been determined to be endangered or threatened under Section 4 of the ESA. Listed species are found in 50 CFR 17.11-17.12.

Natural resources – The viable and/or renewable products of nature and their environments of soil, air, and water. Included are the plants and animals occurring on grasslands, rangelands, croplands, forests, lakes, and streams.

Non-native species – A plant or animal species found outside its natural range.

Noxious weed – Plant species identified by federal or state agencies as requiring control or eradication.

Objective – Specific item to be achieved that supports one or more Goals.

Off-road vehicle – A vehicle designed for travel on natural terrain. The term excludes a registered motorboat confined to use on open water and a military, emergency, or law enforcement vehicle during use by an employee or agent of the government or one of its contractors in the course of employment or agency representation.

Outdoor recreation – Recreational program, activity, or opportunity that is dependent on the natural environment. Examples are hunting, fishing, trapping, picnicking, bird-watching, off-road vehicle use, hiking and interpretive trails use, wild and scenic river use, and underdeveloped camping areas.

Developed or constructed activities such as golf courses, lodging facilities, boat launching ramps, and marinas are not included.

Prescribed fire – Planned, controlled fire (also called prescribed burn); or wildfires managed under prescribed conditions.

Project – Specific activity derived from Targets; often a "project" is a "contract"; a "target" is sometimes a "project" as well.

Range – A designated land or water area that is set aside, managed, and used for range activities of the DoD. The term includes firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access, and exclusionary areas. The term also includes airspace areas designated for military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration.

Rare species – A species that is not widely distributed or has a small population size, although not necessarily on an endangered or threatened list.

Recovery – The improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the ESA.

Riparian areas – Areas located alongside a watercourse, typically a river or stream.

Sedimentation – The process that deposits soils, debris, and other materials either on the ground surfaces or in bodies of water or watercourses.

State-listed species – Any species, plant or animal, that is listed by the appropriate state as threatened or endangered within the state, but it may not be listed by the U.S. Department of the Interior.

Target – Measurable outcome with deadline to achieve Objective.

Threatened species – A species of flora or fauna likely to become endangered within the foreseeable future; a species on a federal or state threatened species list.

Unimproved grounds – All other acreage (including water areas, areas under buildings, and surfaced areas), not classified as improved or semi-improved. Practices and intervals of attention are generally unpredictable such as might evolve from flood, fire, insects, or disease epidemics.

Vegetation community – A collection of plants that combined make up a distinct community.

Watershed – A region or area over which water flows into a particular lake, reservoir, stream, or river.

Wetlands – Land (marshes or swamps) saturated with water constantly or recurrently; conducive to high biodiversity.

Wildfire – Unplanned or uncontrolled fire caused naturally, accidentally, or intentionally.

Wildland fire – All fires, including wildfires and prescribed fires, that occur in areas without buildings or other urban infrastructure.

Wildlife management – The practical application of scientific and technical principles to wildlife populations and habitats so as to maintain such populations essentially for ecological, recreational, and/or scientific purposes.

Woody encroachment – Growth and spread of woody plants (i.e. plants that have woody stems once mature) into an area that was previously grassland.

Appendix C. Laws, Regulations, and Policies

C.1 Introduction

The management of TMD lands is guided by public laws, EOs, rules, and regulations, directives of the DoD, and Army policies. Policy sets the framework and provides direction for management decisions. It is the goal of the Environmental Branch to protect, preserve, and enhance the environmental diversity and integrity of training land while providing a realistic training environment and ensuring that the training requirements and force readiness goals are met.

C.2 Federal Laws

32 CFR 190 – Natural Resources Management Program (22 February 1989): prescribes policies and procedures for an integrated program for multiple-use management of natural resources on property under DoD control.

32 CFR 651 – Environmental Analysis of Army Actions (29 March 2002): revises policy and procedures for implementing the National Environmental Policy Act of 1969 (NEPA) and Council on Environmental Quality (CEQ) regulations in the Code of Federal Regulations (CFR). These guidelines replace policy and procedures found in current Army Regulation 200-2, Environmental Effects of Army Actions.

(7 USC 2801) Federal Noxious Weed Act: gives the Secretary of Agriculture "the authority to designate plants as noxious weeds by regulation, and the movement of all such weeds in interstate or foreign commerce was prohibited except under permit." The Secretary was also given authority to "inspect, seize and destroy products, and to quarantine areas, if necessary to prevent the spread of such weeds."

(16 USC 670) Sikes Act of 1960 (Public Law 86-797): requires military installations to provide public access for those uses that are appropriate and consistent with the military mission. It also requires the DoD to implement and maintain INRMPs and a program of planning for and maintenance of wildlife, fish, game, and non-game conservation.

National Environmental Policy Act (NEPA) of 1969: provides the broad national framework for protecting the environment. It assures that all branches of government give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment.

(10 USC 2671) Military Reservations and Facilities – Hunting, Fishing, and Trapping: requires that all hunting, fishing, and trapping at an installation or a facility be in accordance with the fish and game laws of the state or territory in which it is located.

(16 USC 460) Endangered Species Act (ESA) of 1973: protects threatened and endangered plant and animal species and their critical habitat. It requires all federal agencies to consult with the USFWS on any activities that may negatively impact those species or their habitat. It also requires federal agencies to contribute to recovery of listed species.

(16 USC 703-711) Migratory Bird Treaty Act of 1918: prevents taking, killing, and possessing neotropical birds, their nests, and eggs.

Clean Water Act (as amended through 2002): regulates the discharges of pollutants to waters of the United States and sets effluent standards on an industry basis and sets water quality standards for all contaminants in surface waters.

Clean Air Act (as amended through 1990): regulates air emissions from area, stationary, and mobile sources. This law allowed for the establishment of National Ambient Air Quality Standards (NAAQS) to protect public health and the environment.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1972: provides federal control of pesticide distribution, sale, and use. Requires that users receive certification as applicators of pesticides. All pesticides used in the United States must be registered (licensed) by the Environmental Protection Agency.

C.3 Federal Excecutive Orders

EO 11988, Floodplain Studies (24 May 1972): requires agencies to evaluate the potential effects of proposed undertakings on floodplain areas and to ensure that action take into account flood hazards and floodplain management needs. This EO provides agencies with guidance in questions of development in floodplain contexts and suggests avoidance of such development whenever possible.

EO 11989 and 11644, Use of Off-Road Vehicles on Public Lands: Mandates that USDI, USDA, DOD, and Tennessee Valley Authority shall control and direct off-road vehicle use to protect the resources, maximize safety and minimize conflict. EO 11989 exempts emergency and military vehicles from regulation and authorizes land managers to close any areas to off-roads vehicles if considerable adverse impact will be or has been caused by off-road vehicles.

EO 11990, Protection of Wetlands: minimizes the destruction, loss, or degradation of wetlands to enhance the natural and beneficial values of wetlands.

EO 12962, Recreational Fisheries: mandates that federal agencies shall improve the quantity, function and sustainable production of aquatic resources for recreational fishing.

EO 13112, Invasive Species: prevents the introduction of invasive species, monitors and controls existing populations of invasive species, and restores native species.

EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds: directs federal agencies to promote the conservation of migratory bird populations in conjunction with USFWS.

EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management: mandates that "Federal agencies conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner."

C.4 Army Regulations

AR 200-1 Environmental Protection and Enhancement and Pamphlet 200-1: provide an overview of environmental programs and requirements. The pamphlet describes Army procedures for preserving, protecting, and restoring environmental quality in accordance with Army Regulation 200-1.

C.5 Army National Guard Regulations

Army National Guard, Guidance, Army National Guard Directorate, Environmental Programs Division Guidance for the Creation, Implementation, Review, and Revision and Update of Integrated Natural Resource Management Plans (09 April 2012): provide an overview of how TXARNG will review and seek approval for INRMPs as well as how the TMD will request funding from ARNG I&E, and specific

requirements for what must be included in the INRMP.

C.6 Department of Defense Policies

DoD Instruction 4715.03 (18 March 2011) – Environmental Conservation Program: implements policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources on property under DoD control.

DoD Manual 4715.03 (25 November 2013) – INRMP Implementation Manual: provides procedures to prepare, review, update, and implement INRMPs in compliance with section 670-670o of Title 16, USC, also known as the Sikes Act.

DoD Manual 5525.17 (17 October 2013) – Conservation Law Enforcement: establishes Conservation Law Enforcement organizations, authorities, etc.

C.7 State Laws and Regulations

Texas Department of Agriculture (as filed with the Office of the Secretary of State on 17 Dec 2004), Chapter 19, Quarantines and Noxious Plants: outlines how TXDA adopts lists of noxious plants. New §19.300 is adopted to establish a noxious plant list in accordance with the passage of Senate Bill 854, 78th Texas Legislature, 2003, which amended the Texas Agriculture Code (the Code), by adding new §71.151. Section 71.151 requires the department by rule to publish a list of noxious plant species that have serious potential to cause economic or ecological harm to the state.

Parks and Wildlife Code (amended through 1 Sept 1997), Chapter 66, Fish: outlines guidelines for fishing as well as polices relating to the treating of fish.

Parks and Wildlife Code (as amended through 26 Aug 1991) Chapter 88, Endangered Plants: defines what classifies a plant as endangered and outlines the policies concerning the treatment of said plants.

Appendix D. Standard Operating Procedures

D.1 Red Imported Fire Ant Protocol

Standard Operating Procedure (SOP)
Red Imported Fire Ant Treatment Protocol

Date: 8 May 2015
Number:

Texas Military Department
2200 West 35th Street
Austin, TX 78703

OPR: Construction & Facilities Maintenance Officer (CFMO)
Environmental Branch

Official: _____
John L. (Les) Davis
COL, IN, TXARNG
Director, CFMO

Summary. To establish a protocol for the routine treatment of red imported fire ants (RIFAs) at facilities with minimal impact on native ants and minimal use of pesticides.

Applicability. This SOP is applicable to all personnel involved maintaining facilities, particularly around buildings and on ranges. Only Texas State certified pesticide applicators or personnel trained in the self-help program by the Integrated Pest Management Coordinator (IPMC) may apply pesticides, and only using pesticides authorized at their certification level.

Management Control Process.

Proponent and Exception Authority. The proponent for this SOP is the Director of Construction and Facilities Maintenance Office (CFMO). The deputy director and Environmental Branch Chief have authority to approve exceptions to this SOP consistent with controlling guidance and regulation.

Supplementation. Supplementation of this SOP or establishment of command and local forms on (subject of SOP) is prohibited without prior approval from the Director (CFMO), through the CFMO Operations Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

Suggested Improvements. Users are invited to send comments and suggested improvements concerning this SOP directly to the CFMO Operations Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

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Chapter 1. Responsibilities

Facility managers will ensure this protocol is distributed and utilized by maintenance personnel when necessary. Maintenance personnel will follow the guidelines described here to treat RIFAs to minimize impact to the environment, while reducing the impact of RIFAs on people, equipment, and property.

Chapter 2. Protocol

1. This protocol is designed to protect people, equipment, and property while minimizing impacts to native animals and the environment.

2. Only Texas State certified pesticide applicators or personnel trained in the self-help program by the IPMC may apply pesticides, and only using pesticides authorized at their certification level.

3. Only direct mound application methods at the application rate described on the product label are authorized. Broadcast methods will not be used even if they are described on product labeling.

4. Inspect the volume of pesticide in the product container (i.e., 1/2 package, 1/4 package, etc.) prior to beginning application and record the observation on the self-help reporting form or other appropriate form.

5. Implement individual mound treatment methods at the label rate. Pesticides will be applied around mounds but not directly on the disturbed soil.

6. Inspect the volume of pesticide remaining in the product container after application is complete. Use the volume estimates to estimate the proportion of the product in the container that was used (i.e., 1/2 package, 1/4 package, etc.) and record on the reporting form. Record the total package volume (i.e., 2 lb. etc.) on the form. Provide the reporting form to the IPMC (NGTX-FE, 512-782-6218).

7. Monitor the site periodically to determine if the treatment worked and when reapplication is needed.

Chapter 3. Restrictions

1. Applications should be made in early spring and mid-fall. Fall applications only may be sufficient at some locations.

2. Applications should be made when the temperature is between 70-80 °F. Bait will become rancid quickly on hot days, and ants will be less active on cold days.

3. Do not apply baits if rain is likely within the next 48 hours or within 24 hours after a heavy rain.

4. Report pounds of active ingredient applied to IPMC (NGTX-FE, 512-782-6218) as with other pesticides and herbicides.

5. Only Texas State certified pesticide applicators or personnel trained in the self-help program by the IPMC may apply pesticides on federal or state owned land.

Chapter 4. Recommended Chemicals

Only chemicals on the IPMP or self-help lists for the given applicator's certification level or with prior approval from the IPMC may be used. Contractors and staff must contact the IPMC at 512-782-6218 to confirm authorizations of chemicals that are not on the lists prior to application.

Chapter 5. Points of Contact

1. A copy of this SOP is kept in Appendix D of the INRMP and the Environmental Compliance Toolkit. It is also available on the Environmental website and Lone Star Portal.

2. Questions should be directed to NGTX-FE, IPMC at 512-782-6218.

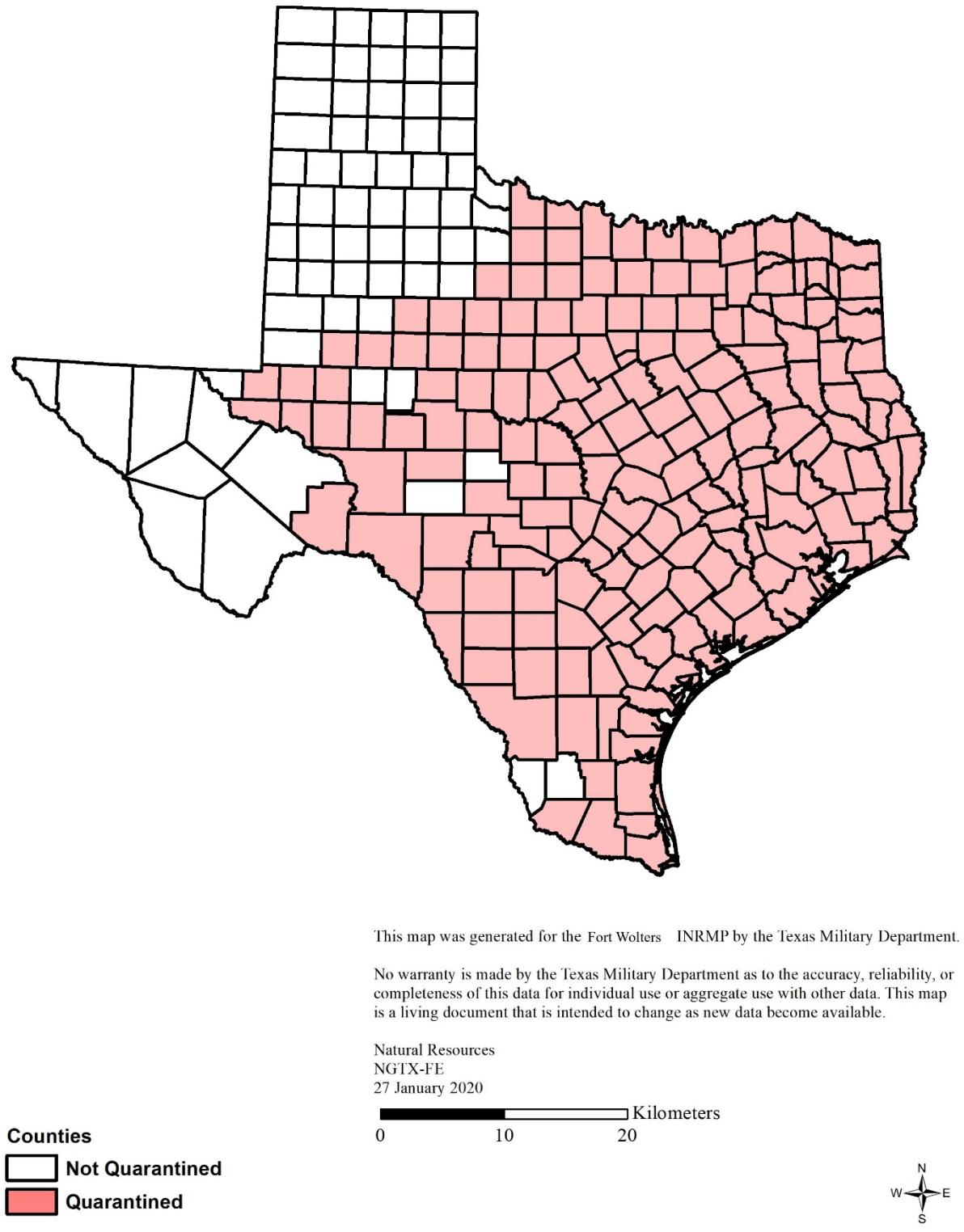

Figure D-1. Red Imported Fire Ant Quarantine Areas of Texas.

D.2 Tree Management

Standard Operating Procedure (SOP)

Tree Management

Number:

Texas Military Department
2200 W. 35th St
Austin, TX 78703

OPR: Construction & Facilities Management Officer (CFMO)
Environmental Branch

Official: John L. Davis
John L. (Les) Davis
COL, IN, TXARNG
Director, CFMO

Summary. To ensure that any activities associated with tree management on state or federal Texas National Guard properties are performed in a manner that ensures long-term tree health. This SOP establishes a protocol for trimming, pruning, cutting and care of trees. The protocol should result in a reduced incidence of oak wilt and the spread of other diseases in trees and a heightened awareness of general management techniques.

Applicability. This SOP applies to all TMD persons responsible for direct or indirect maintenance, care, and health of all species of trees within TMD property.

Management Control Process. CFMO Environmental Branch is responsible for evaluating requests pertaining to any proposed action involving trees. The evaluation shall include compliance issues related to local, state, and federal laws.

Proponent and Exception Authority. The proponent for this SOP is the Director of CFMO. The deputy director, and environmental branch chief have authority to approve exceptions to this SOP consistent with controlling guidance and regulation.

Supplementation. Supplementation of this SOP or establishment of command and local forms on (subject of SOP) is prohibited without prior approval from the Director (CFMO), through CFMO Operations Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

Suggested Improvements. Users are invited to send comments and suggested improvements concerning this SOP directly to Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

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Chapter 1. Tree maintenance request procedures.

1. No tree(s) will be disturbed, cut, trimmed, or removed without prior approval from CFMO Environmental Branch.

2. To prevent the spread of oak wilt and other disease, all equipment used for tree management will be sterilized with a solution of either Lysol TM spray or a 70% rubbing alcohol solution. Arrangements should be made ahead of time regarding disposition of any parts of trees that are removed.

3. Avoid pruning oaks from February 1 through June 1, due to increased susceptibility to the spread of oak wilt.

4. All wounds on oaks shall be painted with a commercial pruning paint immediately after the wound has been made. This includes cutting and trimming of limbs as well as accidents produced by weed eaters, bulldozers, mowers, wind damage or other trauma.

5. Oak trees that are damaged by weather or have fallen limbs should be painted as quickly as possible.

6. Digging or trenching under the canopy of a tree requires prior approval and a Record for Environmental Consideration (REC) process. The Environmental Branch of CFMO, must review and approve these RECs prior to the implementation of any action. The form may be found here; https://portal.tx.ng.mil/arg/arg010/SitePages/env_rec.aspx..

7. In the event that a sick or distressed tree or group of trees is observed, notify CFMO Environmental immediately. Signs of stress or illness include sloughing of bark, browning, and shedding leaves during the growing season.

Chapter 2. Points of contact.

1. Questions, Natural Resources Manager, Dr. Linda Brown, at 512-782-5818.

2. Camp Mabry requires authorization from either Dr. Linda Brown 512-782-5818 or Mr. Pete Byers 512-782-5709.

3. Digging or trenching 512- 782-5818.

4. Sickness or distresses 512-782-5818 or 512-782-6227.

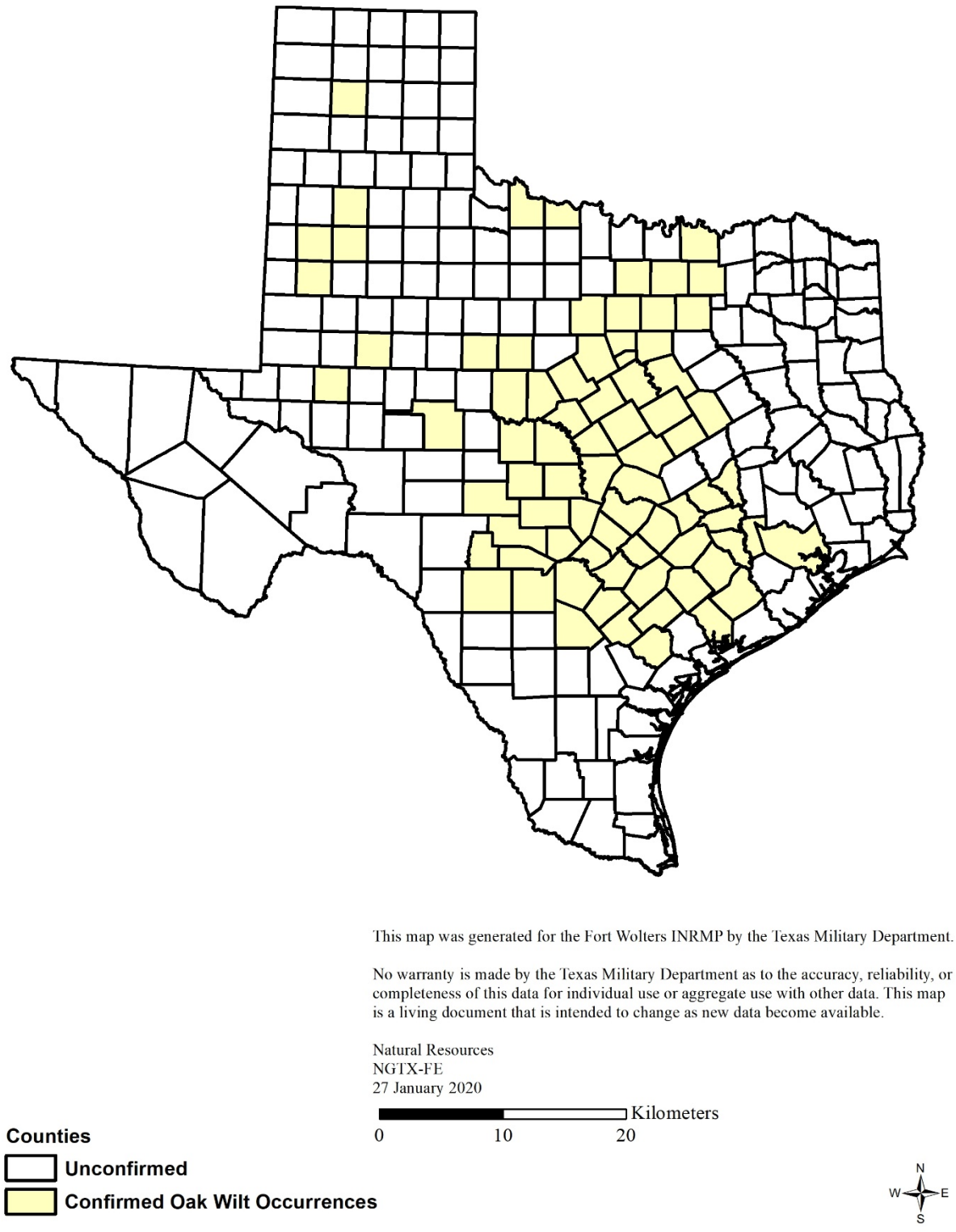

Figure D-2. Oak Wilt Occurrences in Texas Counties

Amendment to Tree Management SOP

As per the Migratory Bird Treaty Act (MBTA) avoidance of tree trimming and removal during the migratory bird breeding season to avoid take as defined by the MBTA. Though breeding periods for different species vary, US Fish and Wildlife Service typically recommends avoiding vegetation removal between March 1st and August 31st. Surveys can be conducted prior to removal in order to document nests, or lack of nests, if activities need to occur during breeding season. However, the best and most cost effective way to avoid take of active nests and/or nesting birds is to conduct such activities outside of the breeding season.

D.3 Landscaping Design

Standard Operating Procedure (SOP)

Landscaping Design

Number:

Texas Military Department
2200 W. 35th St
Austin, TX 78703

OPR: Construction & Facilities Management Officer (CFMO)
Environmental Branch

Official: John L. Davis
John L. (Les) Davis
COL, IN, TXARNG
Director, CFMO

Summary. To establish protocol for landscape design in cantonment areas and near structures.

Applicability. This SOP applies to all TMD persons responsible for direct or indirect maintenance, care, and up keep of the grounds within TMD property.

Management Control Process. CFMO Environmental Branch is responsible for evaluating requests pertaining to any proposed action involving landscape modificaiton or design. The evaluation shall include compliance issues related to local, state, and federal laws.

Proponent and Exception Authority. The proponent for this SOP is the Director of CFMO. The deputy director, and environmental branch chief have authority to approve exceptions to this SOP consistent with controlling guidance and regulation.

Supplementation. Supplementation of this SOP or establishment of command and local forms on (subject of SOP) is prohibited without prior approval from the Director (CFMO), through CFMO Operations Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

Suggested Improvements. Users are invited to send comments and suggested improvements concerning this SOP directly to Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

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Chapter 1. Responsibilities

1. Engineers and architects under the Construction and Facility Management Office (CFMO) are responsible for ensuring that these guidelines are incorporated into new designs and, where applicable, modifications of existing structures.

2. Natural Resource staff are responsible for reviewing any landscape plans.

3. Cultural Resource staff are responsible for reviewing any landscape plans for consistency near buildings of historical significance. Facilities and Engineering staff are responsible for reviewing security concerns.

Chapter 2. Guidelines

1. Landscaping projects shall emphasize native plants, water conservation and low maintenance according to Texas Parks and Wildlife and the Texas Extension Service guidelines.

2. Soil moisture and amount of sun, as well as use of area are key design considerations. Trees should have pervious cover from trunk to dripline and any grade changes will require review and tree protection. In areas with high deer density, considerations should be given to preventing mortality from deer.

3. In some locations, a soil analysis is critical for successful landscape design. Most locations would benefit from the addition of organic matter to landscaping beds.

4. Turf areas should be minimized to the extent practical. Turf areas typically require more maintenance and greater water. Native grass turf areas are a feasible alternative with low maintenance and no watering needs (after establishment).

5. Use plants native to ecoregion that do well in the soil and climate of the area. This reduces maintenance, fertilizer needs, pest problems, watering and mortality as well as providing habitat for other organisms. Invasive plants, or plants prone to escaping cultivation, should never be used. Adapted, non-invasive plants may be approved on a case-by-case basis.

6. Mulch should be applied with landscape installation and during the 1 year maintenance period. Until the plants are well established and there is minimal bare ground, mulch should be top-dressed once or twice a year. Mulch near buildings should be discussed with project engineer or architect to minimize potential termite damage.

7. Have temporary driplines installed during plant establishment. After establishment,

native plants should only require additional water during times of drought. In that case, only water occasionally but thoroughly to promote good root growth, preferably with a drip line. Trees and shrubs should receive supplemental watering inside the dripline of the tree during first two years as needed, typically once a month during dry periods.

8. One year of maintenance should be included in any landscaping contract. This guarantees that the landscaping company will weed, irrigate, mulch and replace any plants that die during the critical first year of plant establishment. After the initial year, minimize mowing to turf areas to promote good ground cover and root growth. Higher turf height (3" or higher) can also reduce storm water runoff and pollution from impervious areas. Fertilizer (non-chemical) and water should only be applied as needed.

9. Typically vegetation within 10 meters of an 'inhabited' building (not storage structures) must have clear line of sight in the 6' immediately above the soil. Security criteria are addressed in the Unified Facility Criteria (UFC) 4-010-01 and Security Construction Measures can be obtained from Facility and Engineering staff.

10. Project specific plant lists can be developed in conjunction with Natural Resource staff.

Chapter 3. Points of contact.

1. Natural Resources Manager, Dr. Linda Brown, at 512- 782-5818.

D.4 Activities Near or In Water Ways

Standard Operating Procedure (SOP)

Activities Near or In Water Ways

Number:

Texas Military Department
2200 W. 35th St
Austin, TX 78703

OPR: Construction & Facilities Management Officer (CFMO)
Environmental Branch

Official: John L. Davis
John L. (Les) Davis
COL, IN, TXARNG
Director, CFMO

Summary. To establish protocols for maintenance and use of areas in or near waterways to include perennial or intermittent (dry) streams, stock tanks, ponds and lakes.

Applicability. This SOP applies to all TMD persons responsible for direct or indirect maintenance, care, and up keep of the grounds within TMD property.

Management Control Process. CFMO Environmental Branch is responsible for evaluating requests pertaining to any proposed action involving waterways. The evaluation shall include compliance issues related to local, state, and federal laws.

Proponent and Exception Authority. The proponent for this SOP is the Director of CFMO. The deputy director, and environmental branch chief have authority to approve exceptions to this SOP consistent with controlling guidance and regulation.

Supplementation. Supplementation of this SOP or establishment of command and local forms on (subject of SOP) is prohibited without prior approval from the Director (CFMO), through CFMO Operations Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

Suggested Improvements. Users are invited to send comments and suggested improvements concerning this SOP directly to Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

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Chapter 1. Responsibilities

1. Facility managers are responsible for ensuring that users and maintenance personnel follow this SOP.

2. Facilities & Engineering are responsible for ensuring any designs or contracts adhere to this SOP.

Chapter 2. Guidelines

1. Water resources are critical to the long-term sustainability of the facility and the associated vegetation provides critical filtration and erosion management.

2. Vegetation management. Vegetation shall never be removed (mowed or otherwise) up to the edge of a water body or waterway. At least a 25 foot buffer shall be undisturbed. Disturbance of vegetation for an additional 75 feet should be limited.

3. Access points. Access points will be designed to minimize erosion and will only be as large as necessary for the type of access.

4. Adjacent roads and trails. Roads adjacent to or crossing waterways or water bodies require extra care during maintenance. Vegetation buffers shall be maintained between roads and water resources. Mowed buffers are not effective. Stream crossings should be either armored low water crossings or a span crossing. See SOP for Unimproved Roads for more details on stream crossings and maintaining roadsides. See SOP for Trails, Fence lines and Firebreaks for more details on maintaining those features.

5. Fishing. No live bait except grubs and worms will be used unless it is caught within the water body that is being fished. All fishing will be “catch and release” unless otherwise posted and approved by Natural Resources.

6. Decontamination of Equipment. ALL equipment (including boats, nets, and boots) will be free from any debris before entering any water body or waterway. ALL equipment will be thoroughly rinsed and dried before entering any water body or waterway. This minimizes the spread of aquatic plants and animals, particularly invasive ones such as *Hydrilla*, Zebra, Mussels, and *Corbicula* clams.

Chapter 3. Points of contact.

1. Questions, Natural Resources Manager, Dr. Linda Brown, at 512-782-5818.

2. Digging or trenching 512-782-5818.

D.5 Brush Piles

Standard Operating Procedure (SOP)

Brush Piles

Number:

Texas Military Department
2200 W. 35th St
Austin, TX 78703

OPR: Construction & Facilities Management Officer (CFMO)
Environmental Branch

Official: John L. Davis
John L. (Les) Davis
COL, IN, TXARNG
Director, CFMO

Summary. To ensure that any activities associated with burning of brush on state or federal Texas National Guard properties are performed in a manner that ensures smoke reduction and reduction of unintended burn areas. This SOP establishes a protocol for activities regarding brush management. The protocol should result in a reduction in smoke produced and a reduction in the potential for unintended burn or fire spread.

Applicability. This SOP applies to all TMD persons responsible for direct or indirect maintenance, care, and removal brush piles of any size within TMD property.

Management Control Process. CFMO Environmental Branch is responsible for evaluating requests pertaining to any proposed action involving requests for any proposed action involving the burning of brush piles, (A brush pile is defined as any 'woody' vegetation removed and stocked or piled in any size.) The evaluation shall include compliance issues related to local, state, and federal laws.

Proponent and Exception Authority. The proponent for this SOP is the Director of CFMO. The deputy director, and environmental branch chief have authority to approve exceptions to this SOP consistent with controlling guidance and regulation.

Supplementation. Supplementation of this SOP or establishment of command and local forms on (subject of SOP) is prohibited without prior approval from the Director (CFMO), through CFMO Operations Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

Suggested Improvements. Users are invited to send comments and suggested improvements concerning this SOP directly to Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

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Chapter 1. Responsibilities

1. Facilities & Engineering are responsible for ensuring contracted design or maintenance work complies with this SOP.

2. Maintenance personnel at training sites are responsible for ensuring activities comply with this SOP.

3. The Wildland Fire Program Coordinator is responsible for evaluating requests for proposed action involving the creation or burning of brush piles.

Chapter 2. Guidelines

1. Prior approval for creating or adding to brush piles is required through the Record for Environmental Consideration (REC) process. The Environmental Branch of CFMO, must review and approve these RECs prior to the implementation of any action. The form may be found here; https://portal.tx.ng.mil/arg/arg010/SitePages/env_rec.aspx. Brush piles that require a prescribed burn for disposal or that may increase wildland fire risk must be coordinated with the Wildland Fire Coordinator.

2. Brush piles should only be used as a last resort to prevent unnecessary smoke production near sensitive receptors and soil sterilization. Other means of brush disposal must be considered first, such as chipping, leaving brush in place, hauling the brush off site, or considering a different location to clear.

3. Brush piles cannot be created within 300 feet of an exterior boundary.

4. Brush piles can only be created using a fork attachment (or similar). Bulldozer blades shall not be used due to the loss of topsoil. In addition, the resulting soil in the brush pile does not allow for combustion of the materials and creates more smoke than necessary.

5. Brush pile burning is a prescribed fire and therefore a prescription must be on file in NGTX-FE and reviewed and approved by qualified personnel. The brush pile must be burned by qualified personnel and monitored by personnel until smoke is no longer produced for 24 hours.

Chapter 3. Points of contact.

1. Natural Resources Manager, Dr. Linda Brown, at 512-782-5818.

2. Wildland Fire Coordinator, Mr. Wayne Strebe, at 512-782-6227.

D.6 Roadside and Dam Mowing

Standard Operating Procedure (SOP)

Roadside and Dam Mowing

Number:

Texas Military Department
2200 W. 35th St
Austin, TX 78703

OPR: Construction & Facilities Management Officer (CFMO)
Environmental Branch

Official: John L. Davis
John L. (Les) Davis
COL, IN, TXARNG
Director, CFMO

Summary. To ensure that any activities associated with mowing of roadsides and earthen dams on state or federal Texas National Guard properties are performed in a manner that ensures long-term health of native vegetation. This SOP establishes a protocol for trimming, pruning, cutting and care of native species. The protocol should result in an increase to critical habitat and a heightened awareness of general management techniques.

Applicability. This SOP applies to all TMD persons responsible for direct or indirect maintenance, care, and health of all species of vegetation within TMD property.

Management Control Process. CFMO Environmental Branch is responsible for evaluating requests pertaining to any proposed action involving removal, planting, digging, and extension of mow buffers on or near waterways. The evaluation shall include compliance issues related to local, state, and federal laws.

Proponent and Exception Authority. The proponent for this SOP is the Director of CFMO. The deputy director, and environmental branch chief have authority to approve exceptions to this SOP consistent with controlling guidance and regulation.

Supplementation. Supplementation of this SOP or establishment of command and local forms on (subject of SOP) is prohibited without prior approval from the Director (CFMO), through CFMO Operations Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

Suggested Improvements. Users are invited to send comments and suggested improvements concerning this SOP directly to Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

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CFMO SOP

Chapter 1. Responsibilities

1. Facility managers are responsible for ensuring that users and maintenance personnel follow this SOP.

2. Facilities & Engineering are responsible for ensuring any designs or contracts adhere to this SOP.

Chapter 2. Guidelines

1. Vegetation, especially native flowers and grasses, are critical to native pollinators. By reducing the width of roadside mowing, reducing the number of times mowed, and by timing mowing to certain times of the year, critical habitat can be protected for these species.

2. Vegetation management. Vegetation shall never be removed (mowed or otherwise) up to the edge of a water body or waterway. At least a 25 foot buffer shall be undisturbed. Disturbance of vegetation for an additional 75 feet should be limited.

3. Roadsides. Mowing along roadsides should be limited to one mower width along each side of the road. Roads adjacent to or crossing waterways or water bodies require extra care during maintenance. Vegetation buffers shall be maintained between roads and water resources. Mowed buffers are not effective.

4. Dams. Dams should be mowed no more than twice a year in late fall (November) and or early spring (February) the vegetation located on dams is prime habitat for Milkweed and other pollinator species.

5. Decontamination of Equipment. ALL equipment should be regularly cleaned to prevent the spread of invasive nonnative plants. Strongly washing all machinery, blades and undercarriages is mandatory.

Chapter 3. Points of contact.

1. Natural Resources Manager, Dr. Linda Brown, at 512-782-5818.

D.7 Migratory Birds

Standard Operating Procedure (SOP)

Migratory Birds

Number:

Texas Military Department
2200 W. 35th St
Austin, TX 78703

OPR: Construction & Facilities Management Officer (CFMO)
Environmental Branch

Official: John L. Davis
John L. (Les) Davis
COL, IN, TXARNG
Director, CFMO

Summary. To ensure that any activities associated with migratory bird management on state or federal Texas National Guard properties are performed in a manner that ensures long-term health of migratory bird habitat. This SOP establishes a protocol for activities during the nesting season and nest disturbance. The protocol should result in an increase in migratory bird habitat and a heightened awareness of general management techniques.

Applicability. This SOP applies to all TMD persons responsible for direct or indirect maintenance, care, and health of all migratory bird species within TMD property.

Management Control Process. CFMO Environmental Branch is responsible for evaluating requests pertaining to any proposed action involving migratory birds and their habitat. The evaluation shall include compliance issues related to local, state, and federal laws.

Proponent and Exception Authority. The proponent for this SOP is the Director of CFMO. The deputy director, and environmental branch chief have authority to approve exceptions to this SOP consistent with controlling guidance and regulation.

Supplementation. Supplementation of this SOP or establishment of command and local forms on (subject of SOP) is prohibited without prior approval from the Director (CFMO), through CFMO Operations Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

Suggested Improvements. Users are invited to send comments and suggested improvements concerning this SOP directly to Office, ATTN: CFMO, P.O. Box 5218, Austin, TX 78763-5218.

Distribution. A

Table of Contents

CFMO SOP

Chapter 1. Responsibilities

1. Facility managers are responsible for ensuring that users and maintenance personnel follow this SOP.

2. Facilities & Engineering are responsible for ensuring any designs or contracts adhere to this SOP.

3. The Wildland Fire Program Coordinator is responsible for evaluating requests for proposed action involving the burning of vegetation.

Chapter 2. Guidelines

1. Migratory birds use a variety of habitats to raise young and rest during long journeys on their migratory routes. With proper management, habitat can be protected for these species.

2. No bird nest(s) will be disturbed or removed without prior approval from CFMO Environmental Branch. If a nest is found during work, establish a 50 meter no work zone and then contact CFMO Environmental Branch.

3. Vegetation management. All vegetation removal requires prior approval and a Record for Environmental Consideration (REC) process. The Environmental Branch of CFMO, must review and approve these RECs prior to the implementation of any action. The form may be found here;
https://portal.tx.ng.mil/arg/arg010/SitePages/env_rec.aspx

4. Limit habitat disturbance during the breeding season, between March and August.

5. Vegetation burning is a prescribed fire and therefore a prescription must be on file in NGTX-FE and reviewed and approved by qualified personnel. Vegetation must be burned by qualified personnel and monitored by personnel until smoke is no longer produced for 24 hours.

Chapter 3. Points of contact.

1. Natural Resources Manager, Dr. Linda Brown, at 512-782-5818.

2. Wildland Fire Coordinator, Mr. Wayne Strebe, at 512-782-6227.

D.8 Integrated Pest Management Plan

Refer to the 2018 Integrated Pest Management Plan for information on Pest Management and Self Help of Pest Management.

https://portal.tx.ng.mil/Pages/Default.aspx

Appendix E. Environmental Assessment

FINDING OF NO SIGNIFICANT IMPACT (FNSI) IMPLEMENTATION OF AN INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN (INRMP), FORT WOLTERS, PALO PINTO AND PARKER COUNTIES, TEXAS

Refer to the 2006 Environmental Assessment for information.

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Appendix F. Table of Goals, Objectives, and Targets

The following is a summary table of all the goals, objectives, and targets listed in the INRMP. This table will be reviewed annually to track progress toward targets for each annual review. Targets may be achieved through one or more projects. Projects can be completed using in-house resources, through cooperative agreements with other agencies and partners, or by contract action.

Section	Goal	Objective	Review Date	Target	Execution Date
Management Framework					
	Maintain and improve usability of land for training		1/11/2025		
		Conduct annual review of land management with operators (training site staff and planners)	1/11/2025		
				Determine extent to which natural resources projects affect Ongoing military activities quarterly	8/2020 (annually thereafter)
				Determine any land management issue that needs to be addressed to improve training	8/2020 (annually thereafter)
		Recover areas previously damaged by training and reopen Responsible - ITAM	1/11/2025		
				Identify and prioritize areas previously damaged	12/2020 (annually thereafter)
				Begin recovery of areas	12/2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
	Identify potential problems during planning phases and avoid or mitigate in design		1/11/2025		
				Create a GIS-based model to identify sensitive areas with buffers for planning	12/2020 (annually thereafter)
				Maintain comprehensive GIS data in required formats with metadata	2020 (annually thereafter)
				Provide general data for use by TMD and cooperating agencies	12/2020 (annually thereafter)
				Maintain and update natural resources data regularly	12/2020 (annually thereafter)
	Maintain ecosystem functions and all components with no net loss of training area		1/11/2025		
		Identify information gaps regarding management techniques and ecosystem function	1/11/2025		
				Develop a list of needs for primary research to support management decisions	12/2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
				Adapt management regime based on research results	Result Dependent
				Create state and transition models for riparian sites and other additional sites	12/2020 (annually thereafter)
		Institute adaptive management structure	1/11/2025		
				Conduct annual review of land management with USFWS, TPWD, trainers, and facilities management	12/2020 (annually thereafter)
				Modify goals, objectives, and targets as needed	12/2020 (annually thereafter)
				Develop database with goals, objectives, and targets to use for tracking queries	12/2020 (annually thereafter)
				Attend Symposiums and conferences to stay current on management processes and new science	2020 annually thereafter
Awareness					
	Inform and involve training site staff with natural resources management		1/11/2025		
		Inform staff about projects and results of projects	1/11/2025		
				Provide maps of Ongoing projects as needed	Quarterly @ TCGC brief

Section	Goal	Objective	Review Date	Target	Execution Date
				Determine who needs to know what and when	Quarterly @ TCGC brief
				Develop examples and photos of successful, innovative solutions	12/2020 (annually thereafter)
		Provide awareness materials for staff to distribute to users	1/11/2025		
				Develop brochures about training site resources and management	As needed
	Educate soldiers about natural resources		1/11/2025		
				Develop computer presentations that can be used for briefings (long and short versions)	Quarterly @ TCGC brief
				Educate soldiers on natural resources safety issues (poison ivy, insects, feral hogs, snakes)	Quarterly in EarthGuard
	Inform and assist headquarters staff about natural resources and land management		1/11/2025		
		Develop SOPs and BMPs that support goals and objectives	1/11/2025		
				Identify all SOPs and BMPs needed and evaluate annually	12/2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
		Participate in planning processes	1/11/2025		
				Attend RPPB meetings and working groups	Quarterly
				Participate in master planning, REC review processes	Ongoing
		Share analysis and results of monitoring data with staff	1/11/2025		
				Present results at annual review	12/2020 (annually thereafter)
	Increase public outreach activities		1/11/2025		
		develop outreach presentations for neighbors/community	1/11/2025		
				Develop 1 outreach program per year on topics such as oak wilt, prescribed fire, restoration, plant ID, invasive species, youth hunting and others	12/2020 (annually thereafter)
				Initiate “open house” day annually starting	12/2020 (annually thereafter)
		Increase public participation in land management projects	1/11/2025		
				Initiate Public Lands Day projects	12/2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
				Present results of surveys and projects at conferences and in newsletters	ongoing
Monitoring					
	Establish a coordinated monitoring program with ITAM and Natural Resources		1/11/2025		
		Cooperation between ITAM and Natural Resources	1/11/2025		
				Natural Resources team supports ITAM with data sharing for fire program, water quality monitoring, GIS and vegetation management	As results are available
		Monitor military training impacts (ITAM)	1/11/2025		
				Incorporate an RTLA component within the overall Monitoring Plan	12/2020 (annually thereafter)
				Determine the thresholds and make recommendations on the frequency and intensity of training area usage	Ongoing
				Identify areas directly impacted by military training	Ongoing
				Develop a monitoring plan for military training	12/2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
				Analyze results yearly and present at annual review	12/2020 (annually thereafter)
		Database management and analysis strategy	1/11/2025		
				Identify any computer software or hand-held data loggers needed	As needed
				Maintain photo-point database and update per manual	2020(annually thereafter)
				Maintain seeding and planting database	As needed
				Develop additional databases	As needed
		Incorporate weather trends into management analysis			
				Coordinate with Texas Forest Service to access weather data from the nearest appropriate station	2020 (annually thereafter)
Erosion and Sediment Control					
	Reduce new erosion		1/11/2025		

Section	Goal	Objective	Review Date	Target	Execution Date
		Incorporate erosion considerations into infrastructure and training planning	1/11/2025		
				Utilize soil erodibility information in facilities planning	Ongoing
				Consider erosion potential during REC project review process	Ongoing
		Avoid erosion-prone areas	1/11/2025		
				Identify erosion site and create a layer in GIS	ongoing
				Establish buffers around erosion features and identify in GIS	ongoing
				Develop and share maps with ITAM	ongoing
		Evaluate proposed road and fire lane maintenance to prevent new erosion	1/11/2025		
				Develop BMPs and SOPs for maintenance of fire lanes, creek crossings, roadside ditches, grading roads, water bars, and seed mix and application	2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
		Maintain/increase vegetation cover and soil stability	1/11/2025		
				Prioritize watersheds and sensitive areas, including wetlands and streams, based on watershed assessment	ongoing
				Monitor erosion areas before and after each prescribed fire or wildfire	ongoing
		Manage feral hogs and their impact on water resources	1/11/2025		
				Conduct Feral Hog Control Projects	ongoing
Fire Management					
	Reduce risk associated with wildland fires		1/11/2025		
		Establish or improve communication with neighbors and general public about wildland fire	1/11/2025		
				Develop Fire Management Plans	2021
				Use all forms of media for public awareness and notifications, including social media, concerning wildland fire operations (see Section 3.2)	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
				Participate in area wide wildland fire programs held by local, state, or national agencies	Ongoing
				Establish or update MOUs and MOAs with outside agencies	As needed
		Improve wildfire incident reporting	1/11/2025		
				Maintain a wildfire history map	2020 (annually thereafter)
				Develop and maintain a database for recording wildfire incidents	2020 (annually thereafter)
		Reduce hazardous fuel accumulation to reduce the probability of extreme wildfire damage to habitat	1/11/2025		
				Assess all on-property structures using Firewise for urban-wildland interface	Ongoing
				Conduct prescribed fire on a natural fire return interval to reduce woody encroachment	Ongoing
				Identify and maintain all existing roads and firebreaks	Ongoing
				Identify and create additional firebreaks as needed	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
	Maintain and improve the usability of the training centers for military training		1/11/2025		
		Conduct prescribed fires on a natural fire return interval to manage brush encroachment, open understory, and stimulate native grasses	1/11/2025		
				Identify training areas with highest use to prioritize burn units	2020 (annually thereafter)
				Keep staff current with fire certifications through fire management CEU's	ongoing
				Coordinate with ITAM on projects to improve training areas	Ongoing
	Maintain high quality areas while promoting native biodiversity		1/11/2025		
		Conduct prescribed fires on natural fire return interval to maintain intact native vegetation	1/11/2025		
				Improve and update GIS priority model to identify areas in need of prescribed fire	2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
				Vary spatial extent and seasonality of prescribed fires to create a heterogeneous environment	Ongoing
				Identify the responses and necessity of prescribed fire for rare, endangered, and invasive species	Ongoing
Invasive Species Control and Pest Management					
	Prevent introduction of new invasive species or establishment of new populations		1/11/2025		
		Develop an early detection system for potential invasive species	1/11/2025		
				Monitor populations of non-native species that are not invasive through vegetation planning level surveys	2020 (annually thereafter)
				Provide training for certified personnel concerning invasive plant identification and provide a reporting format for discoveries	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
				Update invasive plant distribution maps for priority species annually	ongoing
				Examine any dead/dying ash trees for emerald ash borer (*Agrilis planipennis*)	Ongoing
		Participate in statewide initiatives and data sharing to identify potential risks	1/11/2025		
				Remain current on statewide invasive species issues and patterns of spread near Fort Wolters	2020 (annually thereafter)
				Participate in Texas State Invasive Species Council as appropriate	Ongoing
				Share invasive species spatial data with other state and federal agencies	2020 and Ongoing thereafter
		Prevent spread of oak wilt centers	1/11/2025		
				Educate training site personnel to identify oak wilt with oak wilt brochure	2020 (annually thereafter)
				Continue to educate about the SOP for Tree Maintenance	2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
				Introduce and encourage native trees that are not susceptible to oak wilt	2020 (annually thereafter)
				Incorporate invasive species into NEPA analysis	2020 (annually thereafter)
	Reduce or maintain existing populations of invasive species		1/11/2025		
		Certify personnel to treat small invasions in-house to prevent larger treatments	1/11/2025		
				Have at least two state certified pesticide applicators through CEU's to maintain current licenses	2020 (annually thereafter)
				Encourage natural predators by maintaining intact diverse native ecosystems	2020 (annually thereafter)
		Manage feral hogs and reduce numbers when feasible	1/11/2025		
				Target: Communicate with adjacent landowners and extension agents	2020 (annually thereafter)
				Target: Continue feral hog eradication program	2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
		Monitor and manage high-risk invasive species for potential spread	1/11/2025		
				Identify priority areas for treatment, map and re-evaluate annually	Ongoing
				Treat species on sites interior from roads as needed	2020 (annually thereafter)
				Treat species along roadsides and dirt piles	2020 (annually thereafter)
				Identify best management practices to discourage future establishment of non-natives	Ongoing
				Maintain GIS database for invasive species	Ongoing
				Monitor the effects of fire on invasive species	Ongoing
				Treat Invasive Malta Star thistle	2020 and yearly thereafter as needed
	Implement the Integrated Pest Management Plan		1/11/2025		
		Use an integrated pest management approach to maximize safety and minimize	1/11/2025		

Section	Goal	Objective	Review Date	Target	Execution Date
		pesticide use and potential hazards and consider alternatives to pesticide use			
				Assist training center personnel with guidance for pest treatments	2020 (annually thereafter)
				Perform PMQAE duties and maintain training requirements	2020 (annually thereafter)
				Annual review of Integrated Pest Management Plan	2020 (annually thereafter)
				Update Integrated Pest Management Plan every 5 years	2021 (annually thereafter)
		Implement self-help pesticide program	1/11/2025		
				Perform self-help trainings to educate training center staff and suggest appropriate equipment for safety, application, containment, and storage	As needed
				Ensure the Self-Help Pest Program SOP is up to date	2020 (annually thereafter)

Section	Goal	Objective	Review Date	Target	Execution Date
				Update SPUL as needed and annually	2020 (annually thereafter)
		Report pesticide application	1/11/2025		
				Collect and compile self-help and contract labor pesticide application records	Quarterly
				Compile pounds per active ingredients and report to NGB annually	2020 (annually thereafter)
				Submit ISR reporting as requested	As needed
Wetlands, Ponds, and Riparian Areas					
	Maintain with no net loss and improve high quality wetlands, ponds, and riparian areas		1/11/2025		
		Include wetland, riparian, and floodplain considerations in REC project review processes	1/11/2025		
				Restrict vehicular traffic in stream beds	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
				Prevent construction in wetlands, floodplains, and buffers	Ongoing
				Minimize bivouac and camping activities within 25 ft of a water resource	Ongoing
		Protect and restore critical wetland areas	1/11/2025		
				Musgrave pond and creek restoration project	2021
				Identify sensitive areas and establish buffers if appropriate	Ongoing
				Identify and wetlands, ponds, and riparian areas in need of restoration	Ongoing
				Assess feasibility and results of aquatic macrophyte vegetation	Ongoing
				Reduce mowing in picnic areas at Lamar Lake to prepare for an event only	Ongoing
				Restore and maintain grassland buffers adjacent to Water Bodies	Ongoing
				Address beaver damage	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
				Develop BMPs and SOPs to prevent increased sediment loads into water resources	Ongoing
				Reduce erosion contributing to wetlands, ponds, and riparian areas	Ongoing
				Reduce existing invasive species, particularly feral hogs and Eurasian milfoil, and prevent introduction of new invasive species	Ongoing
				Maintain forested riparian areas	Ongoing
				Keep staff trained in wetland needs though CEU's and conferences related to wetlands	ongoing
Vegetation Management					Ongoing
	Manage encroaching woody vegetation using integrated brush management supported by GIS		1/11/2025		
		Develop prioritized brush management areas based on state and transition models	1/11/2025		

Section	Goal	Objective	Review Date	Target	Execution Date
				Keep staff trained in vegetation management needs though CEU's and conferences	Ongoing
				Utilize GIS layers with priority, target species, maintenance period, and recommended method	Ongoing
				Develop a GIS model to prioritize brush management areas	Ongoing
		Reduce the number of eastern red cedar <4 ft tall using prescribed fire	1/11/2025		
				Use prescribed fire in burn units on a natural fire return interval	Ongoing
				Utilize Herbicide management as appropriate	Ongoing
		Reduce acreage of eastern red cedar >4 ft tall	1/11/2025		
				Identify areas with high populations of eastern red cedar > 4 feet tall	Ongoing
				Implement eastern red cedar management projects using a variety of management techniques	Ongoing
		Monitor success of brush management projects	1/11/2025		

Section	Goal	Objective	Review Date	Target	Execution Date
				Implement vegetation and photo point monitoring	Ongoing
	Goal 2: Maintain intact native vegetation		1/11/2025		
		Maintain forested areas (particularly riparian areas)	1/11/2025		
				Minimize removal of vegetation within riparian and wetland buffers	Ongoing
				Remove invasive understory plants that prevent native forest regeneration using a variety of management techniques	Ongoing
		Maintain open grasslands and woodland edges by using prescribed fires	1/11/2025		
				Use prescribed fire in burn units on a natural fire return interval	Ongoing
				Use a variety of management techniques to reduce woody vegetation where fire is ineffective	Ongoing
		Identify relatively undisturbed, intact areas	1/11/2025		

Section	Goal	Objective	Review Date	Target	Execution Date
				Use historic aerial imagery to identify areas with little disturbance	Ongoing
		Identify areas with native remnants and other areas sensitive to brush management methods	1/11/2025		
				Maintain GIS layers of areas consisting of native remnants and areas sensitive to disturbance	Ongoing
				Incorporate rare plant survey management	Ongoing
		Determine management needs or protective measures necessary for the *Quercus stellate* wetland forests	1/11/2025		
				Monitor for tree mortality related to drought stress	Ongoing
				Incorporate rare plant survey management	Ongoing
		Establish seed harvesting and replanting of rare or “missing” species	1/11/2025		

Section	Goal	Objective	Review Date	Target	Execution Date
				Maintain areas that are appropriate for broad scale seed harvesting	Ongoing
				Use ecological site descriptions and species lists to analyze composition of native seed mixes	Ongoing
				Maintain seeding and planting database	Ongoing
		Carefully analyze proposed disturbances in deep sand areas to preserve high occurrence of endemic species	1/11/2025		
				Maintain GIS layer of deep-sand areas	Ongoing
		Monitor and prevent further spread of invasive plants and animals (see Section 3.6)	1/11/2025		
				Maintain GIS layer of invasive plant and animal occurrences	Ongoing
	manage shortleaf pine (*Pinus echinata*) forest, woodland, and isolated stands		1/11/2025		
		Establish baseline information on current short-leaf pine stands	1/11/2025		
			1/11/2025	Analyze historic data including aerial photographs, GIS, and cultural resources information	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
		Identify pine stands for active management	1/11/2025		
				Define desired future condition for each stand and determine management needs	Ongoing
				Conduct prescribed fires in pine stands on a natural fire return interval	Ongoing
Landscaping and Grounds Maintenance					
	Follow xeriscape principles in landscape design and installation		1/11/2025		
		Replace invasive plants with native plants	1/11/2025		
				Identify federal noxious weeds in all landscaping areas	Ongoing
				Remove invasive weeds from landscaped areas	Ongoing
		Implement SOP on Landscaping Design Guidelines	1/11/2025		
				Increased coordination with NR and Engineering project planning	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
				Prohibit the use of invasive and non-native plants in landscaping	Ongoing
	Establish maintenance protocols for ranges and cantonment areas to minimize erosion, invasive plants, and pesticide use		1/11/2025		
		Use native short grass turf when practical/appropriate to reduce mowing	1/11/2025		
				Replace non-native turf with native turf in suitable areas starting	Ongoing
				Incorporate native short grasses into construction project design	Ongoing
		Determine maintenance guidelines and requirements for facilities while minimizing environmental impact	1/11/2025		
				Determine mowing guidelines for specific ranges to minimize erosion and maximize usability	Ongoing
				Determine if mowing regime or equipment, as a vector of seeds, can be adjusted to limit spread of invasive grasses	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
Fish and Wildlife Management					
	Maintain healthy, viable populations of native species		1/11/2025		
		Update planning level surveys at least every five years (mammals, herptiles, birds, fish, insects)	1/11/2025		
				Begin updates starting with mammals and herptile	Ongoing
				Implement bat surveys and look for white nosed syndrome	Ongoing
		Maintain healthy white-tailed deer population	1/11/2025		
				Conduct annual surveys to determine harvest and document population structure	Ongoing
		Maintain healthy upland game bird populations	1/11/2025		
				Conduct baseline surveys to document population structure of upland birds	Ongoing
				Implement habitat management strategies to increase foraging and nesting habitat for upland bird populations such as turkey	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
				bobwhite quail, migratory duck, and dove species	
				Consider implementation of sustainable hunting practices to manage upland game bird populations	Ongoing
		Improve recreational fishing program	1/11/2025		
				Manage for suitable nursery habitat to provide “structure” for larger game fish	Ongoing
				Develop youth fishing derby	2020 and annually thereafter
		Maintain a diverse landscape that provides diverse habitat and food sources for wildlife	1/11/2025		
				Keep staff trained in wildlife science though CEU’s and conferences related to wildlife	ongoing
				Consider wildlife habitat (structure, size, shape, and richness) when planning brush management operations	Ongoing
				Include wildlife habitat analysis in prescribed fire planning	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
				Conduct prescribed fires at various seasons and with varying patch sizes to stimulate forbs and browse regrowth	Annually in the fall Ongoing
				Conduct yearly Migratory bird surveys	Annually
		Minimize negative impacts from native wildlife	1/11/2025		
				Assist other agencies with regional wildlife management initiatives	Ongoing
				Support Facilities and Engineering with removal and prevention of unwanted wildlife near structures	Ongoing
				Diversify vegetation structure using prescribed fires	Ongoing
				Eliminate or reduce non-native species	Ongoing
		Develop aquatics program	1/11/2025		
				Implement water quality monitoring program	Ongoing
				Create an aquatics SOP including the fishing program	2020
		Enhance migratory waterfowl habitat	1/11/2025		

Section	Goal	Objective	Review Date	Target	Execution Date
				Implement habitat improvements as necessary Including plantings, vegetation management, invasive species control	Ongoing
		Evaluate migratory waterfowl populations	1/11/2025		
				Conduct baseline waterfowl populations and species richness survey	Ongoing
				Possible implementation of waterfowl harvest program	Ongoing
		Improve habitat for whooping crane use	1/11/2025		
				Improve stopover habitat through vegetation management	Ongoing
		Improve habitat for aquatic species of concern	1/11/2025		
				Monitor aquatic species	Ongoing
				Implement habitat improvement projects	Ongoing
Endangered, Threatened, and Rare Species Management					

Section	Goal	Objective	Review Date	Target	Execution Date
	Maintain populations of rare species		1/11/2025		
		Maintain populations of ESA Listed Avian Species, State listed species and Army Species of Concern	1/11/2025		
				Continue to document migratory birds through surveys	Ongoing
				Keep staff trained in ESA Management though CEU's and conferences	Ongoing
				Identify specific migratory birds of concern that merit additional surveys or monitoring	Ongoing
				Determine management actions required to maintain or increase populations	Ongoing
				Continue prescribed fire operations to maintain forest edge and grassland habitats	Ongoing
		Maintain populations of bat species of concern	1/11/2025		
				Continue to document bat species through planning level surveys	Ongoing
				Identify potential habitat enhancements based on species present	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
				Determine management actions required to maintain populations	Ongoing
		Maintain and Improve habitat for Monarch Butterflies			
				Implement habitat projects including brush management, native vegetation re-establishment and habitat diversity projects	Ongoing
				Habitat restoration project	2021
				Identify critical areas and methods of protection with minimal impact to training	Ongoing
		Maintain populations of rare plants	1/11/2025		Ongoing
				Determine management actions required to maintain populations	Ongoing
				Maintain database and geodatabase of locations of rare plants	Ongoing
				Communicate to training site staff about locations and the minimization of disturbance on a project specific basis	Quarterly at TCGC Updates
				Conduct Earth Fruit Surveys	2021

Section	Goal	Objective	Review Date	Target	Execution Date
				Earth Frit Management Project	2021
		Determine which unusual plant communities require protection	1/11/2025		
				Maintain GIS layer of plant communities	Ongoing
				Identify protection and monitoring requirements for each area	Ongoing
		Use REC processes to minimize impacts to populations as available and outlined on CFMO page located on Lonestar portal	1/11/2025		
				Use REC process to identify areas of potential impacts of projects	Ongoing
		Protect known populations of Rare, ESA, State listed and Army Species of Concern Mammals, Herptile, and Invertebrates	1/11/2025		
				Identify protection and monitoring requirements for each area	Ongoing
				Conduct Surveys as needed	Ongoing
				Implement management projects for each	Ongoing

Section	Goal	Objective	Review Date	Target	Execution Date
				Implement Horned Lizard management projects	ongoing
		Consider rare, threatened and endangered species when planning prescribed fires and brush management projects	1/11/2025		
				Input GIS layers into prescribed fire prioritization model for prescribed fire planning	Annually
				Create buffer zones in GIS for project planning	Ongoing
	Identify any new occurrences of rare, endangered, or threatened species		1/11/2025		
		Document any sightings of rare species	1/11/2025		
				Target potential habitat and seasons to document rare species during planning level surveys	2020 Ongoing thereafter
				Provide means for training site staff to communicate sightings to natural resources	Ongoing
				Conduct Surveys as needed	Ongoing
Climate Change					

Section	Goal	Objective	Review Date	Target	Execution Date
	Predict likely effects of climate change on existing natural resources		1/11/2025		
		Begin collaborating on vulnerability assessments with other military installations in the region, USFWS, and TPWD by 2025	1/11/2025		
				Keep staff trained in advances in climate adaptation though conferences related to subject	ongoing
				Monitor influences of climate change on natural resources	Ongoing
				Conduct periodic PLS for plants, wildlife, and their communities on post as need is determined	Ongoing
				Monitor rare or endangered plant and animal populations for impacts of climate change through planning level surveys	Ongoing
		Implement management actions to mitigate changes in natural resources	1/11/2025		
				Conduct periodic reviews (5 year) to determine	2020

Section	Goal	Objective	Review Date	Target	Execution Date
				appropriate management approaches and actions in response to detected and predicted changes to plant and animal communities	
				Begin to establish drought resistant plants along streams to reduce erosion from storm events	Ongoing
				Begin to use more drought tolerant species to revegetate invasive species removal project sites	Ongoing
				Promote rainwater capture for watering landscaping plants on post through educating grounds maintenance staff	Ongoing
				Coordinate with grounds maintenance staff on xeriscaping concepts, appropriate plant species, and methods annually	Ongoing
				Install erosion prevention, anti-sedimentation, and water diversion structures in streams as need is determined	Ongoing

Appendix G. Environmental Overview

G.1 Physical Setting

G.1.1 Topography

The terrain ranges from nearly level to sloping with elevations from 234 m (768 ft.) to 304 m (997 ft.) above sea level. The fairly flat uplands are typically located at 280 m (920 ft.) in elevation to fairly steep stream banks with stream elevation at approximately 250 m (820 ft.). Fort Wolters is characterized by cuesta (sloping plains terminated on one side by a steep slope), escarpment, and canyon morphology with sandy and rocky soils. See Figure G-1 Elevation Contours of Fort Wolters.

G.1.2 Geology

Fort Wolters is located on the Pennsylvanian-age strata of the Strawn Group (Avakian and Wermund 1994). The Mineral Wells Formation is the only geologic unit exposed at the surface, which consists of shale with interbedded sandstone and limestone. The shale, sandstone, and limestone occur in bands throughout Fort Wolters, as moderately deep sandy or loamy soils over sandstone or clay.

G.1.3 Soils

There are 2 major soils on Fort Wolters: Truce-Bonti and Chaney-Truce-Bonti. The majority of these soils on Fort Wolters consist of 5 soil associations or series: Bonti, Truce-Chaney-Duffau, Owens, Aledo-Hensley-Lindy, and Santo-Bunyan-Thurber soils (Greenwade et al. 1977; Avakian and Wermund 1994; Reinecke et al. 2005). The soil erodibility factor (K Factor) represents a relative index of the susceptibility of bare soil to erosion. A K Factor less than 0.2 indicates less erodible, better drained soils. A K Factor greater than 0.3 indicates more erodible, less well drained soils. The hydrologic soil group represents a relative index of the rainfall infiltration rates. Group A has the lowest runoff/highest infiltration potential, while Group D has the highest runoff/lowest infiltration potential. Therefore, Group A soils are less erodible than Group D soils. The Highly Erodible Lands (HEL) Classification is a relative classification of the overall wind and water erodibility of a soil type. Ecological site descriptions, determined by the NRCS, indicate the type of ecological community that is expected on those soils in that region (see Section G.2.1 for more details). See Table G-1 Summary of the Soil Types at Fort Wolters, Figure G-2 Soils of Fort Wolters, and Figure G-3 Erosive Soils and Known Erosion at Fort Wolters.

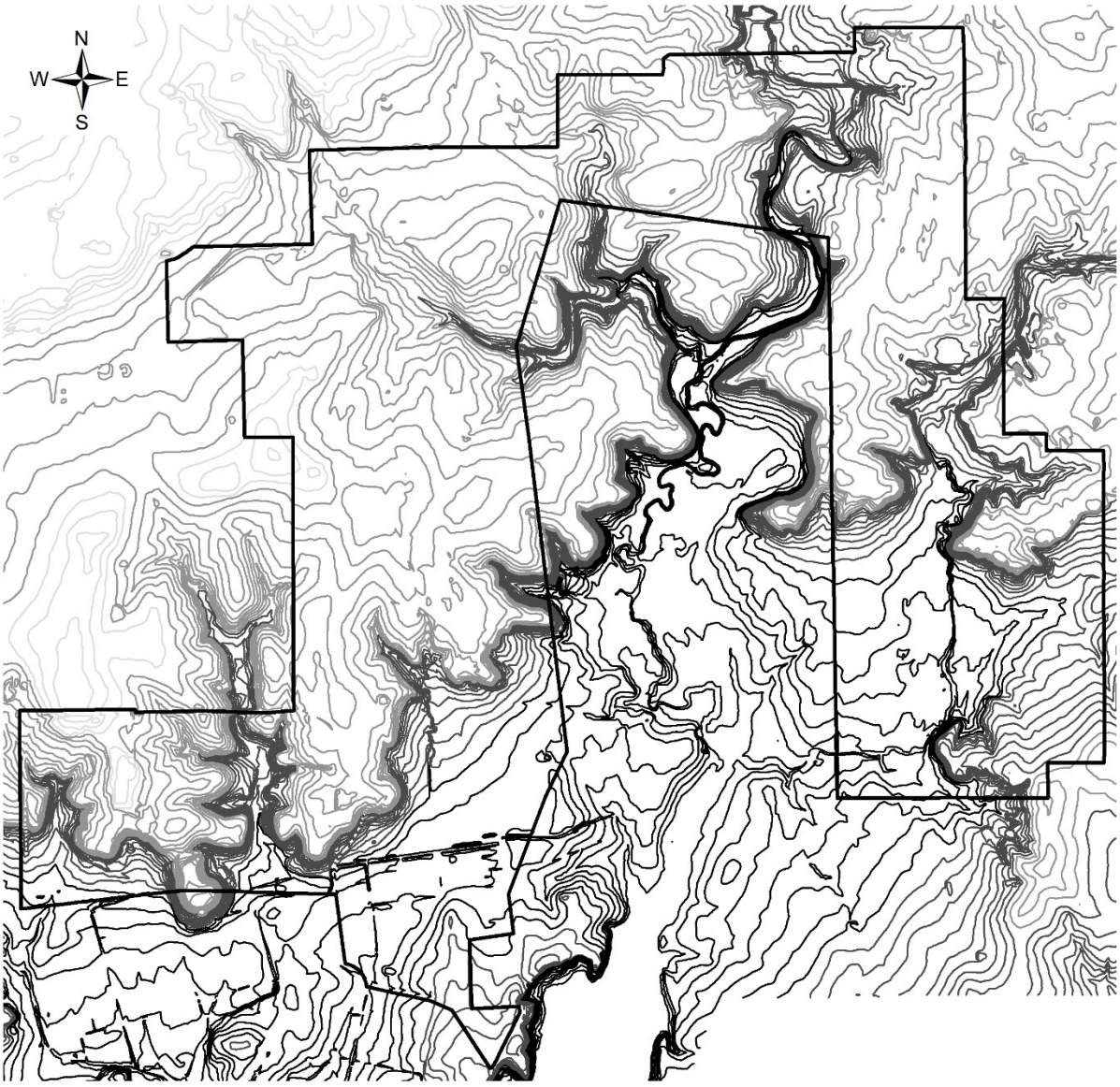


Figure G-1. Elevation Contours of Fort Wolters

Soil Type	Acres (Ha)	K Factor (Hydrologic Group)	HEL Classification	Ecological Site Description
Bonti-Exray complex, very stony	1,472 (596)	0.17 (C)	Potentially highly erodible	Sandy Loam PE 36-50
Bonti fine sandy loam	596 (241)	0.37 (C)	Highly erodible	Sandy Loam PE 36-50
Truce fine sandy loam	456 (185)	0.37 (C)	Potentially highly erodible	Tight Sandy Loam PE 36-43
Owens-Harpersville complex, extremely bouldery	313 (127)	0.32 (D)	Highly erodible	Rocky Hill PE 36-50
Thurber clay loam	227 (92)	0.43 (D)	Potentially highly erodible	Claypan Prairie PE 36- 43
Hensley complex	164 (66)	0.20 (D)	Potentially highly erodible	Redland PE 36-43
Santo-Bunyan soils, frequently flooded	153 (62)	0.24 (B)	Not highly erodible	Loamy Bottomland PE 36-52
Chaney loamy fine sand	149 (60)	0.20 (C)	Potentially highly erodible	Loamy Sand PE 36-52
Windthorst fine sandy loam	90 (36)	0.49 (C)	Potentially highly erodible	Sandy Loam PE 38-52
Duffau-Weatherford soils	53 (21)	0.17 or 0.37 (B)	Potentially highly erodible	Sandy Loam PE 38-52 Loamy Sand PE 36-52
Aledo association	49 (20)	0.32 (C)	Highly erodible	Shallow PE 40-54
Shatruce-Bonti complex, extremely stony	43 (17)	0.20 (C)	Highly erodible	Sandstone Hill PE 36-50
Lindy loam	28 (11)	0.32 (C)	Highly erodible	Deep Redland PE 36-43
Lindy clay loam	10 (4)	0.32 (C)	Highly erodible	Deep Redland PE 36-43
Leeray clay	12 (5)	0.32 (D)	Potentially highly erodible	Clayey Upland PE 36-50

Table G-1. Summary of Soil Types and Area (estimated) at Fort Wolters

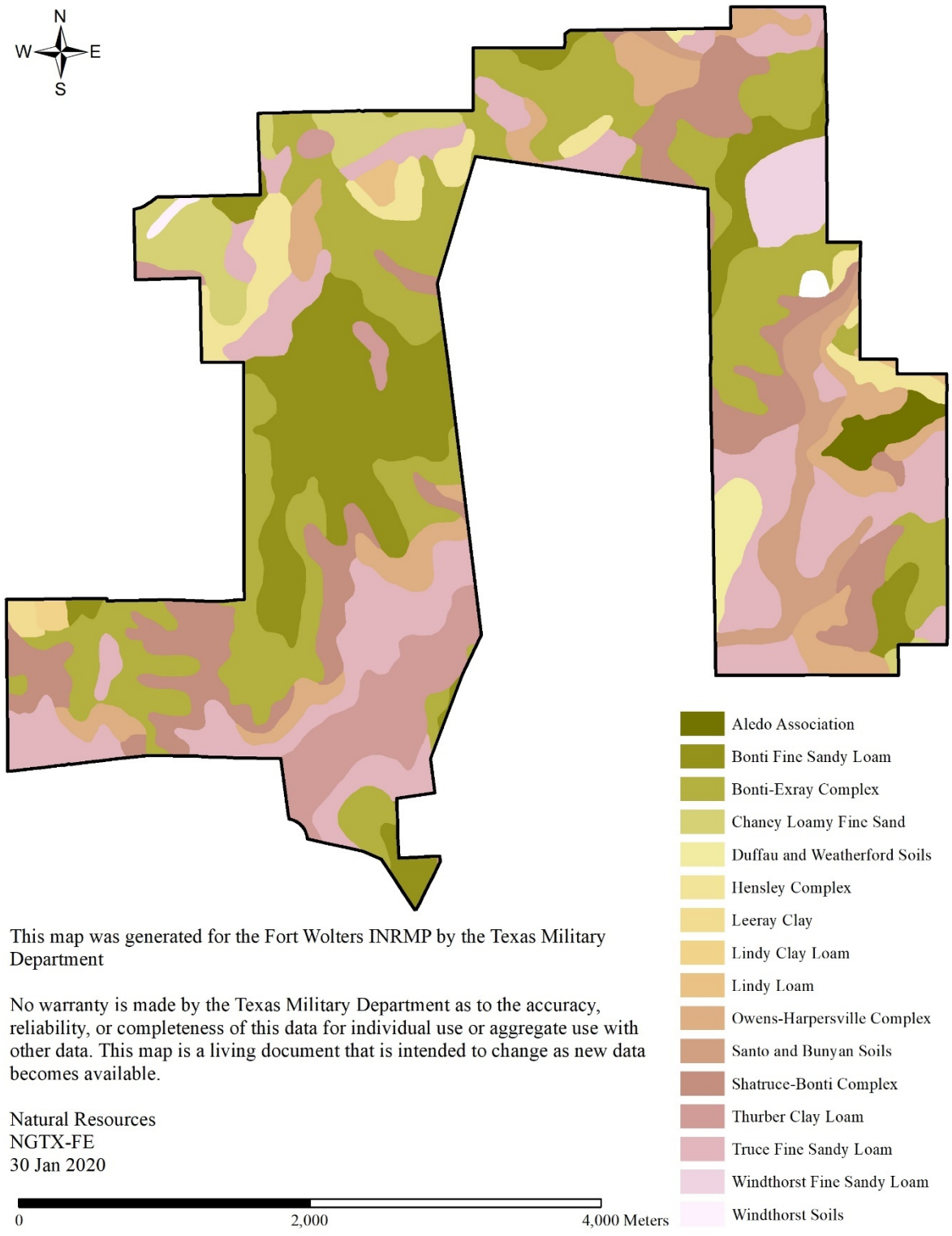


Figure G-2. Soils of Fort Wolters

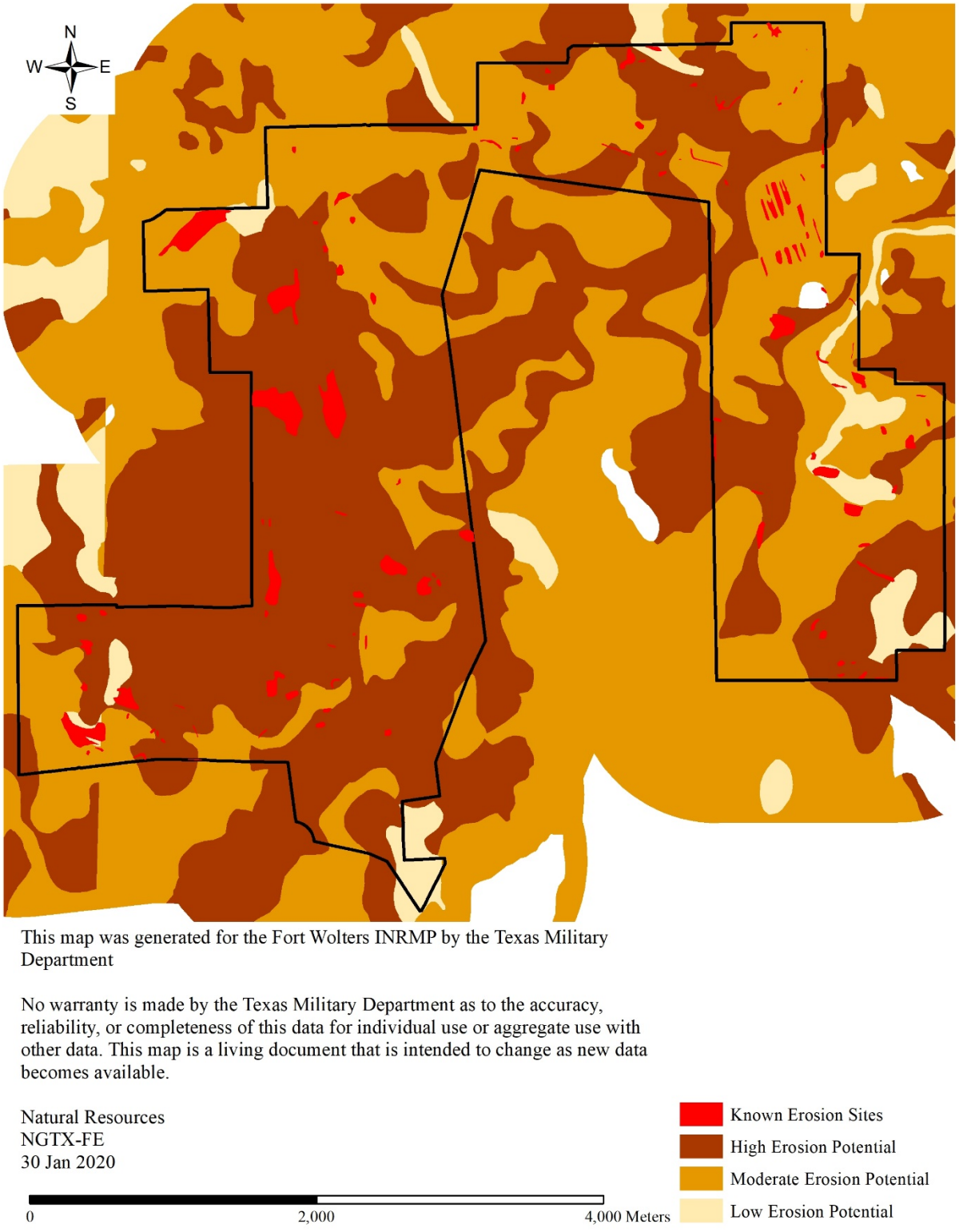


Figure G-3. Erosive Soils and Known Erosion at Fort Wolters

Bonti soils are found throughout Fort Wolters, accounting for close to 50% of the land area. Bonti soils are derived from sandstones and are typically found on gently sloping uplands (Avakian and Wermund 1994). The soils are typically composed of a slightly stony surface layer of light brown, fine sandy loam over a layer of yellowish-red clay, with strongly cemented sandstone underneath. Erosion potential for these soils is moderate to severe, while infiltration is moderately slow (Greenwade et al. 1977). Therefore, these soils are moderately to highly susceptible to vehicle damage, depending on slope and other soils present.

The Truce-Chaney-Duffau soil group is found throughout Fort Wolters but in smaller patches than Bonti soils (Avakian and Wermund 1994). Truce-Chaney-Duffau soils are derived from shales and sandstones, typically on gently sloping to steep uplands. The soils are typically composed of a grayish to brown, fine sandy loam over a layer of red to gray clay, with interbedded shale and limestone underneath. Erosion potential for these soils is slight to severe, while infiltration is slow to moderate (Greenwade et al. 1977). Therefore, these soils are moderately to highly susceptible to vehicle damage, depending on slope and other soils present.

Owens soils are located in small bands throughout Fort Wolters. These soils are derived from shale, typically on gently sloping to steep uplands (Avakian and Wermund 1994). The soils are typically composed of a stony, brown surface layer of clay over 2 more layers of clay with varying colors. Erosion potential for these soils is severe, while infiltration is very slow (Greenwade et al. 1977). Therefore, these soils are highly susceptible to vehicle damage.

The Aledo-Hensley-Lindy soil group is highly localized and rare at Fort Wolters. Aledo and Lindy soils occur in only 1 location each, while Hensley soils have 2 occurrences. All these soils are located near each other in the middle of the eastern part of Fort Wolters (Avakian and Wermund 1994). These soils are derived from limestone, typically on undulating to gently sloping uplands. The soils are typically composed of a shallow, grayish to reddish-brown surface layer of clay loam or loam over a layer of clay or clay loam, with limestone bedrock underneath. Erosion potential for these soils is moderate, while infiltration is slow to moderate (Greenwade et al. 1977). Therefore, these soils have a low susceptibility to vehicle damage.

Santo-Bunyan-Thurber soil group is found throughout Fort Wolters. Thurber soil is derived from ancient alluvium and is typically located on gently sloping uplands. The other soils are derived from existing alluvium and occur in existing floodplains (Avakian and Wermund 1994). The soils are typically composed of a brown surface layer of sandy loam transitioning to sandy clay loam or clay. Erosion potential for these soils is slight to moderate, while infiltration is moderately rapid to very slow (Greenwade et al. 1977). Therefore, these soils have a low to moderate susceptibility to vehicle damage. The Santo and Bunyan soils are not generally exposed to vehicular traffic due to the presence of wetlands and riparian zone and high moisture content.

Water erosion is the main natural cause of soil loss at Fort Wolters. When water and wind are coupled with training or other activities that disturb ground cover, additional soil loss can occur. Current erosion at Fort Wolters is mainly associated with roads, excavation, and mass grading activities. Stable soils can be resilient to a certain level of disturbance with proper use and monitoring. Therefore, stable soils should be focused on when planning for high-impact training activities. To further reduce environmental degradation, training activities should be rotated to ensure the integrity of the vegetative cover. See Section 3.4 for more about erosion at Fort Wolters.

G.1.4 Water Resources

Fort Wolters is contained within the Middle Brazos-Palo Pinto catchment basin (HUC 12060201, USGS) of the Brazos River. For management purposes, 4 major watersheds, which contain 10 subwatersheds, have been identified (Table G-2). This subwatershed scale is used as the spatial framework for management decisions, analysis of cumulative disturbance, and effects of specific activities. The subwatersheds are also used for planning data collection for surveys and monitoring and for identifying sensitive areas and potential impacts. See Figure G-4 Water Resources of Fort Wolters.

Watershed	Acres (Ha)	Average K Factor	Average Hydrologic Group	Average % Vegetation Cover	No. of Erosion Sites
1	142 (58)	0.26	C	88	4
2	471 (191)	0.24	C	85	19
3	215 (87)	0.36	C	80	1
4	444 (180)	0.32	C	85	11
5	240 (97)	0.29	C	72	5
6	794 (321)	0.28	C	88	11
7	251 (130)	0.25	C	86	7
8	510 (206)	0.27	C	83	27
9	171 (69)	0.25	C	56	14
10	841 (340)	0.29	C	70	25

Table G-2. Summary of Watersheds at Fort Wolters

Fort Wolters has approximately 35 acres (14 ha) of surface water, with 29 ponds comprising approximately 11 acres (5 ha) and 61 wetlands comprising approximately 24 acres (10 ha) (see Table G-3 for summary of wetlands and other surface water and Figure G-4 for map of wetlands and other waters) (Fisher et al. 1996; Gravatt et al. 1999; Reinecke et al. 2005). All of the 29 ponds are man-made and serve a variety of purposes, including sources of water for wildfire suppression. Seasonal wetlands typically contain native spikerushes (*Eleocharis* spp.), sedges (*Carex* sp.), flat sedges (*Cyperus* spp.), seacoast sumpweed (*Iva annua*), bushy bluestem (*Andropogon glomeratus*), broomsedge bluestem (*Andropogon virginicus*), cocklebur (*Xanthium strumarium*), poisonbean (*Sesbania drummondii*), and some eastern cottonwood (*Populus deltoides*) shrubs. Wetlands with intermittent or perennial water regimes are dominated by plants that are more adapted to growing in water, including cattail (*Typha* sp.) and black willow (*Salix nigra*). Wetlands that have not been disturbed recently were dominated by trees, including black willows and cottonwoods. The 29 ponds typically do not contain vegetation due to variable water levels. Jurisdictional determinations were not made on these wetlands. Official wetland delineations and jurisdictional determinations according to USACE standards have not been completed and are only done when a specific project requires delineation.

Class	Class Description	No. of Sites	Area Acres (Ha)
PEM1A	Palustrine system, Emergent class, Persistent subclass, with a temporarily Flooded water regime	49	17 (6.88)
PEM1C	Palustrine system, Emergent class, Persistent subclass, with a Seasonally Flooded water regime	1	0.3 (0.12)
PEM1Cx	Palustrine system, Emergent class, Persistent subclass, with a Seasonally Flooded water regime and excavated special modifier	1	0.3 (0.12)
PEM1E	Palustrine system, Emergent class, Persistent subclass, with a Seasonally Saturated water regime	4	4.7 (1.9)
PEM1E/ PSS1E	Palustrine system, Emergent/Scrub-shrub class, Persistent subclass, with a Seasonally Saturated water regime	2	0.3 (0.12)
PEM1H	Palustrine system, Emergent class, Persistent subclass, with a Permanently Flooded water regime	1	0.2 (0.08)
PEM1J	Palustrine system, Emergent class, Persistent subclass, with a Intermittently Flooded water regime	1	1.4 (0.57)
PFO1A	Palustrine system, Forested class, Broad-leaved deciduous subclass, with a Temporarily Flooded water regime	1	0.1 (0.04)
PFO1A/ POWJ	Palustrine system, Open Water/Forested class, Broad-leaved deciduous subclass, with a Temporarily to Intermittently Flooded water regime	1	0.2 (0.08)
POWCx	Palustrine system, Open Water class, with a Seasonally Flooded water regime and excavated special modifier	2	0.1 (0.04)
POWHx	Palustrine system, Open Water class, with a Permanently Flooded water regime and excavated special modifier	18	10.4 (4.21)
POWJx	Palustrine system, Open Water class, with a Intermittently Flooded water regime and excavated special modifier	5	0.5 (0.2)
PUB1A	Palustrine system, Unconsolidated Bottom class, Cobble/Gravel subclass, with a Temporarily Flooded water regime	1	0.01 (0.004)
PUB2A	Palustrine system, Unconsolidated Bottom class, Sand subclass, with a Temporarily Flooded water regime	3	0.01 (0.004)
	Total	90	35.4 (14.33)

Table G-3. Wetlands and Other Waters on Fort Wolters
Class based on USWS Classification (Cowardin et al. 1979) as modified for National Wetland Inventory Mapping Convention.

There are approximately 47 km (29 mi) of intermittent and perennial tributaries on Fort Wolters (see Table G-4 for summary of streams). Rippy Branch is a large tributary to the largest creek on site, Rock Creek, both of which have flowing water most of the year. Rock Creek, a tributary of the Brazos River, flows into Eagle Mountain Lake State Park (TPWD). There are several intermittent tributaries. Most streams have well-developed riparian corridors (see Figure G-4 Water Resources of Fort Wolters).

Stream Order	Class	Class Description	No. of Segments	Length Km (Mi)
1	R4SB3	Riverine system, Intermittent subsystem, Streambed class, with a Cobble-Gravel subclass	66	26.7 (16.6)
2	R4SB3	Riverine system, Intermittent subsystem, Streambed class, with a Cobble-Gravel subclass	15	10 (6.3)
3	R3OW/RB1	Riverine system, Upper Perennial subsystem, Open Water class or a Rock Bottom class with bedrock subclass	4	7.8 (4.9)
4	R3OW/RB1	Riverine system, Upper Perennial subsystem, Open Water class or a Rock Bottom class with bedrock subclass	1	2.2 (1.9)
		Total	86	46.8 (29.1)

Table G-4. Streams and Linear Drainage Features on Fort Wolters
Class based on USWS Classification (Cowardin et al. 1979) as modified for National Wetland Inventory Mapping Convention.

Flood hazard areas on Fort Wolters are limited to areas adjacent to streams that flow into Lake Mineral Wells, including Rock Creek, Rippy Branch, and their unnamed tributaries. These floodplains extend along the banks and become wider as the streams approach Lake Mineral Wells (Fisher et al. 1996).

Wetlands, ponds, and streams are generally off-limits to vehicular traffic except on established road or trail crossings. There are well-developed riparian zones in the floodplains and pose no risk to any current structures (see Figure G-4 Water Resources of Fort Wolters).

There are no major groundwater aquifers at Fort Wolters, yet numerous wells in the Mineral Wells Formation yield low amounts of water of highly variable quality. Groundwater flow is generally to the west and southwest, but on a small scale it will flow toward creeks and streams. Depth to groundwater at Fort Wolters ranges from 5 to 135 ft. (Avakian and Wermund 1994). All abandoned wells have been closed under the rules of the TCEQ.

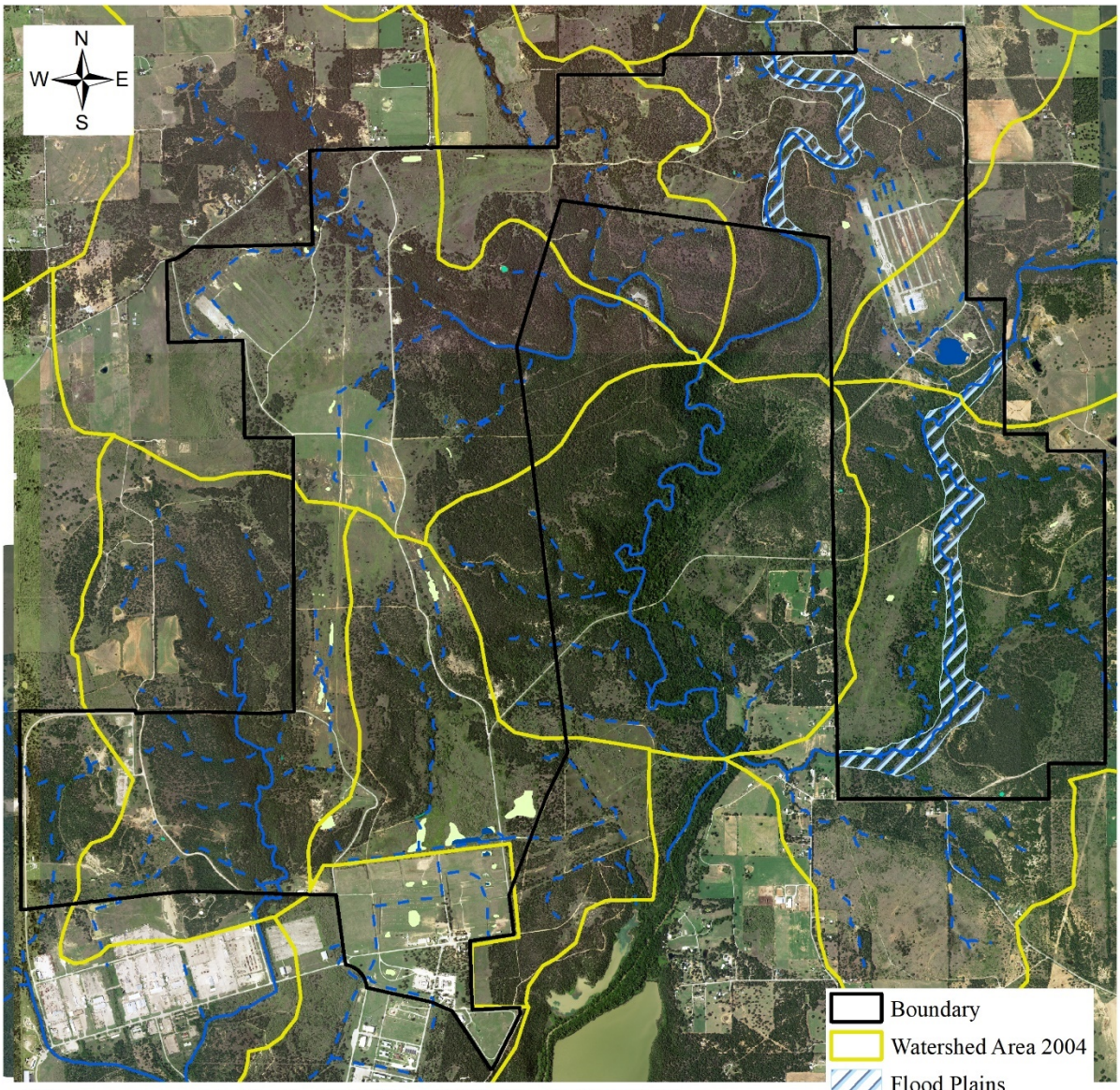


Figure G-4. Water Resources of Fort Wolters

G.1.5 Climate

Parker, Palo Pinto, and Tarrent Counties have a subtropical, subhumid, continental climate with hot, humid summers and dry winters characterized by highly variable temperatures and precipitation. The highest temperatures are typically associated with fair skies, westerly winds, and low humidity. Summer hot spells are usually broken into 3- to 5-day periods interspersed with thunderstorm activity. Periods of rainy weather usually only last a few days and are followed by several days of clear skies. Thunderstorms occur throughout the year but are most frequent in spring. Hail typically occurs 2 or 3 days a year. Snowfall is rare. The average length of the warm season is about 248 days, with average first freeze on November 12 and average last freeze on March 20.

January is the coolest month, with an average high temperature of 58.2 °F and average low temperature of 33.4 °F. July is the warmest month, with an average high temperature averaging of 97.3 °F and average low temperature of 72.3 °F. The average winter high temperature is 61°F, and the average winter low temperature is 36 °F. The average summer high temperature is 96 °F, and the average summer low temperature is 71 °F. The average wind speeds range from 9-13 mph, with the highest speeds in April and the lowest speeds in July. The wettest months are May, June, and October with a mean annual precipitation of 31.79 in., which varies from 22-50 in./year (Avakian and Wermund 1994; 30 Year Average Climate Data from NOAA http://www.srh.noaa.gov/fwd/CLIMO/coop/mineral.html).

G.2 Biological Setting

G.2.1 Vegetational Communities

Fort Wolters is located in the Western Cross Timbers at the transition between the Oak Woods and Prairies and the Blackland Prairies ecoregions of Texas (see Figure G-5 Ecoregions of Fort Wolters). Much of Parker and Palo Pinto Counties has been identified as suitable for rangeland, pastureland, and in areas with better soils, cultivation (Greenwade et al. 1977). Fort Wolters has not been grazed nor cultivated since its formation as a military installation in the 1930s. The typical potential native vegetation has been generally described as an area of interdigitating midgrass grasslands and mixed evergreen/ deciduous woodlands.

Dominant grasses include little bluestem (Schizachyrium scoparium), big bluestem (Andropogon gerardii), Indiangrass (Sorgastrum nutans), sideoats grama (Bouteloua curtipendula), and silver bluestem (Bothriochloa laguroides ssp torreyana). The upland woody vegetation consists mainly of blackjack oak (Quercus marilandica), post oak (Quercus stellata), plateau oak (Quercus fusiformis), red oak (Quercus texana), eastern redcedar (Juniperus virginiana), Ashe juniper (Juniperus ashei), elbowbush (Forestiera pubescens), hackberry (Celtis laevigata var reticulata), saw greenbriar (Smilax bona-nox), fragrant sumac (Rhus aromatica) and other shrubs and forbs. Riparian woodlands are restricted to a few relatively undisturbed creek terraces, and in general are dominated by elm (Ulmus Americana and Ulmus crassifolia), sugar hackberry (Celtis laevigata), and green ash (Fraxinus pensylvanica). Woody plant diversity increases in canyons and on lower slopes where the upland grasslands and woodlands merge with riparian woodlands. Honey mesquite (Prosopis glandulosa) is often numerous in grasslands and abandoned cropland on deeper valley soils.

The plant communities present at Fort Wolters have been classified as Post Oak-Blackjack Oak Woodland, Ashe Juniper-Oak Woodland/Savannah, Little Bluestem-Indiangrass Grassland and Sugar hackberry - Elm Riparian Woodland (Farquhar et al. 1996; Wolfe et al. 1996; Hunter 2005). These communities are described in detail below. Fort Wolters also has the potential to have vine-mesquite (Panicum obtusum) – buffalograss (Bouteloua dactyloides) grassland in a few locations as well as

sideoats grama (Bouteloua curtipendula) mixed with post oak woodlands and sugar hackberry woodlands. There are also pockets of either confirmed or potential Cross Timbers Old Growth forest/woodland. See Figure G-6 Vegetation Communities of Fort Wolters and Figure G-7 Cross Timbers Old Growth of Fort Wolters

Alliance Name	**Common Names**	**NVC Code**	**Acres (Hectares)**
Celtis laevigata – Ulmus crassifolia Forest	Sugar hackberry – Elm Woodland	I.B.2.N.d.8	232(94)
Quercus stellata – Quercus marilandica Woodland	Post Oak – Blackjack Oak Woodland	II.B.2.N.a.25	1687 (682)
Juniperus ashei Woodland	Ashe Juniper – Oak Woodland/Savannah	II.A.4.N.a.3	115 (47)
Schizachyrium scoparium - Sorghastrum nutans Herbaceaous	Little Bluestem-Indiangrass Grassland	V.A.5.N.a.8	1292(523)
Cynodon dactylus Grasslands	Disturbed Grassland		648 (262)

Table G-5. Plant Community Classifications. These plant community classifications are based on the standard descriptions for vegetation communities used by the U.S. National Vegetation Classification system derived from The Nature Conservancy's National Community Classification System (Grossman et al. 1998). For more information, go to the NatureServe web page at http://www.natureserve.org/explorer/.

The Post Oak-Blackjack Oak and Ashe Juniper-Oak woodland and savannah communities comprise 44% of the training site (729 ha/1802 ac) and are found on slopes and uplands throughout Fort Wolters. Post oak (Quercus stellata), blackjack oak (Quercus marilandica), cedar elm (Ulmus crassifolia), Ashe juniper (Juniperus ashei), and Texas oak (Quercus buckleyi) characterize these communities. None of these trees is particularly large (20 to 30 fee tall), perhaps more due to poor site conditions than to any recent disturbance. These woodlands are commonly used for training activities requiring in-place cover and concealment. Based on a generalized state and transition model, these communities will expand in extent and increase in density with a decrease in overall species diversity. Prescribed fire and brush management can shift the edges of these communities to a more patchy distribution of savannah and woodland, resulting in an overall increase in species diversity, habitat types, and a more diverse setting for training.

The Little Bluestem-Indiangrass Grassland community covers 33% of the land (523 ha/1292 ac) throughout Fort Wolters. Woody plants have increased on these sites over the past 100 to 150 years. Where the site was once cultivated, honey mesquite (Prosopis glandulosa) tends to dominate the grassland along with Opuntia spp. Both the native grasslands and the disturbed (mostly non-native) grasslands are commonly used for training activities requiring open areas. With the introduction of increased prescribed fire operations along with an integrated brush management program, these areas should be maintained and possibly increase in species diversity and extent.

The Ashe juniper Woodland and Savannah community covers 18% of the installation (47 ha/115 ac) and is scattered throughout the site. Ashe juniper-dominated woodlands occur on limestone slopes along with Texas oak (Quercus buckleyi) and Texas ash (Fraxinus texensis). Both the woodland and savannah community are likely covering more area than historic records would represent due to fire suppression.

Prescribed fire and an integrated brush management program will be implemented to ensure that this vegetation community does not increase and encroach upon grasslands.

In addition to these major vegetation communities, riparian areas of Sugar hackberry - Elm woodlands (94 ha/232 ac) are present along Rock Creek, Rippy Branch and an unnamed tributary of Rippy Branch. Elm (Ulmus spp.), Texas ash (Fraxinus texensis) and sugar hackberry (Celtis laevigata) characterize this occasionally flooded riparian community, along with a variety of dense riparian shrubs like indiancurrant coralberry (Symphoricarpos orbiculatus), grasses such as inland seaoats (Chasmanthium latifolium) and forbs. Although the vegetation is potentially useful for cover and concealment, it is rarely appropriate for training due to proximity to creeks, wetlands, and water bodies.

The descriptions above and the map of the vegetation communities seem to represent a stable state. However, the landscape is dynamic and has the potential to transition from one vegetative state to another within certain ecological constraints. In other words, multiple stable plant communities can potentially occupy any one location or ecological site. Some vegetative communities can transition into a different state while other vegetative communities reach a state that cannot be changed or reversed without extreme inputs/energy. This "irreversible" state occurs when certain ecological thresholds are passed and one stable state replaces another. Conversely, vegetation dynamics can also be continuous and reversible. The evaluation of vegetation at Fort Wolters must take into consideration continuous and reversible as well as discontinuous and nonreversible vegetation dynamics. State and transitions models represent both types of vegetation dynamics because they represent change due to several variables and inputs and help visualize where thresholds occur: "ecological thresholds have become a focal point of state-and-transition models because threshold identification is necessary for recognition of the various stable plant communities that can potentially occupy an ecological site" (Briske et al. 2003).

The Texas NRCS is in the process of developing ecological site descriptions across Texas, including those found in the Fort Wolters area. The sites are tied directly to soil type (see Table G-1). Typical vegetation for the various ecological sites present on Fort Wolters is presented below in Table G-6 and sites are mapped in Figure G-8 NRCS Ecological Sites of Fort Wolters. A different state and transition model will be developed for each of the ecological site descriptions. Currently, only five of the eleven ecological sites present at Fort Wolters have been completed by the NRCS. An example of a state and transition model for Fort Wolters can be found in Section 3.1.

Ecological Site Name	**Ecological Site Description**	**Acres (Hectares)**
Clayey Upland PE 36-50	Deep, calcareous clays occurring on nearly level to gently sloping upland flats or in broad valleys. Climax vegetation is dominated by sideoats grama, vine mesquite, and Texas wintergrass with lesser amounts of western wheatgrass, buffalograss, white tridens, silver bluestem, catclaw sensitive briar, western ragweed, Engelmann daisy, heath aster, hackberry, and lotebush.	12 (5)
Claypan Prairie 36-43	Nearly level to gently sloping uplands with very slowly permeable soils. Potential vegetation includes vine-mesquite, meadow dropseed, white tridens, Arizona cottontop, buffalograss, Texas wintergrass, sideoats grama, blue grama, heath aster, Engelmann daisy, ragweed, greenthread, and sensitive briar.	227 (92)
Deep Redland PE 36-43	Nearly level to gently sloping upland of reddish brown, moderately dense, noncalcareous clays, clay loams, or loams. Climax plants are predominately indiangrass, little bluestem, big bluestem, sideoats grama, feathery bluestems, Texas wintergrass, tall dropseed, oaks, and many good forbs.	37 (15)

Loamy Bottomland PE 36-52	Floodplains of alluvial soils. Vegetation includes indiangrass; little, sand, or big bluestem, switchgrass, wildryes, Texas wintergrass, vine-mesquite, false switchgrass, meadow dropseed, western wheatgrass, sideoats grama, ragweeds, Engelmann daisy, heath aster, Maximilian sunflower, gauras, elm, hackberry, bumelia, soapberry, grapes, cottonwood, and ash.	180 (73)
Loamy Sand PE 36-52	Deep soils with loamy fine sand surfaces. Climax vegetation is a post oak, blackjack oak savannah with associated woody species and big and little bluestems, indiangrass, lespedezas, tickclovers, snoutbeans, butterfly pea, partridge pea, bundleflower, and sensitive briar.	148 (60)
Redland PE 36-43	Stony, shallow, reddish, noncalcareous loams. Vegetation includes little and big bluestems, indiangrass, sideoats grama, tall dropseed, Texas wintergrass, vine-mesquite, wildryes, Texas cupgrass, buffalograss, curlymesquite, Engelmann daisy, bush sunflower, asters, sagewort; live, post, and shin oaks; sumacs, elm, bumelia, greenbrier, and elbowbush.	163 (66)
Rocky Hill PE 36-50	Steep hillsides of fertile, stony, calcareous clays and shaly soils. Vegetation includes little and big bluestems, indiangrass, sideoats grama, vine-mesquite, Texas cupgrass, Texas wintergrass, tall dropseed, buffalograss, heath aster, bush sunflower, gayfeather, daleas, bumelia, hackberry, elm, elbowbush, and sumacs.	313 (127)
Sandstone Hill PE 36-50	Shallow, stony sandy loam. Climax vegetation is savannah and includes little bluestem, sand lovegrass, purpletop, sideoats grama,	42 (17)
	Scribner panicum, post oak, live oak, elm, hackberry, bumelia, greenbrier, sensitive briar, sagewort, lespedeza, and other forbs.	
Sandy Loam PE 36-50/38-52	Upland sandy loam soils. Climax vegetation is little bluestem, indiangrass, purpletop, sideoats grama, sand lovegrass, Texas wintergrass, hooded windmillgrass, fringeleaf paspalum, sand dropseed, Engelmann daisy, prairie clover, bundleflower, neptunia, western indigo, sumacs, post oak, and blackjack oak.	2197 (889)
Shallow PE 40-54	Shallow, clayey soils. Climax vegetation is big and little bluestems, indiangrass, sideoats and tall gramas, cane bluestem, plains lovegrass, Maximilian sunflower, bush sunflower, Engelmann daisy, orange zexmenia, daleas, gayfeather, sundrops, penstemon, heath aster, prairie clover, prairie bluets, and bundleflower with scattered live oak.	49 (20)
Tight Sandy Loam PE 36-43	A savannah of level to gently rolling sandy loams. Vegetation includes sideoats grama, vine-mesquite, buffalograss, Texas wintergrass, sand dropseed, silver and little bluestems, hairy grama, ragweed, sagewort, dayflower, sensitive briar, Egelmann daisy, gayfeather, heath aster, post oak, elbowbush, greenbrier, and bumelia.	457 (185)

Table G-6. Ecological Site Summary for Fort Wolters

G.2.2 Flora

Fort Wolters supports a substantial diversity of plants due to the variety and transitional nature of the habitat. Various biological inventories, rare plant surveys, and chance encounters over the last 10 years have resulted in the documentation of over 600 plant species in 92 families (Farquhar et al. 1996; Gravatt et al. 1999; Clayton and Reinecke 2003; Quayle et al. 2004). There are 82 species in the grass family (Poaceae), 105 species in the sunflower family (Asteraceae) and 62 species in the legume family

(Fabaceae). There are 11 plant species considered rare at Fort Wolters - four ranked S1, two ranked S2 and five ranked S3, with only one of those ranked G1 and none ranked G2. There is also a high diversity of lichens at Fort Wolters. Voucher specimens have been collected at various times over the last 20 years. A complete, current plant list is available in Appendix H.

Scientific Name	**Common Name**	**State Rank**	**Global Rank**
Senecio quaylei	Quayle's ragwort	S1	G1
Mimosa aculeaticarpa var biuncifera	Mimosa	S1	G4
Chamaesyce missurica	Prairie sandmat	S1	G5
Lespedeza violacea	Violet lespedeza	S1	G5
Pediomelum reverchonii	Rock scurfpea	S2	G3
Erigeron strigosus var strigosus	Prairie fleabane	S2	G5
Calylophus serrulatus	Halfshrub sundrop	S3	G3
Yucca pallida	Pale yucca	S3	G3
Escobaria missouriensis	Missouri foxtail cactus	S3	G5
Opuntia engelmannii var lindheimeri	Texas pricklypear	S3	G5
Pediomelum digitatum	Palmleaf Indian breadroot	S3	G5

Table G-7. Plant Species of Concern at Fort Wolters. Status indicates state or global conservation status as identified by Natureserve (G1/S1= critically imperiled, G2/S2= imperiled, G3/S3=vulnerable, G4/S4= apparently secure, G5/S5= secure. G=global, S=state).

A survey for invasive plants was completed in 2003 (Clayton and Reinecke 2003). This survey and other surveys and projects have identified 42 non-native invasive plants at Fort Wolters, with six species listed as state noxious weeds and one species listed as a prohibited plant per Texas Agriculture Code. The majority of these species occur in small numbers or small areas. Saltcedar (Tamarix ramosissima) occurs in two different sites with a total stem count of under 10 based on current knowledge; however, the potential impact from even these individuals could be high, so it is a priority for control. Johnsongrass (Sorghum halepense) and King Ranch bluestem (Bothriochloa ischaemum var songarica) are widespread and are present in nearly all grasslands at Fort Wolters. They are difficult to control but persistent efforts may yield reduced impact. Japanese honeysuckle (Lonicera japonica) and sericea lespedeza (Lespedeza cuneata) are considered to pose a potential risk of increasing in extent. Data obtained from field surveys were analyzed using methodology from the National Park Service Exotic Ranking System to establish priorities for control and management of each invasive species. The priorities were based on interactions between significance of ecological impacts and feasibility of control of the invasive species present. The highest priority is assigned to the invasive species that poses the highest threat to the installation yet still will be easy to manage, and the lower priorities are given to invasive species that pose little threat and/or will be difficult to control. See Section 3.6 for more discussion of Invasive Species Control Program. See Table G-8 Invasive Plants of Fort Wolters and Figure G-9 Invasive Plants of Fort Wolters.

Scientific Name	Common Name	Priority
Achillea millefolium	Western yarrow	
Albizia julibrissin	Silktree	
Avena fatua	Wild oat	TX weed
B. ischaemum	King Ranch bluestem	High
Bromus catharticus	Rescuegrass	
Bromus arvensis	Japanese brome	
Bromus tectorum	Cheatgrass	
Capsella bursa-pastoris	Shepherdspurse	
Chenopodium album	Lambsquarters	
Chenopodium ambrosioides	Mexican tea	
Citrullus lanatus var lanatus	Watermelon	
Cynodon dactylon	Bermudagrass	TX weed
Echinochloa crus-galli	Barnyardgrass	
Eragrostis cilianensis	Stinkgrass	
Eragrostis curvula	Weeping lovegrass	
Iris germanica	German iris	
Lactuca serriola	Prickly lettuce	
*Lamium amplexicaule**	Henbit	
Lespedeza cuneata	Sericea lespedeza	Medium
Lolium perenne ssp multiflorum	Italian ryegrass	
Lonicera japonica	Japanese honeysuckle	High
Lotus corniculatus	Birdsfoot trefoil	
Malva neglecta	Common mallow	
Medicago minima	Little burclover	
Medicago polymorpha	Burclover	
Melilotus officinalis	White sweetclover	
Melilotus indicus	Annual yellow sweetclover	
Melilotus officinalis	Yellow sweetclover	
*Paspalum dilatatum**	Dallisgrass	
Scientific Name	Common Name	Priority
Polygonum lapathifolium	Nodding smartweed	
Polypogon monspeliensis	Rabbitfoot beardgrass	
Polypogon viridis	Water bentgrass	
Pyrus calleryana	Callery pear	
Rumex crispus	Curly dock	TX weed
Rumex pulcher	Fiddle dock	TX weed
Salsola tragus	Prickly Russian thistle	
Sonchus asper	Prickly sowthistle	
Sorghum halepense	Johnsongrass	High, TX weed
Tamarix ramosissima	Saltcedar	High, TX prohibited
Torilis arvensis	Canada hedgeparsley	
Tribulus terrestris	Goathead	TX weed

Vicia sativa	Common vetch	

Table G-8. Invasive Plants of Fort Wolters. Priority for control is based on extent of potential impact and feasibility of control. "TX Prohibited" indicates the species is on the prohibited list for Texas. "TX Weed" indicates the species as been identified by TXDA as an official weed for Texas. * indicates species is only found in cantonement area or other mowed areas.

G.2.3 Fauna

Due to the location of Fort Wolters at a transition between ecoregions, there is a high diversity in vertebrate animals. The first biological surveys were conducted by Texas Parks and Wildlife in 1994 and focused on plants and birds (Farquhar et al. 1996). Surveys for animals and an update to the bird survey have recently been completed by researchers from University of North Texas, Sam Houston State University, and Texas A&M University. Preliminary aquatic surveys were conducted at Fort Wolters in 1995 and included fish and macroinvertebrates (Linam et al. 1996). Voucher specimens have been collected at various times over the last 30 years for all taxa documented. See Appendix H for current complete species lists for vertebrates and invertebrates. Details about the invasive species program are in Section 3.6 and rare species program are in Section 3.11. Table G-9 summarizes all rare animals and Table G-10 summarizes all non-native animals.

The first baseline survey for mammals was completed in February 2004 (Thies 2004). A variety of survey methods were used to assess all mammals, from large carnivores to bats to small rodents. The surveys to date have identified 27 species in 15 families, with 6 species of carnivores, 13 species of rodents, 2 species of bats, and 6 species of other mammals. Only one non-native mammal, the house mouse, was recorded during this survey. However, there have been recent sightings of feral hogs at Fort Wolters by the training site staff. Only one mammal of concern, the mountain lion, was recorded.

The first baseline survey for reptiles and amphibians (also referred to as "herptiles") was completed in September 2003 (Ryberg and Fitzgerald 2003). All surveys to date have identified 38 species in 13 families, with 11 species of frogs and toads, 0 species of salamanders, 3 species of turtles, 8 species of lizards and 16 species of snakes. There have been no non-native herptiles recorded. Only one reptile of concern, Texas horned lizard (Phrynosoma cornutum), has been recorded. There is an ongoing project to document the number, location, and specific habitat preferences of Texas horned lizards at Fort Wolters.

The first baseline survey for birds was conducted in 1994-1995 (Farquhar et al. 1996), with an update completed in May 2005 (Neudorf 2005). The surveys to date have identified 110 species in 34 families. Some of the species include 10 ducks, 8 raptors, 2 hummingbirds, and 63 songbirds. There were approximately 47 permanent residents, 32 winter residents, and 16 spring and summer residents. Sixteen birds of concern, as identified by Partners in Flight and Natureserve, occur on Fort Wolters including painted buntings (Passerina ciris) and ladder-backed woodpeckers (Picoides scalaris) (see Section 3.11). Only one non-native bird, the European starling (Sturnus vulgaris), was recorded.

A fish survey conducted in 1995 surveyed Rock Creek, Rippy Branch, and some of the larger tributaries and ponds (Linam et al. 1996). An update to the fish survey was conducted in 2007 (Hendrickson and Cohen 2007). Several species of sunfish and minnows were documented representing 19 fish species from 6 families. No fish species of concern have been documented at Fort Wolters. Water quality appeared to be high, but water quantity was limited. There have been two non-native fish species documented - the redbreast sunfish (Lepomis auritus) and the golden shiner (Notemigonus crysoleucas).

Preliminary aquatic macroinvertebrate surveys were conducted in 1995 (Linam et al. 1996), with comprehensive terrestrial and aquatic invertebrate surveys completed in 2005 (Karatayev and Burlakova 2005; Kennedy et al. 2005). In addition, insect collections have been done in conjunction with assessing

the impacts of red imported fire ants (Solenopsis invicta) (Cook 2002). These initial efforts at classifying invertebrates have documented at least 630 species present at Fort Wolters. Identifications for many groups will take years to accumulate as there are a limited number of experts available. A wide variety of methods were used for these surveys in all seasons and in all habitats to develop this list.

The results from these surveys identified 649 species representing 107 families in 15 orders of insects and 9 families in 7 orders of non-insect invertebrates (e.g. spiders, mollusks, crustaceans). Within insects, there are 13 species of Ephemeroptera, 11 species of Trichoptera, 2 species of Plecoptera, 37 species of Odonata, 31 species of Lepidoptera, 53 species of Orthoptera, 36 species of Hemiptera, 248 species of Coleoptera, 68 species of Diptera, and 110 species of Hymenoptera. Within the Coleoptera, there are 31 species of ground beetles (Carabidae), 18 species of long-horned beetles (Cerambycidae), 27 species of leaf beetles (Chrysomelidae), 27 species of diving beetles (Dytiscidae), and 30 species of scarab beetles (Scarabaeidae), among other families. Within the Diptera, there are 50 species of midges (Chironomidae), among other families. Within the Hymenoptera, there are 39 species of ants (Formicidae), 35 species of velvet ants (Mutillidae), along with other families of bees and wasps. Only one rare invertebrate has been documented - Toxolasma parvus, the lilliput. There are four documented non-native invertebrates – the red imported fire ant (Solenopsis invicta), the honey bee (Apis mellifera), a Tenebrionid beetle (Poecilocrypticus formicophilus) and a Tubificid worm (Branchiura sowerbyi).

Insects play a critical role in shaping landscapes via seed dispersal, herbivory, pollination, and parasitism. Without an understanding of the insects, any understanding of the ecosystem will be extremely limited. They are often primary players in shaping the habitat and in plant population dynamics. Insects can serve as useful indicators for assessing the impacts of land use and land management.

Scientific Name	**Common**	**State Rank**	**Global Rank**
Puma concolor	Mountain lion	S2	G5
Phrynosoma cornutum	Texas horned lizard	S4, threatened	G4G5
Toxolasma parvus	Lilliput	S3	G5
Coccyzus americanus	Yellow-billed cuckoo	S4, PIF	G5
Aimophila ruficeps	Rufous-crowned sparrow	S4	G5, BCC, PIF
Ammodramus leconteii	LeConte’s sparrow	S3	G4, BCC, PIF
Ammodramus savannarum	Grasshopper sparrow	S3, PIF	G5, BCC
Anas americana	American widgeon	S3, PIF	G5, GBCC
Anas platyrhynchos	Mallard	S3	G5, GBCC
Archilochus alexandri	Black-chinned hummingbird	S5	G5, PIF

Scientific Name	Common	State Rank	Global Rank
Aythya affinis	Lesser scaup	S3	G5, GBCC
Aythya americana	Redhead	S3, PIF	G5, GBCC
Aythya valisineria	Canvasback	S4, PIF	G5, GBCC
Bartramia longicauda	Upland sandpiper	S3	G5, BCC
Chondestes grammacus	Lark sparrow	S4, PIF	G5, PIF
Circus cyaneus	Northern harrier	S2, PIF	G5, BCC, PIF
Colinus virginianus	Northern bobwhite	S4	G5, GBCC
Egretta caerulea	Little blue heron	S5	G5, BCC
Lanius ludovicianus	Loggerhead shrike	S4, PIF	G4, BCC, PIF
Myiarchus crinitus	Great crested flycatcher	S4, PIF	G5
Passerina ciris	Painted bunting	S4	G5, BCC, PIF
Pelecanus erythrorhynchos	White pelican	S2	G3
Picoides scalaris	Ladder-backed woodpecker	S5, PIF	G5, BCC, PIF
Pipilo erythrophthalmus	Eastern towhee	S2, PIF	G5
Pipilo maculatus	Spotted towhee	S4, PIF	G5
Sphyrapicus varius	Yellow-bellied sapsucker	PIF	G5
Spiza americana	Dickcissel	S4, PIF	G5, BCC, PIF
Spizella pusilla	Field sparrow	S5	G5, BCC, PIF
Tyrannus forficatus	Scissor-tailed flycatcher	S3	G5, BCC, PIF
Zonotrichia querula	Harris' sparrow	S4	G5, BCC, PIF

Table G-9. Animal Species of Concern at Fort Wolters. Status indicates state or global conservation status as identified by Natureserve (G1/S1= critically imperiled, G2/S2= imperiled, G3/S3=vulnerable, G4/S4= apparently secure, G5/S5= secure. G=global, S=state). "BCC" indicates Birds of Conservation Concern and "GBCC" indicates Game Birds of Conservation Concern as identified by USFWS. "PIF" indicates species identified as at risk by Partners in Flight, either globally or regionally.

Scientific Name	Common Name	Priority	Origin
Mus musculus	House mouse	Medium	Europe
Rattus rattus	Roof rat	Medium	Europe
Rattus norvegicus	Norway rat	Medium	Europe
Sus scrofa	Feral hog	High	Europe
Passer domesticus	House sparrow	Low	Europe
Sturnus vulgaris	European starling	Low	Europe
Lepomis auritus	Red-breasted sunfish	Low	Eastern US
Notemigonus crysoleucas	Golden shiner	Low	SE US
Solenopsis invicta	Red imported fire ant	High	S. America
Apis mellifera	Honey bee	Low	Europe
Poecilocrypticus formicophilus	Tenebrionid beetle	Low	S. America
Branchiura sowerbyi	Tubificid worm	Low	Europe

Table G-10. Non-native Animals of Fort Wolters. Priority indicates management concern. Origin indicates area of origin

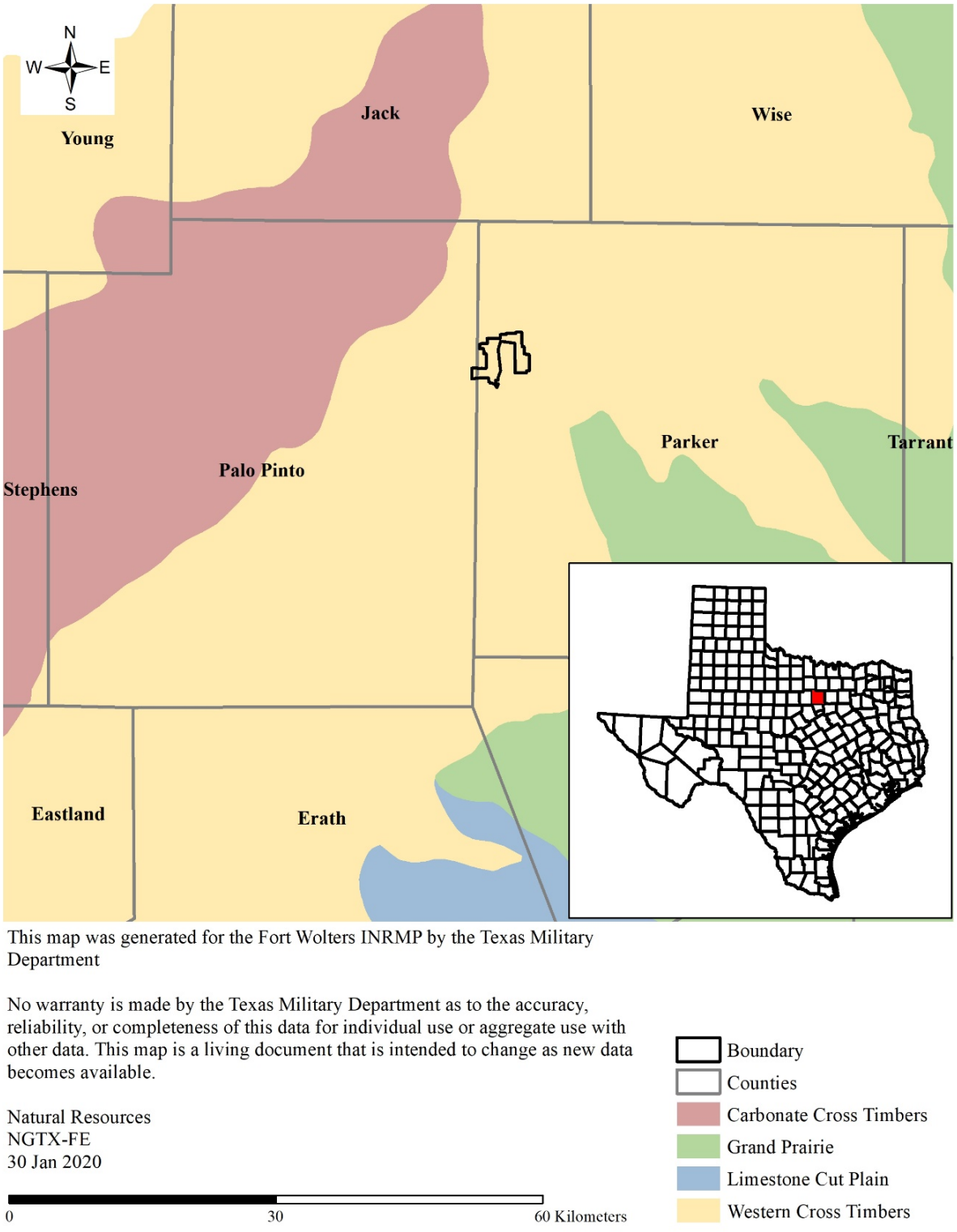


Figure G-5. Ecoregions of Fort Wolters

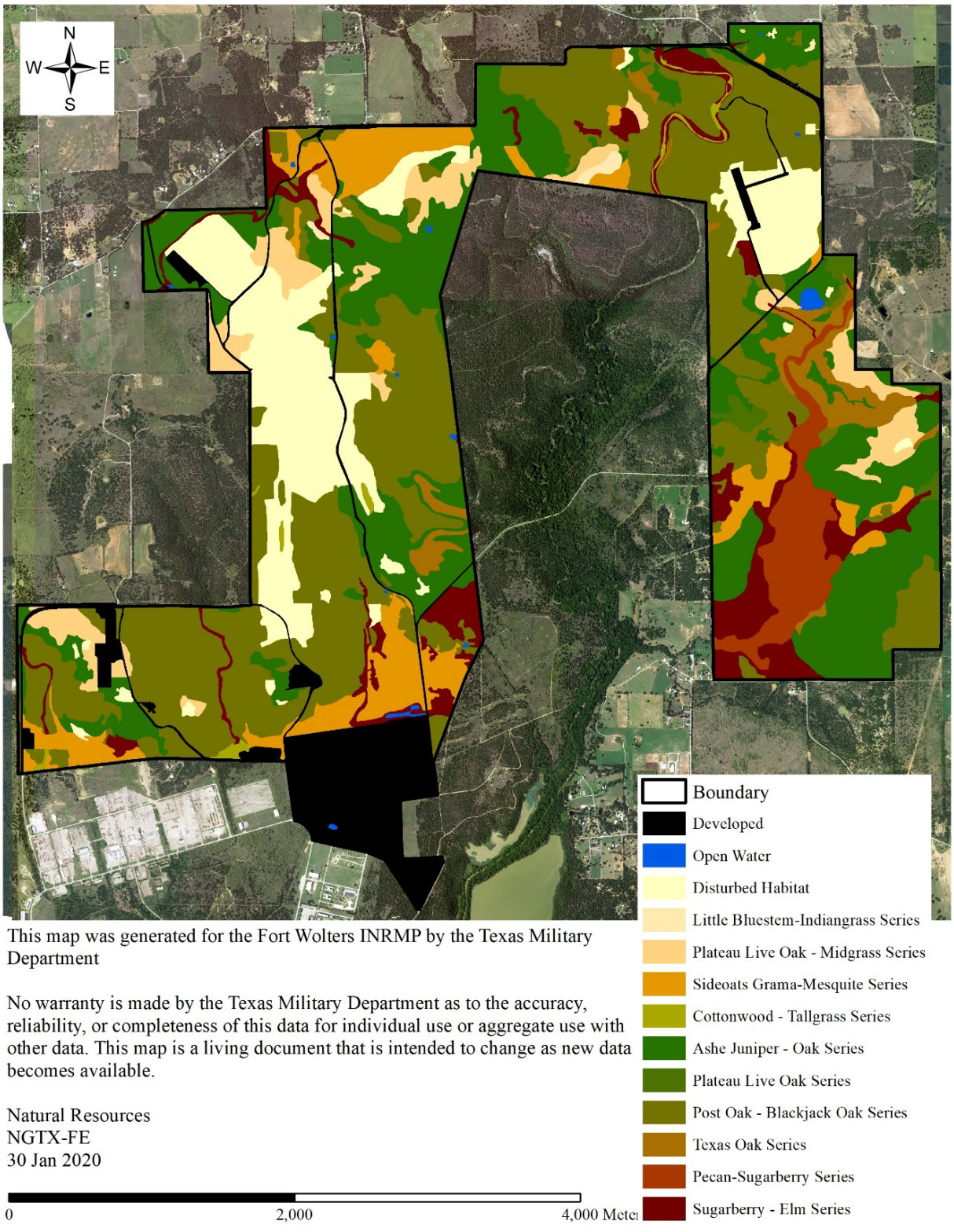
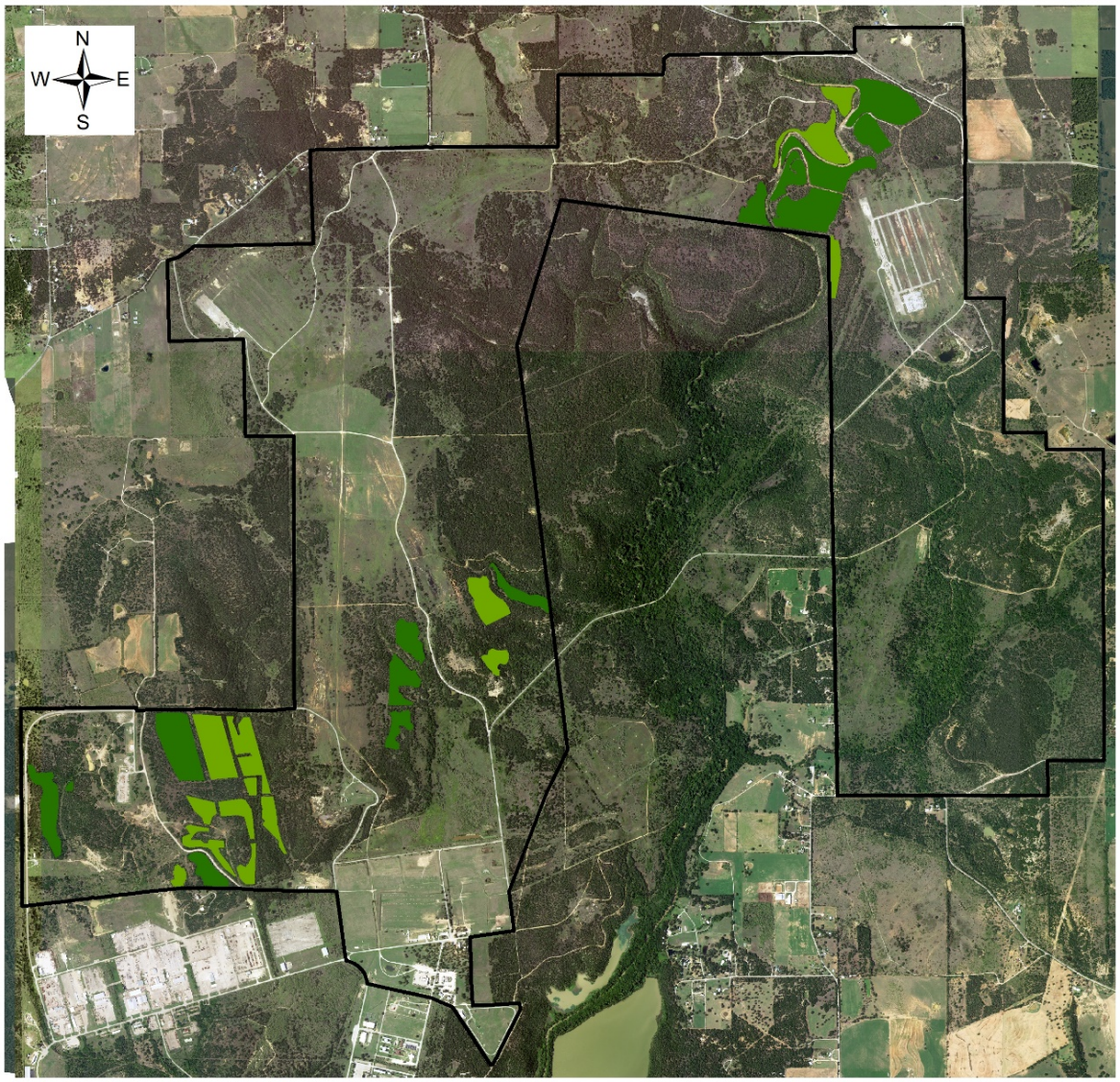


Figure G-6. Vegetation Communities of Fort Wolters



This map was generated for the Fort Wolters INRMP by the Texas Military Department

No warranty is made by the Texas Military Department as to the accuracy, reliability, or completeness of this data for individual use or aggregate use with other data. This map is a living document that is intended to change as new data becomes available.

Natural Resources
NGTX-FE
30 Jan 2020

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Boundary
Potential
Confirmed

Figure G-7. Cross Timbers Old Growth of Fort Wolters

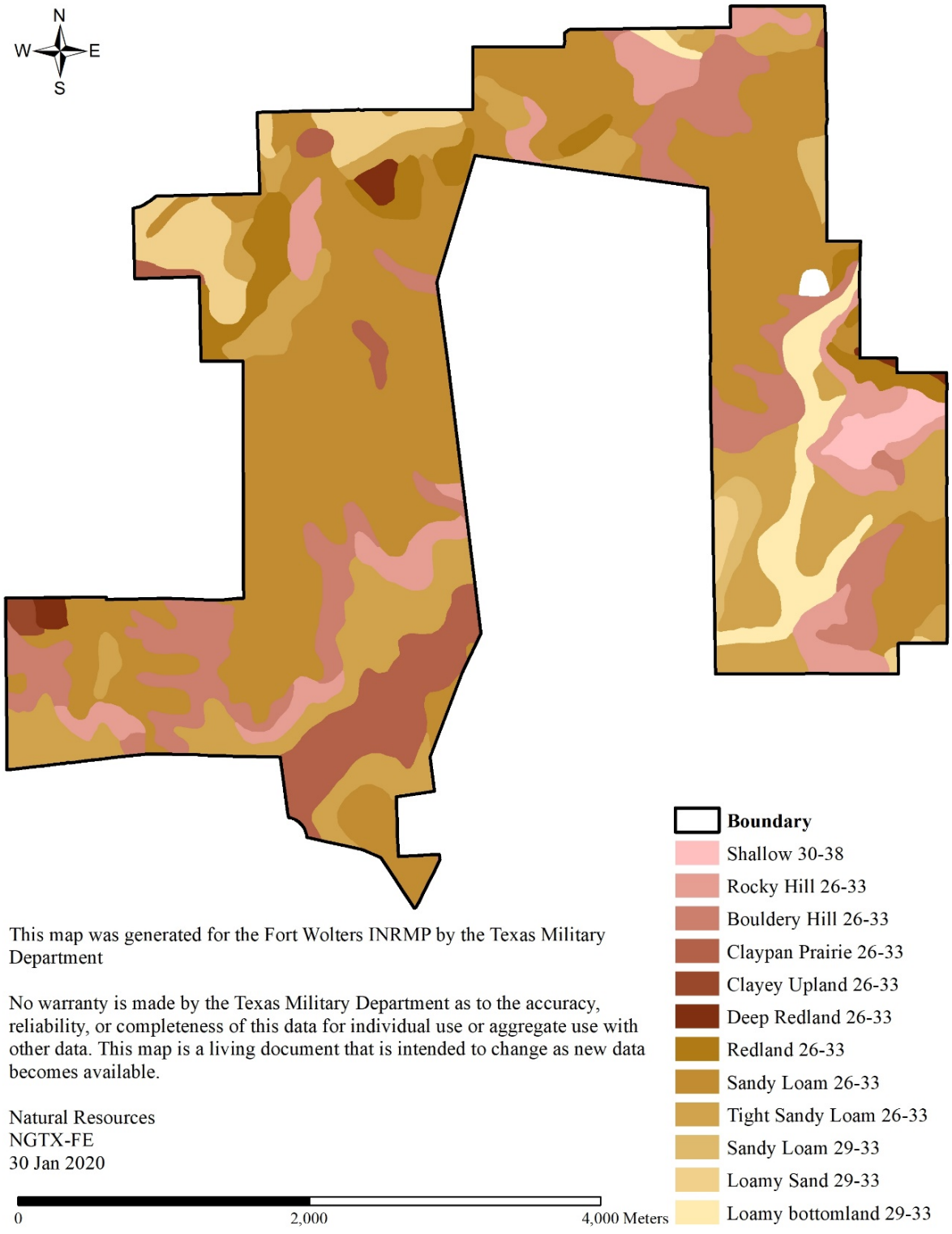

Figure G-8. NRCS Ecological Sites of Fort Wolters

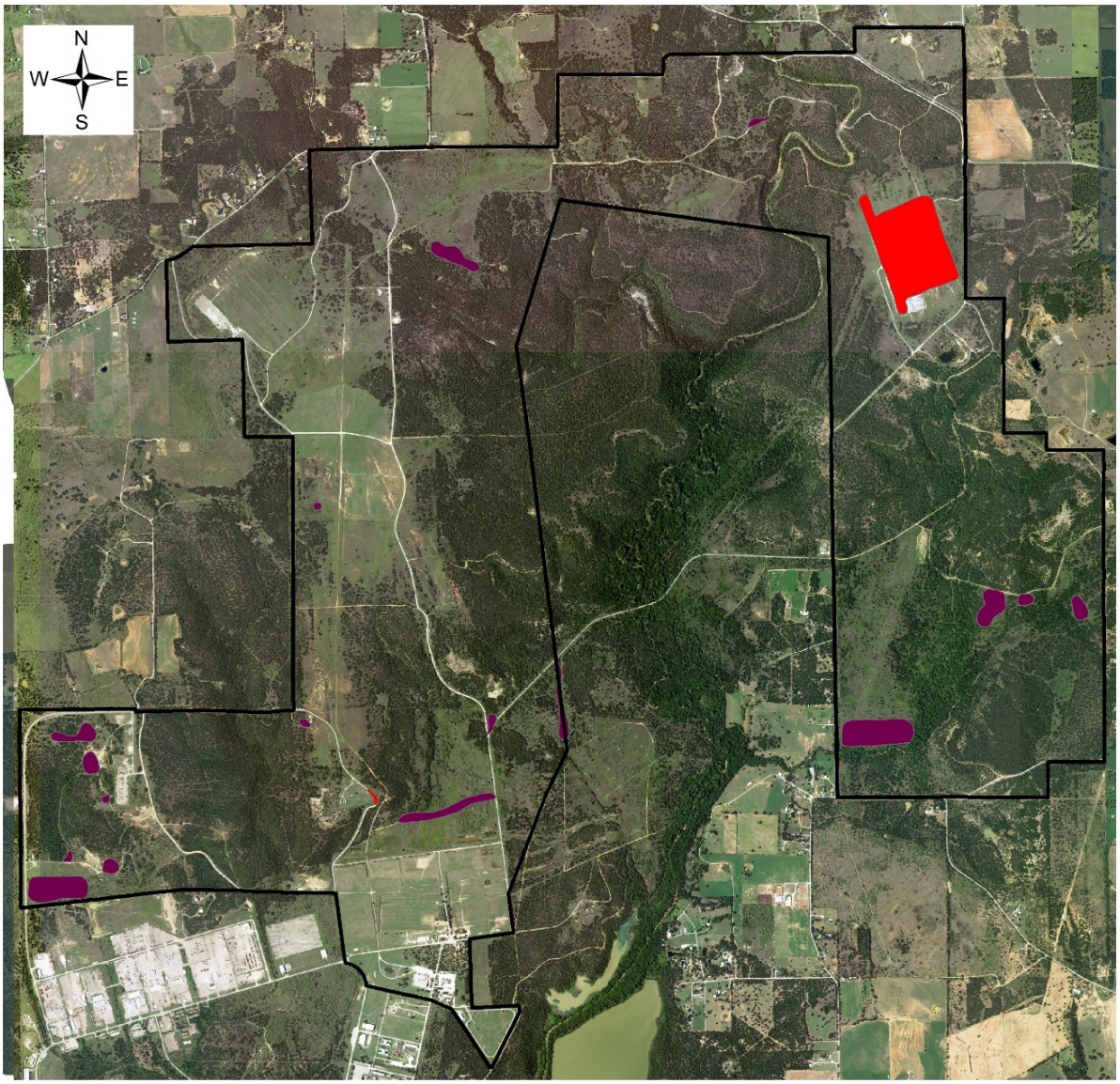

Figure G-9. Invasive Plants of Fort Wolters

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Appendix H. Species List

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
Coniferophyta: Conifers			
	Cupressaceae	*Juniperus ashei*	Ashe juniper
		Juniperus virginiana	Eastern red cedar
Equisetophyta: Horsetails			
	Equisetaceae	*Equisetum hyemale* var. *affine*	Scouringrush horsetail
		Equisetum laevigatum	Smooth horsetail
Magnoliophyta: Flowering Plants – Monocots			
	Agavaceae	*Yucca arkansana*	Arkansas yucca
		Yucca pallida	Twistleaf yucca
	Alismataceae	*Echinodorus berteroi*	Upright burhead
	Araceae	*Arisaema dracontium*	Green dragon
	Commelinaceae	*Commelina erecta*	Erect dayflower
		Commelina erecta var. *angustifolia*	Whitemouth dayflower
		Tradescantia occidentalis	Prairie spiderwort
		Tradescantia ohiensis	Bluejacket
	Cyperaceae	*Carex amphibola*	Eastern narrowleaf sedge
		Carex blanda	Eastern woodland sedge
		Carex cephalophora	Oval-leaf sedge
		Carex cherokeensis	Cherokee sedge
		Carex emoryi	Emory's sedge
		Carex microrhyncha	Littlesnout sedge
		Carex muehlenbergii	Muhlenberg's sedge
		Carex planostachys	Cedar sedge
		Carex retroflexa	Reflexed sedge
		Carex tetrastachya	Britton's sedge
		Carex texensis	Texas sedge
		Cyperus acuminatus	Tapertip flatsedge
		Cyperus croceus	Baldwin's flatsedge
		Cyperus lupulinus ssp. *lupulinus*	Great Plains flatsedge
		Cyperus setigerus	Lean flatsedge
		Cyperus strigosus	Strawcolored flatsedge
		Eleocharis compressa var. *acutisquamata*	Sharpscale spikerush
		Eleocharis geniculata	Canada spikesedge
		Eleocharis montevidensis	Sand spikerush
		Eleocharis obtusa	Blunt spikerush
		Eleocharis palustris	Common spikerush

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Eleocharis quadrangulata	Squarestem spikerush
		Fimbristylis puberula	Hairy fimbry
		Fimbristylis puberula var. *puberula*	Hairy fimbry
		Fuirena simplex	Western umbrella-sedge
		Fuirena simplex var. *simplex*	Western umbrella-sedge
		Schoenoplectus californicus	California bulrush
		Schoenoplectus pungens	Common threesquare
		Scirpus pendulus	Rufous bulrush
	Iridaceae	*Iris germanica*	German iris
		Nemastylis geminiflora	Prairie pleatleaf
		Sisyrinchium chilense	Swordleaf blue-eyed grass
		Sisyrinchium langloisii	Roadside blue-eyed grass
		Sisyrinchium minus	Dwarf blue-eyed grass
	Juncaceae	*Juncus acuminatus*	Tapertip rush
		Juncus brachyphyllus	Tuftedstem rush
		Juncus dudleyi	Dudley's rush
		Juncus effusus	Common rush
		Juncus marginatus	Grassleaf rush
		Juncus sp.	Rush
		Juncus texanus	Texas rush
		Juncus torreyi	Torrey's rush
	Liliaceae	*Allium canadense* var. *canadense*	Meadow garlic
		Allium canadense var. *fraseri*	Fraser meadow garlic
		Allium drummondii	Drummond's onion
		Camassia scilloides	Atlantic camas
		Nothoscordum bivalve	Crowpoison
	Najadaceae	*Najas guadalupensis*	Southern waternymph
	Orchidaceae	*Spiranthes cernua*	Nodding lady's tresses
	Poaceae	*Andropogon gerardii*	Big bluestem
		Andropogon glomeratus	Bushy bluestem
		Andropogon ternarius	Splitbeard bluestem
		Andropogon virginicus	Broomsedge bluestem
		Aristida longispica var. *geniculata*	Slimspike threeawn
		Aristida oligantha	Oldfield threeawn
		Aristida purpurea	Prairie threeawn
		Aristida purpurea var. *purpurea*	Purple threeawn
		Avena fatua	Wild oat
		Bothriochloa barbinodis	Cane bluestem
		Bothriochloa ischaemum	Yellow bluestem

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Bothriochloa ischaemum var. *songarica*	Yellow bluestem
		Bothriochloa laguroides ssp. *torreyana*	Silver beardgrass
		Bouteloua curtipendula	Sideoats grama
		Bouteloua curtipendula var. *curtipendula*	Sideoats grama
		Bouteloua dactyloides	Buffalograss
		Bouteloua gracilis	Blue grama
		Bouteloua hirsuta	Hairy grama
		Bouteloua hirsuta var. *pectinata*	Tall grama
		Bouteloua rigidiseta	Texas grama
		Bromus arvensis	Field brome
		Bromus catharticus	Rescuegrass
		Bromus pubescens	Hairy woodland brome
		Bromus tectorum	Cheatgrass
		Cenchrus longispinus	Mat sandbur
		Cenchrus spinifex	Coastal sandbur
		Chasmanthium latifolium	Indian woodoats
		Chloris verticillata	Tumble windmill grass
		Coelorachis cylindrica	Cylinder jointtail grass
		Cynodon dactylon	Bermudagrass
		Dichanthelium acuminatum var. *fasciculatum*	Western panicgrass
		Dichanthelium dichotomum	Cypress panicgrass
		Dichanthelium linearifolium	Slimleaf panicgrass
		Dichanthelium oligosanthes	Heller's rosette grass
		Dichanthelium oligosanthes var. *scribnerianum*	Scribner's rosette grass
		Digitaria ciliaris	Southern crabgrass
		Digitaria cognata	Fall witchgrass
		Echinochloa crus-galli	Barnyardgrass
		Elymus canadensis	Canada wildrye
		Elymus virginicus	Virginia wildrye
		Eragrostis cilianensis	Stinkgrass
		Eragrostis curtipedicellata	Gummy lovegrass
		Eragrostis curvula	Weeping lovegrass
		Eragrostis intermedia	Plains lovegrass
		Eragrostis secundiflora	Red lovegrass
		Eragrostis secundiflora ssp. *oxylepis*	Red lovegrass
		Eragrostis sp.	Lovegrass

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Eragrostis spectabilis	Purple lovegrass
		Eragrostis superba	Wilman lovegrass
		Eragrostis trichodes	Sand lovegrass
		Eriochloa sericea	Texas cupgrass
		Erioneuron pilosum	Hairy woollygrass
		Hordeum pusillum	Little barley
		Koeleria macrantha	Prairie junegrass
		Leptochloa dubia	Green sprangletop
		Leptochloa fusca ssp. *fascicularis*	Bearded sprangletop
		Limnodea arkansana	Ozark grass
		Lolium perenne ssp. *multiflorum*	Italian ryegrass
		Melica nitens	Threeflower melicgrass
		Muhlenbergia reverchonii	Seep muhly
		Nassella leucotricha	Texas wintergrass
		Panicum capillare	Witchgrass
		Panicum coloratum	Kleingrass
		Panicum dichotomiflorum	Fall panicgrass
		Panicum hallii var. *hallii*	Hall's panicgrass
		Panicum obtusum	Vine mesquite
		Panicum virgatum	Switchgrass
		Paspalum dilatatum	Dallisgrass
		Phalaris caroliniana	Carolina canarygrass
		Poa arachnifera	Texas bluegrass
		Polypogon monspeliensis	Annual rabbitsfoot grass
		Polypogon viridis	Beardless rabbitsfoot grass
		Schedonnardus paniculatus	Tumblegrass
		Schizachyrium scoparium	Little bluestem
		Setaria leucopila	Streambed bristlegrass
		Setaria parviflora	Marsh bristlegrass
		Sorghastrum nutans	Indiangrass
		Sorghum halepense	Johnsongrass
		Sporobolus compositus var. *compositus*	Composite dropseed
		Sporobolus compositus var. *drummondii*	Drummond's dropseed
		Sporobolus cryptandrus	Sand dropseed
		Tridens albescens	White tridens
		Tridens flavus	Purpletop tridens
		Tridens muticus var. *elongatus*	Slim tridens
		Tridens muticus var. *muticus*	Slim tridens

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Tridens strictus	Longspike tridens
		Triplasis purpurea	Purple sandgrass
		Vulpia octoflora	Sixweeks fescue
	Potamogetonaceae	*Potamogeton diversifolius*	Waterthread pondweed
		Potamogeton nodosus	Longleaf pondweed
	Smilacaceae	*Smilax bona-nox*	Saw greenbrier
		Smilax tamnoides	Bristly greenbrier
	Typhaceae	*Typha domingensis*	Southern cattail
Magnoliophyta: Flowering Plants – Dicots			
	Acanthaceae	*Dyschoriste linearis*	Polkadots
		Justicia americana	American water-willow
		Ruellia humilis	Fringeleaf wild petunia
	Amaranthaceae	*Froelichia gracilis*	Slender snakecotton
		Gossypianthus lanuginosus var. *lanuginosus*	Woolly cottonflower
	Anacardiaceae	*Rhus aromatica*	Fragrant sumac
		Rhus copallinum	Winged sumac
		Rhus glabra	Smooth sumac
		Rhus lanceolata	Prairie sumac
		Rhus trilobata	Skunkbush sumac
		Toxicodendron radicans ssp. *eximium*	Eastern poison ivy
		Toxicodendron radicans ssp. *negundo*	Eastern poison ivy
		Toxicodendron radicans ssp. *radicans*	Eastern poison ivy
		Toxicodendron radicans var. *verrucosum*	Eastern poison ivy
		Toxicodendron rydbergii	Western poison ivy
	Apiaceae	*Ammoselinum popei*	Plains sandparsley
		Bifora americana	Prairie bishop
		Chaerophyllum tainturieri	Hairyfruit chervil
		Chaerophyllum tainturieri var. *tainturieri*	Hairyfruit chervil
		Cymopterus macrorhizus	Bigroot springparsley
		Daucus pusillus	American wild carrot
		Eryngium leavenworthii	Leavenworth's eryngo
		Polytaenia nuttallii	Prairie parsley
		Ptilimnium nuttallii	Nuttall's prairie parsley
		Sanicula canadensis	Canadian blacksnakeroot
		Spermolepis divaricata	Roughfruit scaleseed
		Spermolepis inermis	Red River scaleseed

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Torilis arvensis	Spreading hedgeparsley
	Apocynaceae	*Amsonia ciliata*	Fringed bluestar
		Amsonia ciliata var. *texana*	Texas bluestar
		Apocynum cannabinum	Indianhemp
	Aquifoliaceae	*Ilex decidua*	Possumhaw
	Asclepiadaceae	*Asclepias asperula*	Spider milkweed
		Asclepias asperula ssp. *capricornu*	Antelopehorns
		Asclepias tuberosa ssp. *interior*	Butterfly milkweed
		Asclepias verticillata	Whorled milkweed
		Asclepias viridiflora	Green comet milkweed
		Asclepias viridis	Green antelopehorn
		Funastrum crispum	Wavyleaf twinevine
		Matelea biflora	Star milkvine
		Matelea reticulata	Netted milkvine
		Matelea sp.	Milkvine
	Asteraceae	*Achillea millefolium*	Common yarrow
		Achillea millefolium var. *occidentalis*	Western yarrow
		Amyblyolepis setigera	Huisache daisy
		Ambrosia artemisiifolia	Annual ragweed
		Ambrosia psilostachya	Cuman ragweed
		Ambrosia trifida	Great ragweed
		Ambrosia trifida var. *texana*	Texan great ragweed
		Amphiachyris dracunculoides	Prairie broomweed
		Antennaria parlinii ssp. *fallax*	Parlin's pussytoes
		Aphanostephus skirrhobasis	Arkansas dozedaisy
		Artemisia ludoviciana	White sagebrush
		Artemisia ludoviciana ssp. *mexicana*	White sagebrus
		Baccharis neglecta	Rooseveltweed
		Baccharis salicina	Willow baccharis
		Baccharis texana	Prairie false willow
		Brickellia eupatorioides var. *texana*	False boneset
		Centaurea americana	American start-thistle
		Chaetopappa asteroides	Arkansas leastdaisy
		Cirsium texanum	Texas thistle
		Cirsium undulatum	Wavyleaf thistle
		Conyza canadensis	Canadian horseweed
		Conyza canadensis var. *canadensis*	Canadian horseweed
		Conyza canadensis var. *glabrata*	Canadian horseweed
		Coreopsis tinctoria	Golden tickseed

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Coreopsis wrightii	Rock tickseed
		Crepis pulchra	Smallflower hawksbeard
		Dracopis amplexicaulis	Clasping coneflower
		Echinacea angustifolia	Blacksamson echninacea
		Eclipta prostrata	False daisy
		Engelmannia peristenia	Engelmann's daisy
		Erigeron modestus	Plains fleabane
		Erigeron strigosus	Prairie fleabane
		Erigeron strigosus var. *strigosus*	Prairie fleabane
		Erigeron tenuis	Slender fleabane
		Eupatorium serotinum	Lateflowering thoroughwort
		Evax prolifera	Bighead pygmycudweed
		Evax verna	Spring pygmycudweed
		Gaillardia aestivalis	Lanceleaf blanketflower
		Gaillardia aestivalis var. *aestivalis*	Lanceleaf blanketflower
		Gaillardia pulchella	Firewheel
		Gaillardia suavis	Perfumeballs
		Gamochaeta falcata	Narrowleaf purple everlasting
		Gamochaeta purpurea	Spoonleaf purple everlasting
		Grindelia nuda var. *nuda*	Curlytop gumweed
		Grindelia papposa	Spanish gold
		Grindelia squarrosa	Curlycup gumweed
		Helenium amarum var. *amarum*	Yellowdicks
		Helenium amarum var. *badium*	Yellowdicks
		Helenium microcephalum	Smallhead sneezeweed
		Helianthus annuus	Common sunflower
		Helianthus maximiliani	Maximilian sunflower
		Heterotheca canescens	Hoary false goldenaster
		Heterotheca subaxillaris	Camphorweed
		Hymenopappus artemisiifolius	Oldplainsman
		Hymenopappus scabiosaeus var. *corymbosus*	Carolina woollywhite
		Hymenopappus tenuifolius	Chalk Hill hymenopappus
		Iva angustifolia	Narrowleaf marsh elder
		Iva annua	Annual marsh elder
		Krigia caespitosa	Weedy dwarfdandelion
		Krigia occidentalis	Western dwarfdandelion
		Krigia virginica	Virginia dwarfdandelion
		Lactuca ludoviciana	Biannual lettuce

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Lactuca serriola	Prickly lettuce
		Liatris mucronata	Cusp blazing star
		Liatris punctata	Dotted blazing star
		Lindheimera texana	Texas yellowstar
		Lygodesmia texana	Texas skeletonplant
		Machaeranthera tanacetifolia	Tanseyleaf tansyaster
		Oligoneuron nitidum	Shiny goldenrod
		Packera obovata	Roundleaf ragwort
		Packera plattensis	Prairie groundsel
		Palafoxia callosa	Small palafox
		Pluchea odorata	Sweetscent
		Pluchea odorata var. *odorata*	Sweetscent
		Pseudognaphalium obtusifolium	Rabbit-tobacco
		Pseudognaphalium obtusifolium ssp. *obtusifolium*	Rabbit-tobacco
		Pyrrhopappus carolinianus	Carolina desert-chicory
		Pyrrhopappus grandiflorus	Tuberous desert-chicory
		Pyrrhopappus sp.	Desert-chicory
		Ratibida columnifera	Upright prairie coneflower
		Rudbeckia hirta	Blackeyed Susan
		Rudbeckia hirta var. *pulcherrima*	Blackeyed Susan
		Senecio ampullaceus	Texas ragwort
		Senecio quaylei	Quayle's ragwort
		Solidago altissima	Canada goldenrod
		Solidago nemoralis var. *nemoralis*	Gray goldenrod
		Solidago petiolaris	Downy ragged goldenrod
		Solidago radula	Western rough goldenrod
		Sonchus asper	Spiny sowthistle
		Sonchus sp.	Sowthistle
		Symphyotrichum ericoides var. *ericoides*	White heath aster
		Symphyotrichum oblongifolium	Aromatic aster
		Symphyotrichum patens var. *gracile*	Late purple aster
		Symphyotrichum patens var. *patens*	Late purple aster
		Symphyotrichum pratense	Barrens silky aster
		Symphyotrichum subulatum	Eastern annual saltmarsh aster
		Tetraneuris linearifolia	Fineleaf fournerved daisy
		Tetraneuris linearifolia var. *linearifolia*	Fineleaf fournerved daisy
		Tetraneuris scaposa	Stemmy four-nerve daisy

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Tetraneuris scaposa var. *scaposa*	Stemmy four-nerve daisy
		Thelesperma filifolium	Stiff greenthread
		Thelesperma filifolium var. *filifolium*	Stiff greenthread
		Verbesina encelioides	Golden crownbeard
		Verbesina virginica	White crownbeard
		Vernonia baldwinii ssp. *baldwinii*	Baldwin's ironweed
		Xanthisma texanum	Texas sleepydaisy
		Xanthisma texanum ssp. *drummondii*	Drummond's sleepydaisy
		Xanthium strumarium	Rough cocklebur
		Xanthium strumarium var. *canadense*	Canada cocklebur
	Bignoniaceae	*Campsis radicans*	Trumpet creeper
	Boraginaceae	*Heliotropium tenellum*	Pasture heliotrope
		Lappula occidentalis var. *occidentalis*	Flatspine stickseed
		Lithospermum incisum	Narrowleaf stoneseed
		Lithospermum sp.	Stoneseed
		Myosotis macrosperma	Largeseed forget-me-not
	Brassicaceae	*Capsella bursa-pastoris*	Shepherd's purse
		Descurainia pinnata	Western tansymustard
		Draba cuneifolia	Wedgeleaf draba
		Draba platycarpa	Broadpod draba
		Lepidium austrinum	Southern pepperwort
		Lepidium densiflorum	Common pepperweed
		Lepidium virginicum	Virginia pepperweed
	Buddlejaceae	*Polypremum procumbens*	Juniper leaf
	Cactaceae	*Coryphantha* sp.	Beehive cactus
		Cylindropuntia leptocaulis	Christmas cactus
		Echinocereus reichenbachii ssp. *reichenbachii*	Lace hedgehog cactus
		Escobaria missouriensis	Missouri foxtail cactus
		Escobaria vivipara var. *radiosa*	Spinystar
		Opuntia engelmannii var. *lindheimeri*	Texas pricklypear
		Opuntia humifusa	Devil's-tongue
		Opuntia phaeacantha	Tulip pricklypear
		Opuntia sp.	Pricklypear
	Campanulaceae	*Lobelia cardinalis*	Cardinal flower
		Triodanis perfoliata	Clasping Venus' looking-glass
	Caprifoliaceae	*Lonicera albiflora*	Western white honeysuckle

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Lonicera japonica	Japanese honeysuckle
		Symphoricarpos orbiculatus	Coralberry
		Viburnum rufidulum	Rusty blackhaw
	Chenopodiaceae	*Chenopodium album*	Lambsquarters
		Chenopodium ambrosioides	Mexican tea
		Chenopodium pallescens	Slimleaf goosefoot
		Chenopodium simplex	Mapleleaf goosefoot
		Salsola kali	Russian thistle
		Salsola tragus	Prickly Russian thistle
	Cistaceae	*Helianthemum georgianum*	Georgia frostweed
		Lechea san-sabeana	San Saba pinweed
		Lechea tenuifolia	Narrowleaf pinweed
	Clusiaceae	*Hypericum drummondii*	Nits and lice
		Hypericum hypericoides ssp. *hypericoides*	St. Andrew's cross
		Hypericum hypericoides ssp. *multicaule*	St. Andrew's cross
	Convolvulaceae	*Convolvulus equitans*	Texas bindweed
		Dichondra carolinensis	Carolina ponyfoot
		Evolvulus nuttallianus	Shaggy dwarf morning-glory
		Evolvulus sericeus	Silver dwarf morning-glory
		Ipomoea cordatotriloba var. *cordatotriloba*	Tievine
	Cornaceae	*Cornus drummondii*	Roughleaf dogwood
	Crassulaceae	*Sedum nuttallianum*	Yellow stonecrop
	Cucurbitaceae	*Citrullus lanatus* var. *lanatus*	Watermelon
		Cucurbita foetidissima	Missouri gourd
		Ibervillea lindheimeri	Lindheimer's globeberry
		Ibervillea sp.	Globeberry
	Cuscutaceae	*Cuscuta indecora* var. *indecora*	Bigseed alfalfa dodder
	Ebenaceae	*Diospyros virginiana*	Common persimmon
	Euphorbiaceae	*Acalypha monococca*	Slender threeseed mercury
		Argythamnia humilis var. *humilis*	Low silverbush
		Chamaesyce fendleri	Fendler's sandmat
		Chamaesyce maculata	Spotted sandmat
		Chamaesyce missurica	Prairie sandmat
		Chamaesyce prostrata	Prostrate sandmat
		Cnidoscolus texanus	Texas bullnettle
		Croton capitatus var. *lindheimeri*	Lindheimer's hogwort
		Croton lindheimerianus	Threeseed croton

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Croton monanthogynus	Prairie tea
		Euphorbia bicolor	Snow on the prairie
		Euphorbia dentata	Toothed spurge
		Euphorbia longicruris	Wedgeleaf spurge
		Euphorbia marginata	Snow on the mountain
		Euphorbia spathulata	Warty spurge
		Euphorbia tetrapora	Weak spurge
		Phyllanthus polygonoides	Smartweed leaf-flower
		Stillingia texana	Texas toothleaf
		Tragia betonicifolia	Betonyleaf noseburn
		Tragia brevispica	Shortspike noseburn
		Tragia ramosa	Branched noseburn
	Fabaceae	*Acacia angustissima* var. *hirta*	Prairie acacia
		Albizia julibrissin	Silktree
		Amorpha fruticosa	Desert false indigo
		Astragalus crassicarpus	Groundplum milkvetch
		Astragalus crassicarpus var. *crassicarpus*	Groundplum milkvetch
		Astragalus leptocarpus	Rare loco milkvetch
		Astragalus lindheimeri	Lindheimer's milkvetch
		Astragalus nuttallianus	Smallflowered milkvetch
		Astragalus nuttallianus var. *nuttallianus*	Smallflowered milkvetch
		Centrosema virginianum	Spurred butterfly pea
		Cercis canadensis var. *canadensis*	Eastern redbud
		Cercis canadensis var. *texensis*	Texas redbud
		Chamaecrista fasciculata	Partridge pea
		Clitoria mariana	Atlantic pidgeonwings
		Dalea aurea	Golden prairie clover
		Dalea compacta var. *pubescens*	Compact prairie clover
		Dalea enneandra	Nineanther prairie clover
		Dalea multiflora	Roundhead prairie clover
		Dalea tenuis	Pinkglobe prairieclover
		Desmanthus illinoensis	Illinois bundleflower
		Desmanthus leptolobus	Slenderlobe bundleflower
		Desmanthus velutinus	Velvet bundleflower
		Desmodium paniculatum	Panicledleaf ticktrefoil
		Desmodium sessilifolium	Sessileleaf ticktrefoil
		Desmodium tweedyi	Tweedy's ticktrefoil
		Galactia canescens	Hoary milkpea

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Galactia volubilis	Downy milkpea
		Gleditsia triacanthos	Honeylocust
		Indigofera miniata	Coastal indigo
		Lespedeza cuneata	Sericea lespedeza
		Lespedeza procumbens	Trailing lespedeza
		Lespedeza repens	Creeping lespedeza
		Lespedeza stuevei	Tall lespedeza
		Lespedeza violacea	Violet lespedeza
		Lespedeza virginica	Slender lespedeza
		Lotus corniculatus	Bird's-foot trefoil
		Lotus unifoliolatus	American bird's-foot trefoil
		Lotus unifoliolatus var. *unifoliolatus*	American bird's-foot trefoil
		Medicago minima	Little bur-clover
		Medicago polymorpha	Burclover
		Melilotus indicus	Annual yellow sweetclover
		Melilotus officinalis	Yellow sweetclover
		Melilotus indicus	Annual yellow sweetclover
		Melilotus officinalis	Yellow sweetclover
		Mimosa aculeaticarpa var. *biuncifera*	Catclaw mimosa
		Mimosa borealis	Fragrant mimosa
		Mimosa nuttallii	Nuttall's sensitive-briar
		Mimosa sp.	Sensitive plant
		Neptunia lutea	Yellow puff
		Pediomelum cuspidatum	Largebract Indian breadroot
		Pediomelum digitatum	Palmleaf Indian breadroot
		Pediomelum linearifolium	Narrowleaf Indian breadroot
		Pediomelum reverchonii	Rock Indian breadroot
		Prosopis glandulosa	Honey mesquite
		Psoralidium tenuiflorum	Slimflower scurfpea
		Senna roemeriana	Twoleaf senna
		Sesbania drummondii	Poisonbean
		Sesbania vesicaria	Bagpod
		Strophostyles helvola	Amberique-bean
		Strophostyles leiosperma	Slickseed fuzzybean
		Styphnolobium affine	Eve's necklacepod
		Tephrosia virginiana	Virginia tephrosia
		Vicia lodoviciana ssp. *ludoviciana*	Louisiana vetch
		Vicia sativa	Garden vetch
		Vicia sativa ssp. *nigra*	Garden vetch

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
	Fagaceae	*Quercus buckleyi*	Buckley oak
		Quercus fusiformis	Texas live oak
		Quercus marilandica	Blackjack oak
		Quercus shumardii var. *shumardii*	Shumard oak
		Quercus stellata	Post oak
	Gentianaceae	*Centaurium texense*	Lady Bird's centaury
		Eustoma exaltatum ssp. *russellianum*	Showy prairie gentian
		Sabatia campestris	Texas star
	Geraniaceae	*Erodium cicutarium*	Redstem stork's bill
		Erodium texanum	Texas stork's bill
		Geranium carolinianum	Carolina geranium
	Hydrophyllaceae	*Nama hispidum*	Bristly nama
	Juglandaceae	*Carya illinoinensis*	Pecan
		Carya texana	Black hickory
	Krameriaceae	*Krameria lanceolata*	Trailing krameria
	Lamiaceae	*Hedeoma acinoides*	Slender false pennyroyal
		Hedeoma drummondii	Drummond's false pennyroyal
		Hedeoma reverchonii	Reverchon's false pennyroyal
		Lamium amplexicaule	Henbit deadnettle
		Monarda citriodora	Lemon beebalm
		Monarda fistulosa	Wild bergamot
		Monarda fistulosa ssp. *fistulosa*	Wild bergamot
		Monarda punctata	Spotted beebalm
		Monarda punctata ssp. *punctata* var. *intermedia*	Spotted beebalm
		Salvia azurea	Azure blue sage
		Salvia azurea var. *grandiflora*	Pitcher sage
		Salvia coccinea	Blood sage
		Salvia farinacea	Mealycup sage
		Salvia texana	Texas sage
		Scutellaria drummondii var. *edwardsiana*	Drummond's skullcap
		Teucrium canadense	Canada germander
		Teucrium laciniatum	Lacy germander
	Linaceae	*Linum hudsonioides*	Texas flax
		Linum pratense	Meadow flax
		Linum sulcatum	Grooved flax
	Loasaceae	*Mentzelia albescens*	Wavyleaf blazing star
	Lythraceae	*Ammannia coccinea*	Purple ammannia

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Lythrum californicum	Valley redstem
	Malvaceae	*Abutilon fruticosum*	Texas Indian mallow
		Callirhoe involucrata	Purple poppymallow
		Callirhoe involucrata var. *involucrata*	Purple poppymallow
		Callirhoe pedata	Palmleaf poppymallow
		Malva neglecta	Common mallow
		Sida abutifolia	Spreading fanpetals
	Menispermaceae	*Cocculus carolinus*	Carolina coralbead
	Moraceae	*Maclura pomifera*	Osage orange
		Morus rubra	Red mulberry
	Nyctaginaceae	*Mirabilis gigantea*	Giant four o'clock
		Mirabilis linearis	Narrowleaf four-o'clock
		Mirabilis sp.	Four o'clock
	Oleaceae	*Forestiera pubescens*	Stretchberry
		Forestiera pubescens var. *glabrifolia*	Stretchberry
		Forestiera pubescens var. *pubescens*	Stretchberry
		Fraxinus pennsylvanica	Green ash
		Fraxinus texensis	Texas ash
	Onagraceae	*Calylophus berlandieri* ssp. *pinifolius*	Berlandier's sundrop
		Calylophus serrulatus	Yellow sundrops
		Gaura coccinea	Scarlet beeblossom
		Gaura mollis	Velvetweed
		Gaura suffulta	Kisses
		Ludwigia peploides	Floating primrose-willow
		Oenothera laciniata	Cutleaf evening primrose
		Oenothera speciosa	Pinkladies
		Oenothera triloba	Stemless evening primrose
	Oxalidaceae	*Oxalis stricta*	Common yellow oxalis
		Oxalis violacea	Violet woodsorrel
	Papaveraceae	*Argemone albiflora*	Bluestem pricklypoppy
		Argemone albiflora ssp. *texana*	Bluestem pricklypoppy
	Passifloraceae	*Passiflora lutea*	Yellow passionflower
	Phytolaccaceae	*Phytolacca americana*	American pokeweed
		Rivina humilis	Rougeplant
	Plantaginaceae	*Plantago pDAG-Aonica*	Woolly plantain
		Plantago rhodosperma	Redseed plantain
		Plantago wrightiana	Wright's plantain
	Platanaceae	*Platanus occidentalis*	American sycamore

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
	Polemoniaceae	*Ipomopsis rubra*	Standing-cypress
		Phlox drummondii	Annual phlox
		Phlox drummondii ssp. *mcallisteri*	McAllister's phlox
	Polygalaceae	*Polygala alba*	White milkwort
		Eriogonum annuum	Annual buckwheat
		Eriogonum longifolium	Longleaf buckwheat
		Polygonum hydropiperoides	Swamp smartweed
		Polygonum lapathifolium	Curlytop smartweed
		Polygonum tenue	Pleatleaf knotweed
		Rumex crispus	Curly dock
		Rumex hastatulus	Heartwing sorrel
		Rumex pulcher	Fiddle dock
	Portulacaceae	*Claytonia virginica*	Virginia springbeauty
		Phemeranthus parviflorus	Sunbright
		Portulaca pilosa	Kiss me quick
	Primulaceae	*Androsace occidentalis*	Western rockjasmine
		Samolus valerandi ssp. *parviflorus*	Seaside brookweed
	Ranunculaceae	*Anemone berlandieri*	Tenpetal thimbleweed
		Delphinium carolinianum ssp. *virescens*	Carolina larkspur
	Rhamnaceae	*Condalia hookeri*	Brazilian bluewood
		Frangula caroliniana	Carolina buckthorn
		Ziziphus obtusifolia	Lotebush
	Rosaceae	*Geum canadense*	White avens
		Geum canadense var. *canadense*	White avens
		Prunus angustifolia	Chickasaw plum
		Prunus gracilis	Oklahoma plum
		Prunus mexicana	Mexican plum
		Prunus rivularis	Creek plum
		Prunus sp.	Plum
		Pyrus calleryana	Callery pear
		Rubus oklahomus	Oklahoma blackberry
		Rubus trivialis	Southern dewberry
		Sanguisorba annua	Prairie burnet
	Rubiaceae	*Cephalanthus occidentalis*	Common buttonbush
		Diodia teres	Poorjoe
		Galium aparine	Stickywilly
		Galium circaezans	Licorice bedstraw
		Galium pilosum	Hairy bedstraw
		Galium texense	Texas bedstraw

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
		Galium virgatum	Southwest bedstraw
		Houstonia pusilla	Tiny bluet
		Stenaria nigricans var. *nigricans*	Diamondflowers
	Rutaceae	*Zanthoxylum clava-herculis*	Hercules' club
		Zanthoxylum fagara	Lime pricklyash
		Zanthoxylum hirsutum	Texas Hercules' club
	Salicaceae	*Populus deltoides*	Eastern cottonwood
		Populus deltoides ssp. *deltoides*	Eastern cottonwood
		Salix nigra	Black willow
	Sapindaceae	*Sapindus saponaria* var. *drummondii*	Western soapberry
		Ungnadia speciosa	Mexican buckeye
	Sapotaceae	*Sideroxylon lanuginosum*	Gum bully
		Sideroxylon lanuginosum ssp. *oblongifolium*	Gum bully
	Scrophulariaceae	*Agalinis heterophylla*	Prairie false foxglove
		Agalinis homalantha	San Antonio false foxglove
		Castilleja indivisa	Entireleaf Indian paintbrush
		Castilleja purpurea var. *citrina*	Prairie Indian paintbrush
		Castilleja purpurea var. *purpurea*	Downy Indian paintbrush
		Leucospora multifida	Narrowleaf paleseed
		Nuttallanthus texanus	Texas toadflax
		Penstemon cobaea	Cobaea beardtongue
		Penstemon laxiflorus	Nodding beardtongue
		Veronica peregrina	Neckweed
		Veronica peregrina ssp. *xalapensis*	Hairy purslane speedwell
	Solanaceae	*Chamaesaracha coniodes*	Gray five yes
		Physalis cinerascens	Smallflower groundcherry
		Physalis sp.	Groundcherry
		Quincula lobata	Chinese lantern
		Solanum dimidiatum	Western horsenettle
		Solanum elaeagnifolium	Silverleaf nightshade
		Solanum rostratum	Buffalobur nightshade
	Tamaricaceae	*Tamarix ramosissima*	Saltcedar
	Ulmaceae	*Celtis laevigata*	Sugarberry
		Celtis laevigata var. *laevigata*	Sugarberry
		Celtis laevigata var. *reticulata*	Netleaf hackberry
		Ulmus americana	American elm
		Ulmus crassifolia	Cedar elm
	Urticaceae	*Parietaria pensylvanica*	Pennsylvania pellitory

H.1 Plants

Class/Order	Family	Scientific Name	Common Name
	Valerianaceae	*Valerianella amarella*	Hairyseed cornsalad
		Valerianella radiata	Beaked cornsalad
	Verbenaceae	*Glandularia bipinnatifida*	Dakota mock vervain
		Glandularia bipinnatifida var. *bipinnatifida*	Dakota mock vervain
		Glandularia pumila	Pink mock vervain
		Phyla nodiflora	Turkey tangle fogfruit
		Verbena canescens	Gray vervain
		Verbena halei	Texas vervain
	Violaceae	*Hybanthus verticillatus*	Babyslippers
		Viola affinis	Sand violet
		Viola bicolor	Field pansy
	Viscaceae	*Phoradendron tomentosum*	Christmas mistletoe
	Vitaceae	*Cissus trifoliata*	Sorrelvine
		Parthenocissus quinquefolia	Virginia creeper
		Vitis mustangensis	Mustang grape
	Zygophyllaceae	*Kallstroemia parviflora*	Warty caltrop
		Tribulus terrestris	Puncturevine
Pteridophyta: Ferns and Allies			
	Aspleniaceae	*Asplenium platyneuron*	Ebony spleenwort
	Dryopteridaceae	*Woodsia obtusa*	Bluntlobe cliff fern
		Woodsia obtusa ssp. *occidentalis*	Western cliff fern
	Ophioglossaceae	*Ophioglossum englemannii*	Limestone adderstongue
		Ophioglossum vulgatum	Southern adderstongue
	Pteridaceae	*Cheilanthes alabamensis*	Alabama lipfern
		Cheilanthes lindheimeri	Fairyswords
		Cheilanthes tomentosa	Woolly lipfern
		Pellaea atropurpurea	Purple cliffbrake

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
Annelida					
	Clitellata: Worms, Leeches, and Allies				
		Haplotaxida	Tubificidae	*Branchiura sowerbyi*	
		Rhynchobdellida	Glossiphoniidae	*Helobdella stagnalis*	Leech
				Helobdella triserialis	Leech
				Placobdella ornata	
				Placobdella parasitica	Leech
Arthropoda					
	Arachnida: Spiders and Scorpions				
		Araneae	Araneidae	*Argiope* sp.	Orb-weaving spider
		Scorpiones	Buthidae	*Centruroides vittatus*	Striped bark scorpion
	Insecta: Insects				
		Coleoptera	Anthicidae	*Notoxus* sp.	
			Anthribidae	*Ormiscus* sp.	
				Trigonorhinus sp.	
			Attelabidae	*Eugnamptus* sp.	
			Bostrichidae	*Lichenophanes bicornis*	
				Xylobiops sp.	
			Buprestidae	*Acmaeodera* sp.	
				Agrilus sp.	
				Chrysobothris basalis	
				Chrysobothris sp.	
				Taphrocerus sp.	
			Cantharidae	*Chauliognathus limbicollis*	
				Discodon sp.	
				Podabrus sp.	
				Polemius sp.	
				Silis sp.	
			Carabidae	*Agonum decorum*	
				Agonum pallipes	
				Agonum sp.	
				Amphasia sp.	
				Anisodactylus sp.	
				Calathus opaculus	
				Calosoma marginale	
				Calosoma scrutator	
				Calybe sallei	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Cicindela belfragei	Loamy-ground tiger beetle
				Cicindela obsoleta volturina	Large grassland tiger beetle
				Cicindela punctulata	Punctured tiger beetle
				Cicindela repanda	Bronzed tiger beetle
				Cicindela rufiventris	Eastern red-bellied tiger beetle
				Cicindela sexguttata	Six-spotted tiger beetle
				Cicindela sp.	Tiger beetle
				Clivina bipistulata	
				Clivina sp.	
				Discoderus sp.	
				Galerita sp.	
				Harpalus gravis	
				Harpalus sp.	
				Helluomorphoides sp.	
				Lebia ornata	
				Lebia sp.	
				Lebia viridis	
				Notiobia sp.	
				Pasimachus sp.	
				Scarites sp.	
				Selenophorus sp.	
				Stenolophus lineola	
				Stenomorphus sp.	
			Cerambycidae	*Aneflomorpha* sp.	
				Anelaphus moestum	
				Ataxia sp.	
				Batyle ignicollis	
				Batyle suturalis	
				Dorcaschema alternatum	Small mulberry borer
				Hippopsis lemniscata	
				Knulliana cincta	Banded hickory borer
				Mecas sp.	
				Oberea sp.	
				Oncideres sp.	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Plinthocoelium suaveolens	
				Pseudostrangalia cruentata	
				Strangalia sexnotata	
				Strangalia virilis	
				Tetraopes texanus	
				Tilloclytus geminatus	
				Typocerus octonotatus	
				Typocerus sinuatus	
			Chrysomelidae	*Asphaera lustrans*	
				Brachypnoea lecontei	
				Capraita nigrosignata	
				Chrysomela knabi	
				Cryptocephalus mucoreus	
				Diabrotica cristata	
				Diabrotica sp.	
				Diabrotica undecimpunctata	Corn rootworm
				Exema canadensis	
				Gratiana pallidula	
				Griburius lecontii	
				Kuschelina flavocyanea	
				Kuschelina petaurista	
				Luperosoma parallelus	
				Lysathia ludoviciana	
				Metachroma sp.	
				Metrioidea convexa	
				Metrioidea popenoei	
				Mychrous denticollis	
				Ophraella communa	
				Ophraella notulata	
				Pachybrachis bivittatus	
				Pachybrachis sp.	
				Pachybrachis vau	
				Pachybrachis vestigialis	
				Paria sp.	
				Xanthonia sp.	
				Zygogramma disrupta	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
			Cleridae	*Chariessa pilosa*	
				Chariessa sp.	
				Isohydnocera sp.	
				Pelonides quadripunctatum	
			Coccinellidae	*Adalia bipunctata*	
				Coccinella septempunctata	Sevenspotted lady beetle
				Exochomus sp.	
				Harmonia axyridis	
				Hippodamia convergens	Convergent lady beetle
				Hyperaspis sp.	
				Olla v-nigrum	
				Scymnus loewii	
				Scymnus sp.	
			Curculionidae	*Artipus* sp.	
				Colecerus sp.	
				Curculio sp.	
				Dichoxenus sp.	
				Eudiagogus rosenschoeldi	
				Listronotus sp.	
				Myrmex sp.	
				Pandeleteius sp.	
				Rynchaenus mixtus	
				Sitona sp.	
				Sphenophorus sp.	
			Dermestidae	*Cryptorhopalum* sp.	
				Dermestes sp.	
			Dryopidae	*Pelonomus obscurus*	
			Dytiscidae	*Agabus disintegratus*	
				Agabus species	Diving beetle
				Celina sp.	Diving beetle
				Copelatus chevrolati	
				Coptotomus sp.	
				Coptotomus venustus	
				Cybister fimbriolatus	
				Desmopachria dispersus	
				Eretes sp.	
				Eretes sticticus	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Hydaticus sp.	
				Hydroporus rufilabris	
				Hygrotus nubilus	
				Laccophilus fasciatus	
				Laccophilus fasciatus rufus	
				Laccophilus fasciatus terminalis	
				Laccophilus proximus	
				Laccophilus sp.	Diving beetle
				Liodessus obscurellus	
				Neobidessus pullus	
				Neoporus dimidiatus	
				Neoporus sp.	
				Neoporus undulatus	
				Platambus semivittatus	
				Rhantus calidus	
				Thermonectus basillaris	
				Thermonectus ornaticollis	
				Thermonectus sp.	
				Uvarus sp.	
			Elateridae	*Aeolus* sp.	
				Conoderus vespertinus	Tobacco wireworm
				Melanotus sp.	
				Neotrichophorus sp.	
			Elmidae	*Stenelmis* sp.	Riffle beetle
			Erotylidae	*Pseudischyrus* sp.	
				Tritoma sp.	
			Geotrupidae	*Bolbocerosoma* sp.	
				Geotrupes opacus	
			Gyrinidae	*Dineutus* sp.	Whirligig beetle
				Gyrinus sp.	
			Haliplidae	*Haliplus deceptus*	
				Haliplus fasciatus	
				Haliplus lewsii	
				Haliplus oklahomensis	
				Haliplus sp.	Crawling water beetle
				Haliplus triopsis	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Haliplus tumidus	
				Peltodytes festivus	
				Peltodytes litoralis	
				Peltodytes sexmaculatus	
				Peltodytes sp.	Crawling water beetle
			Hybosoridae	*Hybosorus illigeri*	
			Hydrophilidae	*Berosus exiguus*	
				Berosus infuscatus	
				Berosus peregrinus	
				Berosus pugnax	
				Berosus sp.	Water scavenger beetle
				Helochares maculicollis	
				Helochares sp.	
				Hydrobius sp.	Water scavenger beetle
				Hydrochara sp.	
				Hydrophilus sp.	
				Hydrophilus triangularis	
				Tropisternus collaris	
				Tropisternus lateralis	
				Tropisternus sp.	
			Lampyridae	*Photuris pensylvanica*	
				Pleotomus pallens	
			Meloidae	*Epicauta* sp.	
				Pyrota insulata	
				Pyrota sp.	
			Melyridae	*Attalus rufiventris*	
				Collops balteatus	
			Mordellidae	*Mordella* sp.	
				Mordellistena species	
			Noteridae	*Hydrocanthus atripennis*	
				Hydrocanthus sp.	Burrowing water beetle
			Oedemeridae	*Oxacis* species	
				Sparedrus aspersus	
			Phengodidae	*Phengodes* sp.	
			Scarabaeidae	*Anomala innuba*	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Anomala marginata	
				Aphodius lividus	
				Ateuchus sp.	
				Canthon ebenus	
				Canthon viridis	
				Cyclocephala longula	
				Diplotaxis sp.	
				Dyscinetus morator	
				Euetheola humilis	
				Euphoria sepulcralis	
				Melanocanthon nigricornis	
				Onthophagus aeneus	
				Onthophagus gazella	Dung beetle
				Onthophagus hecate hecate	
				Onthophagus knausi	
				Onthophagus medorensis	
				Onthophagus orpheus	
				Onthophagus pennsylvanicus	
				Pelidnota notata	
				Phanaeus vindex	Dung beetle
				Phileurus valgus	
				Phyllophaga rubiginosa	
				Phyllophaga sp.	
				Phyllophaga submucida	
				Phyllophaga subpruinosa	
				Phyllophaga torta	
				Phyllophaga vanalleri	
				Serica sp.	
				Tomarus gibbosus	
				Trichiotinus texanus	
			Scirtidae	*Cyphon* sp.	
			Silphidae	*Necrodes surinamensis*	
			Staphylinidae	*Homaeotarsus* sp.	
				Pinophilus sp.	
				Platydracus sp.	
				Quedius sp.	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
			Tenebrionidae	*Blapstinus* sp.	
				Isomira sp.	
				Lobopoda sp.	
				Parasida sp.	
				Platydema sp.	
				Poecilocrypticus formicophilus	
			Trogidae	*Omorgus punctatus*	
				Trox sp.	
				Trox variolatus	
			Zopheridae	*Zopherus nodulosus*	
		Dictyoptera	Blattellidae	*Blattella vaga*	Field cockroach
				Parcoblatta bolliana	Boll's wood cockroach
				Parcoblatta caudelli	Caudell's wood cockroach
				Parcoblatta fulvescens	Fulvous wood cockroach
			Mantidae	*Oligonicella mexicanus*	
				Stagmomantis carolina	
				Stagmomantis sp.	
		Diptera	Asilidae	*Laphria* sp.	
				Leptogaster sp.	
			Ceratopogonidae	*Culicoides* sp.	Biting midge
			Chaoboridae	*Chaoborus americanus*	
				Chaoborus punctipennis	Phantom midge
				Eucorethra sp.	Phantom midge
			Chironomidae	*Ablabesmyia mallochi*	
				Ablabesmyia peleensis	
				Ablabesmyia sp.	Midge
				Chironomus decorus	
				Cladopelma collator	
				Cladotanytarsus sp.	Midge
				Coelotanypus concinnus	
				Coelotanypus tricolor	
				Cricotopus sp.	
				Cryptochironomus fulvus	
				Dicrotendipes modestus	
				Dicrotendipes neomodestus	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Dicrotendipes sp.	Midge
				Dicrotendipes tritomus	
				Djalmabatista pulcher	
				Endochironomus nigricans	
				Glyptotendipes lobiferus	
				Glyptotendipes meridionalis	
				Glyptotendipes sp.	
				Goeldichironomus holoprasinus	
				Kiefferulus dux	
				Labrundinia pilosella	
				Larsia planensis	
				Larsia sp.	Midge
				Nanocladius distinctus	
				Nilothauma sp.	
				Parakiefferiella sp.	
				Paramerina smithae	
				Polypedilum beckae	
				Polypedilum halterale	Midge
				Polypedilum illinoense	Midge
				Polypedilum sp.	Midge
				Polypedilum sulaceps	
				Polypedilum trigonum	
				Procladius bellus	
				Procladius sp.	Midge
				Procladius sublettei	
				Psectrocladius vernalis	
				Pseudochironomus rex	
				Pseudochironomus richardsoni	
				Pseudochironomus sp.	Midge
				Stictochironomus palliatus	
				Tanypus punctipennis	
				Tanypus sp.	Midge
				Tanypus stellatus	
				Tanytarsus mendax	
				Tanytarsus sp.	Midge
				Thienemanniella xena	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Zavreliella marmorata	
			Culicidae	*Aedes vexans*	Vexans mosquito
				Aedes zoosophus	Mosquito
				Anopheles crucians	Mosquito
				Anopheles punctipennis	
				Anopheles quadrimaculatus	Common malaria mosquito
				Anopheles sp.	Mosquito
				Culex erraticus	Mosquito
				Culex salinarius	Mosquito
				Culex sp.	Mosquito
				Culiseta sp.	Mosquito
			Simuliidae	*Simulium* sp.	Blackfly
			Stratiomyidae	*Odontomyia* sp.	Soldier fly
		Ephemeroptera	Baetidae	*Baetis* sp.	Mayfly
				Callibaetis floridanus	
				Callibaetis sp.	Mayfly
			Caenidae	*Caenis latipennis*	
				Caenis punctata	
				Caenis sp.	Mayfly
			Ephemeridae	*Hexagenia limbata*	
				Hexagenia sp.	Mayfly
			Heptageniidae	*Cinygmula* sp.	Mayfly
				Stenonema femoratum	
				Stenonema sp.	Mayfly
			Isonychiidae	*Isonychia* sp.	Mayfly
			Leptohyphidae	*Leptohyphes* sp.	Mayfly
		Hemiptera	Belostomatidae	*Belostoma bakeri*	
			Cicadellidae	*AcerDAG-Aallia* sp.	
				Acinopterus sp.	
				Aphrodes sp.	
				Balclutha abdominalis	
				Chlorotettix sp.	
				Cuerna sp.	
				Macrosteles sp.	
				Prairiana sp.	
				Scaphytopius sp.	
				Stragania sp.	
				Texananus sp.	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Xerophloea sp.	
			Coreidae	*Leptoglossus* sp.	Leaf-footed bugs
			Corixidae	*Corisella* sp.	
				Hesperocorixa sp.	
				Ramphocorixa sp.	
				Sigara sp.	
				Trichocorixa sp.	Water boatmen
			Gelastocoridae	*Gelastocoris oculatus oculatus*	Toad bug
			Gerridae	*Gerris* sp.	Water strider
				Limnoporus sp.	Water strider
				Metrobates sp.	
			Hydrometridae	*Hydrometra australis*	
				Hydrometra sp.	Marsh treader
			Lygaeidae	*Oncopeltus fasciatus*	Large milkweed bug
			Mesoveliidae	*Mesovelia* sp.	Water treader
			Naucoridae	*Limnocoris* sp.	Creeping water bug
			Nepidae	*Ranatra nigra*	
				Ranatra sp.	
				Ranatra texana	
			Notonectidae	*Buenoa* sp.	
				Notonecta sp.	
			Pleidae	*Neoplea* sp.	
			Reduviidae	*Arilus cristatus*	
				Arilus sp.	
				Zelus longipes	
			Thyreocoridae	*Corimelaena* sp.	
			Veliidae	*Microvelia* sp.	Ripple bug
		Hymenoptera	Andrenidae	*Andrena sitiliae*	
				Calliopsis rozeni	
				Pterosarus bancrofti	
				Pterosarus ornatipes	
			Apidae	*Anthophora bomboides*	Digger bee
				Anthophora fedorica	Digger bee
				Apis mellifera	Honey bee
				Ceratina shinnersi	Carpenter bee
				Diadasia rinconis	Common cactus bee
				Melissodes sp.	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
			Formicidae	*Aphaenogaster texana*	
				Brachymyrmex depilis	
				Camponotus americanus	Carpenter ant
				Camponotus herculeanus	
				Camponotus pennsylvanicus	Black carpenter ant
				Crematogaster ashmeadi	
				Crematogaster laeviuscula	
				Crematogaster lineolata	
				Crematogaster minutissima	
				Crematogaster punctulata	
				Dorymyrmex flavus	
				Forelius mccooki	
				Forelius pruinosus	
				Formica pallidefulva	
				Hypoponera opacior	
				Labidus coecus	
				Leptogenys elongata	
				Leptothorax terrigena	
				Monomorium minimum	Little black ant
				Myrmecina americana	
				Neivamyrmex harrisii	
				Neivamyrmex nigrescens	
				Neivamyrmex pilosa	
				Paratrechina faisonensis	
				Paratrechina vividula	
				Pheidole hyatti	
				Pheidole metallescens	
				Pheidole morrisii	
				Pheidole porcula	
				Pheidole sp.	Ants
				Pogonomyrmex barbatus	Red harvester ant
				Solenopsis geminata	Fire ant
				Solenopsis invicta	Red imported fire ant

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Solenopsis molesta	Thief ant
				Solenopsis salina	Fire ant
			Halictidae	*Trachymyrmex septentrionalis*	
				Augochloropsis metallica	
				Halictus tripartitus	
				Lasioglossum bardus	
				Lasioglossum texanus	
				Sphecodes minor	
			Megachilidae	*Heriades carinata*	Mason bee
				Heriades variolosa	Mason bee
				Hoplitis pilosifrons	Mason bee
				Lithurge gibbosa	
				Megachile pugnatus	
			Mutillidae	*Dasymutilla birkmani*	Velvet ant
				Dasymutilla bollii	Velvet ant
				Dasymutilla creusa	Velvet ant
				Dasymutilla electra	Velvet ant
				Dasymutilla gorgon	Velvet ant
				Dasymutilla klugii	Velvet ant
				Dasymutilla melanippe	Velvet ant
				Dasymutilla nitidula	Velvet ant
				Dasymutilla quadriguttata	Velvet ant
				Dasymutilla scaevola	Velvet ant
				Dasymutilla sp.	Velvet ant
				Dasymutilla texanella	Velvet ant
				Dasymutilla vesta	Velvet ant
				Dasymutilla vesta errans	Velvet ant
				Dasymutilla waco	Velvet ant
				Dasymutilla zelaya	Velvet ant
				Ephuta sp.	
				Myrmilloides grandiceps	
				Odontophotopsis sp.	
				Photomorphus (Photomorphina) sp. *1*	
				Photomorphus sp.	
				Pseudomethoca bequaerti	
				Pseudomethoca frigida	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Pseudomethoca propinqua	
				Pseudomethoca simillima	
				Sphaeropthalma (Photopsis) sp. *1*	
				Sphaeropthalma auripilis	
				Sphaeropthalma fasciventris	
				Sphaeropthalma sp.	
				Timulla nicholi	
				Timulla oajaca	
				Timulla ocellaria	
			Sphecidae	*Alysson melleus*	Sand wasp
				Bicyrtes fodiens	
				Cerceris jucunda	
				Cerceris rufopicta	
				Chalybion californicus	Blue mud dauber
				Chalybion zimmermanni	
				Crabro tumidus	
				Gorytes dorothyae	
				Liris argentatus	
				Pluto spangleri	
				Sphex ichneumonea	Great gold digger wasp
				Tachysphex antennatus	
				Tachysphex texana	
			Vespidae	*Polistes apachus*	Paper wasp
				Polistes carolina	Paper wasp
				Polistes fuscata	Paper wasp
				Polistes metricus	Paper wasp
				Vespula maculifrons	Eastern yellowjacket
				Vespula squamosa	Yellowjacket
		Isoptera	Termitidae	*Gnathamitermes tubiformans*	Desert termite
		Lepidoptera	Hesperiidae	*Achalarus lyciades*	
				Amblyscirtes vialis	
				Atalopedes campestris	Field skipper
				Erynnis funeralis	
				Erynnis horatius	Brown dusky wing

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Euphyes vestris	Dun sedge skipper
				Pyrgus communis	Checkered skipper
				Thorybes pylades	Northern cloudy wing
			Lycaenidae	*Callophrys gryneus*	Juniper hairstreak
				Everes comyntas	Tailed blue
				Hemiargus isola	Mexican blue
			Nymphalidae	*Anaea andria*	Goatweed leafwing
				Asterocampa celtis	Hackberry butterfly
				Cercyonis pegala	Wood nymph
				Chlosyne gorgone	Great plains checkerspot
				Danaus gilippus	Queen butterfly
				Danaus plexippus	Monarch butterfly
				Euptoieta claudia	Variegated fritillary
				Junonia coenia	
				Libytheana carinenta	American snout butterfly
				Limenitis archippus	Viceroy
				Phyciodes tharos	Pearl crescent
				Phyciodes vesta	Mequite crescent
				Vanessa atalanta	Red admiral
				Vanessa cardui	Painted lady
				Vanessa virginiensis	American painted lady
			Papilionidae	*Papilio glaucus*	Tiger swallowtail
			Pieridae	*Colias cesonia*	
				Colias eurytheme	Alfalfa caterpillar
				Eurema lisa	
				Eurema nicippe	
				Nathalis iole	
				Phoebis sennae	
				Pontia protodice	
		Neuroptera	Chrysopidae	*Chrysoperla* sp.	
			Hemerobiidae	*Hemerobius* sp.	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
		Odonata	Aeshnidae	*Anax junius*	Common green darner
				Anax sp.	Darner
				Basiaeschna janata	Springtime darner
			Coenagrionidae	*Argia* sp.	Narrow-winged damselflies
				Coenagrion sp.	Bluet
				Enallagma civile	Familiar bluet
				Enallagma sp.	Bluet
			Corduliidae	*Epitheca costalis*	Stripe-winged baskettail
				Epitheca cynosura	Common baskettail
				Epitheca petechialis	Dot-winged baskettail
				Epitheca princeps	Prince baskettail
				Epitheca sp.	Baskettail
			Gomphidae	*Arigomphus lentulus*	Stillwater clubtail
				Phyllogomphoides stigmatus	Four-striped leaftail
				Progomphus sp.	Sanddragons
			Lestidae	*Archilestes grandis*	Great spreadwing
				Lestes disjunctus	Northern spreadwing
				Lestes sp.	Spreadwing
			Libellulidae	*Celithemis elisa*	Calico pennant
				Celithemis eponina	Halloween pennant
				Celithemis fasciata	Banded pennant
				Dythemis fugax	Checkered setwing
				Dythemis velox	Swift setwing
				Erythemis simplicicollis	Eastern pondhawk
				Erthryodiplax umbrata	Band-winged dragonlet
				Libellula luctuosa	Widow skimmer
				Libellula semifasciata	Painted skimmer
				Orthemis ferruginea	Roseate skimmer
				Orthemis sp.	Common skimmer
				Pachydiplax longipennis	Blue dasher
				Perithemis tenera	Eastern amberwing

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Plathemis lydia	Common whitetail
				Sympetrum ambiguum	Blue-faced meadowhawk
				Sympetrum corruptum	Variegated meadowhawk
				Sympetrum sp.	Meadowhawk
				Tramea carolina	Carolina saddlebag
				Tramea onusta	Red saddlebag
			Macromiidae	*Macromia* sp.	Green-eyed skimmer
		Orthoptera	Acrididae	*Ageneotettix deorum*	
				Amblytropidia mysteca	
				Arphia simplex	
				Arphia xanthoptera	
				Boopedon gracile	
				Campylacantha olivacea olivacea	
				Chortophaga viridifasciata	Greenstriped grasshopper
				Dactylotum bicolor	
				Dissosteira carolina	Carolina grasshopper
				Encoptolophus costalis	
				Hadrotettix trifasciatus	
				Hesperotettix speciosa	
				Hesperotettix viridis	
				Hippiscus ocelote	
				Melanoplus angustipennis impiger	
				Melanoplus bispinosus	
				Melanoplus bivittatus	Two-striped grasshopper
				Melanoplus differentialis	Differential grasshopper
				Melanoplus femurrubrum	Redlegged grasshopper
				Melanoplus packardii	Packard grasshopper
				Melanoplus ponderosus	
				Melanoplus sanguinipes vulturnus	Migratory grasshopper
				Melanoplus texanus	
				Mermiria bivittata	
				Opeia obscura	

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
				Orphulella pelidna	
				Schistocerca americana	American grasshopper
				Schistocerca lineata	
				Spharagemon cristatum	
				Spharagemon equale	
				Syrbula admirabilis	
				Trachyrhachys kiowa	
				Trimerotropis pallidipennis	
				Trimerotropis pistrinaria	
				Xanthippus corallipes	
			Gryllidae	*Gryllus personatus*	
				Gryllus texensis	
			Mogoplistidae	*Cycloptilum squamosum*	
			Oecanthidae	*Oecanthus argentinus*	
			Podoscirtidae	*Hapithus agitator*	Restless bush cricket
			Rhaphidophoridae	*Ceuthophilus* sp.	
			Tetrigidae	*Paratettix cucullatus*	Hooded grouse locust
				Tettigidea lateralis	Black-sided grouse locust
			Tettigoniidae	*Arethaea grallator*	
				Conocephalus strictus	Straight-laced meadow grasshopper
				Neoconocephalus robustus	
				Neoconocephalus triops	
				Orchelimum silvaticum	
				Orchelimum vulgare	Common meadow grasshopper
				Pediodectes haldemani	Shield-backed katydid
				Scudderia curvicauda	
				Scudderia furcata	Forktailed bush katydid
			Trigonidiidae	*Allonemobius socius*	
				Eunemobius carolinus	Carolina ground cricket
		Plecoptera	Perlidae	*Anacroneuria* sp.	Stonefly

H.2 Invertebrates

Phylum	Class	Order	Family	Scientific Name	Common Name
			Pteronarcyidae	*Pteronarcys* sp.	Net-spinning caddisfly
		Trichoptera	Hydropsychidae	*Cheumatopsyche* sp.	Net-spinning caddisfly
			Hydroptilidae	*Ochrotrichia* sp.	Microcaddisfly
			Leptoceridae	*Ceraclea maculata*	
				Oecetis inconspicua	
				Triaenodes flavescens	
				Triaenodes ignitus	
				Triaenodes injustus	
				Triaenodes tardus	
			Philopotamidae	*Chimarra obscura*	
				Chimarra sp.	Fingernet caddisfly
			Polycentropodidae	*Cernotina calcea*	
Mollusca					
	Bivalvia: Clams, Mussels, and Allies				
		Unionoida	Unionidae	*Pyganodon grandis*	Giant floater
				Toxolasma parvus	Lilliput
				Uniomerus tetralasmus	Pondhorn
				Utterbackia imbecillis	Paper pondshell
		Veneroida	Pisidiidae	*Musculium partumeium*	Swamp fingernailclam
				Musculium securis	Pond fingernail clam
				Musculium transversum	Long fingernailclam
				Pisidium sp.	Peaclam
	Gastropoda: Snails and Allies				
		Basommatophora	Physidae	*Physella* sp.	Snail
			Planorbidae	*Gyraulus circumstriatus*	Disc gyro
				Gyraulus sp.	Gyro
				Planorbella trivolvis	Marsh rams-horn
	Malacostraca: Shrimps and Allies				
		Amphipoda	Hyalellidae	*Hyalella azteca*	
				Hyalella sp.	
		Decapoda	Cambaridae	*Cambarellus* sp.	Crayfish
			Palaemonidae	*Palaemonetes* sp.	Grass shrimp

H.3 Fish

Class/Order	Family	Scientific Name	Common Name
Cypriniformes: Minnows and Allies			
	Cyprinidae	*Cyprinella lutrensis*	Red shiner
		Cyprinella venusta	Blacktail shiner
		Notemigonus crysoleucas	Golden shiner
		Pimephales vigilax	Bullhead minnow
Cyprinodontiformes: Pupfish and Allies			
	Fundulidae	*Fundulus notatus*	Blackstripe topminnow
	Poecilidae	*Gambusia affinis*	Mosquitofish
Perciformes: Perch and Allies			
	Centrarchidae	*Chaenobryttus gulosus*	Warmouth
		Lepomis auritus	Redbreast sunfish
		Lepomis cyanellus	Green sunfish
		Lepomis humilis	Orangespotted sunfish
		Lepomis macrochirus	Bluegill
		Lepomis megalotis	Longear sunfish
		Lepomis microlophus	Redear sunfish
		Micropterus salmoides	Largemouth bass
		Pomoxis annularis	White crappie
	Sciaenidae	*Aplodinotus grunniens*	Freshwater drum
Siluriformes: Catfish			
	Ictaluridae	*Ameiurus melas*	Black bullhead
		Ameiurus natalis	Yellow bullhead
		Ictalurus punctatus	Channel catfish

H.4 Amphibians

Class/Order	Family	Scientific Name	Common Name
Anura: Amphibians			
	Bufonidae	*Bufo debilis debilis*	Eastern green toad
		Bufo punctatus	Red spotted toad
		Bufo speciosus	Texas toad
		Bufo valliceps	Gulf coast toad
		Bufo woodhousii woodhousii	Woodhouse's toad
	Hylidae	*Acris crepitans*	Cricket frog
		Acris crepitans blanchardi	Blanchard's cricket frog
		Acris crepitans crepitans	Northern cricket frog
		Hyla versicolor	Gray treefrog
		Pseudacris clarkii	Spotted chorus frog
		Pseudacris streckeri streckeri	Strecker's chorus frog
	Microhylidae	*Gastrophryne carolinensis*	Eastern narrowmouth toad
		Gastrophyrne olivacea	Great plains narrowmouth toad
	Ranidae	*Rana blairi*	Plains leopard frog
		Rana catesbeiana	Bullfrog
		Rana species	True frog
		Rana sphenocephala	Southern leopard frog

H.5 Reptiles

Class/Order	Family	Scientific Name	Common Name
Squamata: Reptiles			
	Colubridae	*Coluber constrictor flaviventris*	Eastern yellowbelly racer
		Diadophis punctatus arnyi	Prairie ringneck snake
		Elaphe guttata emoryi	Great plains rat snake
		Elaphe obsoleta lindheimerii	Texas rat snake
		Lampropeltis getula splendida	Desert kingsnake
		Masticophis flagellum	Coachwhip
		Masticophis flagellum testaceus	Western coachwhip
		Nerodia erythrogaster	Plain-bellied water snake
		Nerodia erythrogaster transversa	Blotched water snake
		Nerodia rhombifer rhombifer	Diamondback water snake
		Nerodia sp.	Water snake
		Opheodrys aestivus	Rough green snake
		Sonora semiannulata	Ground snake
		Tantilla gracilis	Flat-headed snake
		Thamnophis proximus rubrilineatus	Redstripe ribbon snake
		Thamnophis sirtalis	Common garter snake
		Virginia striatula	Rough earth snake
	Iguanidae	*Crotaphytus collaris collaris*	Eastern collared lizard
	Phrynosomatidae	*Phyrnosoma cornutum*	Texas horned lizard
		Sceleporus olivaceus	Texas spiny lizard
		Sceloporus undulatus consobrinus	Southern prairie lizard
	Scincidae	*Eumeces septentrionalis obtusirostris*	Southern prairie skink
		Eumeces tetragrammus brevilineatus	Short-lined skink
		Scincella lateralis	Ground skink
	Teiidae	*Cnemidophorus gularis gularis*	Texas spotted whiptail
		Cnemidophorus sp.	Whiptail
	Viperidae	*Agkistrodon contortrix*	Copperhead
		Agkistrodon contortrix laticinctus	Broad-banded copperhead
		Agkistrodon piscivorus	Cottonmouth
		Agkistrodon piscivorus leucostoma	Western cottonmouth
		Crotalus atrox	Western diamondback rattlesnake
Testudines: Turtles			
	Chelydridae	*Chelydra serpentina*	Snapping turtle
	Emydidae	*Pseudemys texana*	Texas river cooter
		Trachemys scripta	Red-eared slider
		Trachemys scripta elegans	Red-eared slider

H.6 Birds

Class/Order	Family	Scientific Name	Common Name
Anseriformes: Ducks and Allies			
	Anatidae		
		Anas acuta	Northern pintail
		Anas americana	American widgeon
		Anas discors	Blue-winged teal
		Anas platyrhynchos	Mallard
		Aythya affinis	Lesser scaup
		Aythya americana	Redhead
		Aythya collaris	Ring-necked duck
		Aythya valisineria	Canvasback
		Branta canadensis	Canada goose
		Bucephala albeola	Bufflehead
		Lophodytes cucullatus	Hooded merganser
Apodiformes: Hummingbirds			
	Trochilidae	*Archilochus alexandri*	Black-chinned hummingbird
		Archilochus colubris	Ruby-throated hummingbird
Ciconiiformes: Herons and Allies			
	Accipitridae	*Accipiter cooperii*	Cooper's hawk
		Buteo jamaicensis	Red-tailed hawk
		Buteo lineatus	Red-shouldered hawk
		Circus cyaneus	Northern harrier
		Ictinia mississippiensis	Mississippi kite
	Ardeidae	*Ardea alba*	Great egret
		Ardea herodias	Great blue heron
		Bubulcus ibis	Cattle egret
		Butorides virescens	Green heron
		Egretta caerulea	Little blue heron
	Charadriidae	*Charadrius vociferus*	Killdeer
	Ciconiidae	*Cathartes aura*	Turkey vulture
		Coragyps atratus	Black vulture
	Falconidae	*Falco peregrinus*	Peregrine falcon
		Falco sparverius	American kestrel
	Pelecanidae	*Pelecanus erythrorhynchos*	American white pelican
	Phalacrocoracidae	*Phalacrocorax auritus*	Double-crested cormorant
	Podicipedidae	*Podilymbus podiceps*	Pied-billed grebe
	Scolopacidae	*Bartramia longicauda*	Upland sandpiper
Columbiformes: Doves and Pigeons			
	Columbidae	*Streptopelia decaocto*	Eurasian collared-dove
		Zenaida asiatica	White-winged dove

H.6 Birds

Class/Order	Family	Scientific Name	Common Name
		Zenaida macroura	Mourning dove
Coraciiformes: Kingfishers and Allies			
	Alcedinidae	*Ceryle alcyon*	Belted kingfisher
Cuculiformes: Cuckoos and Allies			
	Cucilidae	*Coccyzus americanus*	Yellow-billed cuckoo
		Geococcyx californianus	Greater roadrunner
Galliformes: Fowl			
	Odontophoridae	*Colinus virginianus*	Northern bobwhite
	Phasianidae	*Meleagris gallopavo*	Wild turkey
Passeriformes: Songbirds and Allies			
	Alaudidae	*Eremophila alpestris*	Horned lark
	Bombycillidae	*Bombycilla cedrorum*	Cedar waxwing
	Cardinalidae	*Cardinalis cardinalis*	Northern cardinal
		Passerina caerulea	Blue grosbeak
		Passerina ciris	Painted bunting
		Passerina cyanea	Indigo bunting
		Spiza americana	Dickcissel
	Certhiidae	*Polioptila caerulea*	Blue-gray gnatcatcher
	Corvidae	*Corvus brachyrhynchos*	American crow
		Corvus corax	Common raven
		Cyanocitta cristata	Blue jay
	Emberizidae	*Aimophila ruficeps*	Rufous-crowned sparrow
		Ammodramus leconteii	LeConte's sparrow
		Ammodramus savannarum	Grasshopper sparrow
		Calcarius ornatus	Chestnut-collared longspur
		Chondestes grammacus	Lark sparrow
		Junco hyemalis	Dark-eyed junco
		Melospiza lincolnii	Lincoln's sparrow
		Melospiza melodia	Song sparrow
		Passerculus sandwichensis	Savannah sparrow
		Passerella iliaca	Fox sparrow
		Pipilo erythrophthalmus	Eastern towhee
		Pipilo maculatus	Spotted towhee
		Pooecetes gramineus	Vesper sparrow
		Spizella passerina	Chipping sparrow
		Spizella pusilla	Field sparrow
		Zonotrichia albicollis	White-throated sparrow
		Zonotrichia leucophrys	White-crowned sparrow
		Zonotrichia querula	Harris' sparrow

H.6 Birds

Class/Order	Family	Scientific Name	Common Name
	Fringillidae	*Carduelis psaltria*	Lesser goldfinch
		Carduelis tristis	American goldfinch
		Carpodacus mexicanus	House finch
	Hirundinidae	*Hirundo rustica*	Barn swallow
		Petrochelidon pyrrhonota	Cliff swallow
		Progne subis	Purple martin
	Icteridae	*Agelaius phoeniceus*	Red-winged blackbird
		Molothrus ater	Brown-headed cowbird
		Quiscalus quiscula	Common grackle
		Sturnella magna	Eastern meadowlark
		Sturnella sp.	Meadowlark
	Laniidae	*Lanius ludovicianus*	Loggerhead shrike
	Mimidae	*Mimus polyglottos*	Northern mockingbird
	Paridae	*Baeolophus atricristatus*	Black-crested titmouse
		Baeolophus bicolor	Tufted titmouse
		Poecile carolinensis	Carolina chickadee
	Parulidae	*Dendroica coronata*	Yellow-rumped warbler
		Vermivora celata	Orange-crowned warbler
	Passeridae	*Passer domesticus*	House sparrow
	Regulidae	*Regulus calendula*	Ruby-crowned kinglet
		Regulus satrapa	Golden-crowned kinglet
	Sittidae	*Sitta canadensis*	Red-breasted nuthatch
		Sitta carolinensis	White-breasted nuthatch
	Sturnidae	*Sturnus vulgaris*	European starling
	Thraupidae	*Piranga rubra*	Summer tanager
	Troglodytidae	*Thryomanes bewickii*	Bewick's wren
		Thryothorus ludovicianus	Carolina wren
		Troglodytes aedon	House wren
	Turdidae	*Catharus guttatus*	Hermit thrush
		Sialia sialis	Eastern bluebird
		Turdus migratorius	American robin
	Tyrannidae	*Myiarchus crinitus*	Great crested flycatcher
		Sayornis phoebe	Eastern phoebe
		Tyrannus forficatus	Scissor-tailed flycatcher
		Tyrannus tyrannus	Eastern kingbird
		Tyrannus verticalis	Western kingbird
	Vireonidae	*Vireo bellii*	Bell’s vireo
		Vireo flavifrons	Yellow-throated vireo
		Vireo gilvus	Warbling vireo

H.6 Birds

Class/Order	Family	Scientific Name	Common Name
		Vireo griseus	White-eyed vireo
		Vireo olivaceus	Red-eyed vireo
Piciformes: Woodpeckers and Allies			
	Picidae	*Colaptes auratus*	Northern flicker
		Melanerpes carolinus	Red-bellied woodpecker
		Picoides pubescens	Downy woodpecker
		Picoides scalaris	Ladder-backed woodpecker
		Picoides villosus	Hairy woodpecker
		Sphyrapicus varius	Yellow-bellied sapsucker
Strigiformes: Owls			
	Strigidae	*Bubo virginianus*	Great horned owl
		Otus asio	Eastern screech-owl
		Strix varia	Barred owl
	Tytonidae	*Tyto alba*	Barn owl

H.7 Mammals

Class/Order	Family	Scientific Name	Common Name
Artiodactyla: Deer and Allies			
	Cervidae	*Odocoileus virginianus*	White-tailed deer
	Suidae	*Sus scrofa*	Feral hog
Carnivora: Carnivores			
	Canidae	*Canis latrans*	Coyote
		Urocyon cinereoargenteus	Gray fox
	Felidae	*Lynx rufus*	Bobcat
		Puma concolor	Mountail lion
	Mephitidae	*Mephitis mephitis*	Striped skunk
	Procyonidae	*Procyon lotor*	Racoon
Chiroptera: Bats			
	Molossidae	*Tadarida brasiliensis*	Brazilian free-tail bat
	Vespertilionidae	*Lasiurus borealis*	Eastern red bat
		Lasiurus sp.	Hairy-tailed bats
		Nycticeius humeralis	Evening bat
Didelphimorphia			
	Didelphidae	*Didelphis virginiana*	Opossum
Insectivora: Shrews and Allies			
	Soricidae	*Cryptotis parva*	Least shrew
Lagomorpha: Rabbits and Allies			
	Leporidae	*Lepus californicus*	Black-tailed jackrabbit
		Sylvilagus floridanus	Eastern cottontail
Rodentia: Rodents			
	Castoridae	*Castor canadensis*	American beaver
	Geomyidae	*Geomys bursarius*	Plains pocket gopher
	Heteromyidae	*Chaetodipus hispidus*	Hispid pocket mouse
	Muridae	*Baiomys taylori*	Nothern pygmy mouse
		Mus musculus	House mouse
		Neotoma micropus	Southern Plains woodrat
		Peromyscus attwateri	Texas mouse
		Peromyscus boylii	Brush mouse
		Peromyscus leucopus	White-footed mouse
		Peromyscus maniculatus	Deer mouse
		Peromyscus sp.	Deer mouse
		Rattus norvegicus	Norway rat
		Rattus rattus	Roof rat
		Reithrodontomys fulvescens	Fulvous harvest mouse
		Sigmodon hispidus	Hispid cotton rat
	Sciuridae	*Sciurus niger*	Fox squirrel

H.7 Mammals

Class/Order	Family	Scientific Name	Common Name
Xenarthra: Armadillos	Talpidae	*Scalopus aquaticus*	Eastern mole
	Dasypodidae	*Dasypus novemcinctus*	Nine-banded armadillo

Appendix I. Summary of Reports for Fort Wolters

This document provides a summary of all reports available for this training site from the Natural Resources Program. This summary is current as of 9 March 2009.

I.1 Citations in Chronological Order

Avakian and Wermund 1994; Farquhar, Maresh et al. 1996; Linam, Seaman et al. 1996; Wolfe, Liu et al. 1996; Farquhar, Baker et al. 1999; Gravatt, Martel et al. 1999; Best, Barr et al. 2001; Clayton and Reinecke 2003; Ryberg and Fitzgerald 2003; Cook 2004; Cook 2004; Quayle, O'Kennon et al. 2004; Thies 2004; Hunter 2005; Kennedy, Jackson et al. 2005; Neudorf 2005; Reinecke, Schneider et al. 2005; Sosebee, Fish et al. 2005; Cook and Cook 2006; Leipnik 2006; Ammerman, Dowler et al. 2007; Hendrickson and Cohen 2007; Bethune and Walsh 2008; Breeden 2008; Cox 2008; Perry 2008; Pogue, Harbison et al. 2008; Radke, Wester et al. 2008

I.2 Reports with Abstracts

Ammerman LK, Dowler RC, et al. 2007. Bat diversity and activity: a comparison among Texas Army National Guard sites. San Angelo (TX): Angelo State University.

Texas Army National Guard training sites (Camp Maxey, Fort Wolters, Camp Swift, Camp Bowie, and Camp Mabry) were surveyed for bats using mist nets and ANABAT units during spring, summer, and fall seasons from October 2005-November 2006. A total of 7 species were documented across all 5 sites. Based on mist net captures, Camp Maxey had the highest species diversity (5 species documented) whereas Camp Swift and Camp Mabry had the lowest (a single species was documented at each site). There were 2 county records for Lamar County (Camp Maxey) and 1 county record for Parker County (Fort Wolters). Species occurrence was also recorded at each site with acoustic monitoring. Canonical correspondence analysis of acoustic data revealed no impact due to training on the bat communities. Conservation of wetlands, open water, woodlands, and dead snags are recommended for maintaining bat populations.

Avakian AJ, Wermund EG. 1994. Physical environment of Fort Wolters military reservation, Parker and Palo Pinto counties, Texas. Austin (TX): Bureau of Economic Geology, University of Texas at Austin.

This report summarizes the physical environment (e.g. wind, temperature, rainfall, soils, geology, hydrology) of Fort Wolters and available data in 1993. The principal impacts to the environment at Fort Wolters are the network of roads and trails and the numerous quarries. Disturbance on steep slopes and in wet, clayey soils should be particularly avoided. Minimizing soil erosion and vegetation loss should the primary objectives for maintaining overall environmental quality.

Best RL, Barr CL, et al. 2001. Management practices for red imported fire ant populations on Texas Army National Guard grounds. College Station (TX): Texas Cooperative Extension, Texas A&M University System.

Three Texas Army National Guard (TXARNG) training camps were monitored for red imported fire ant infestation: Camp Swift (Bastrop), Camp Bowie (Brownwood), and Fort Wolters (Mineral Wells). The cantonment area and firing ranges at each training camp were evaluated for fire ant activity and TXARNG personnel were interviewed for information regarding fire ant encounters and/or problems associated with fire ant infestations. Method demonstrations were conducted on the firing ranges to determine the most successful management program for controlling red imported fire ants.

Bethune K, Walsh M. 2008. Stormwater Pollution Prevention Plan (SWPPP) guidance manual for Fort Wolters. Austin (TX): Watershed Concepts.
The purpose of this guidance manual is to provide familiarity with the National Pollutant Discharge Elimination System (NPDES) and the Texas Pollutant Discharge Elimination System (TPDES) as applicable to construction activities, aid in determining the need for a Storm Water Pollution Prevention Plan (SWPPP), and provide additional guidance in obtaining the General Permit for construction activities. Under the Construction General Permit TXR150000, construction activities from which runoff goes into or adjacent to any waters of the United States are regulated (and therefore the General Permit TXR150000 is required) according to the area of land disturbed. This document is specifically designed for those persons responsible for obtaining the General Permit for Construction Activities (TXR150000) for sites less than 5 acres. It provides the user with guidance on selecting control measures that ensure compliance with the General Permit; however, it is not intended as a design manual for structural stormwater management control measures.

Breeden JB. 2008. Game survey and monitoring plan for Camp Bowie, Fort Wolters, and Camp Maxey. Stephenville (TX): Tarleton State University.
This project was conducted to establish a long term game population survey and monitoring protocol in order to develop an effective wildlife management plan and monitor population trends. With the exception of Camp Maxey, all deer surveys should be conducted during August or early September. Due to thick vegetation at Camp Maxey, it would be helpful to conduct the deer survey during winter. Visibility measurements should be taken every 3-4 years. Remote cameras could be used as a reliable alternative to spotlight surveys, especially in areas of thick vegetative cover. This would eliminate the concerns of reduced detectability on Fort Wolters and Camp Maxey as well as reduce the travel to each site. However, this may only be practical on small sites. Incidental sighting data can also be helpful in monitoring the population. It seems unlikely that the observed number of wild turkeys was representative of the study sites. Limited time and the large area of the sites made locating wild turkey roosts more difficult than anticipated.

Clayton L, Reinecke R. 2003. Invasive plant species survey Fort Wolters, Texas. Plano (TX): GeoMarine.
An invasive plant species survey was conducted at Fort Wolters on 7-11 April 2003 to establish baseline data and to prioritize species and areas of control and restoration. Two invasive species were identified, King Ranch Bluestem and Johnsongrass. Johnsongrass was determined to be the most problematic. Concentrated areas of invasive species were delineated on aerial photographs when observed.

Cook JL. 2004. Chemical control of red imported fire ants at TXARNG training sites. Huntsville (TX): Sam Houston State University.
First, all 3 types of bait (methoprene, abamectin, and mixed) provide control of fire ants. Second, treatments as low as 1 lb./acre give good control. Third, there are occasional failures of treatment regardless of rate and bait. Fourth, fire ants are the first recolonizers of an area that has been treated. Finally, these treatments do eliminate native ants in the treatment area as well as fire ants. More than 120 mounds/acre require treatment at the maximum rate, although in most cases half the label rate is sufficient to achieve control. Within 6 months, the population typically occurs at half original rate. Within 12 months, the population typically occurs at original rate. If treatment is stopped on the ranges that have been treated for the last 5 years, fire ants will likely return to the high infestation rates prior to treatment. The biological controls currently being released may reduce infestation rate over the long-term and eventually result in less need for treatment, but that may take 5-20 years to be effective.

Cook JL. 2004. Selective application of chemical baits for the management of *Solenopsis invicta* at TXARNG training sites October 2003-September 2004. Huntsville (TX): Sam Houston State University.
Camp Bowie results indicate that fire ants do not occur more than 100 m from a stock tank. Stock tanks that have permanent water have almost solid fire ant populations, while stock tanks with intermittent water have some native species and lower densities of fire ants. Fort Wolters results indicate fire ants over the entire installation with the highest densities on the ranges and along Rock Creek. Camp Swift results indicate 49 species of velvet ants at Camp Swift, higher diversity than anywhere else in the country. In addition, two master's thesis projects are described that are being conducted at Camp Swift (but not funded by the Texas National Guard) in conjunction with the fire ant control project.

Cook JL, Cook TJ. 2006. Release and attempt to establish natural enemies of the red imported fire ant 2004-2006. Huntsville (TX): Sam Houston State University.
At least 1 species of phorid fly and the microsporidian *Thelohania solenopsae* are both established at Camp Maxey. There are several notable aspects associated with their establishment. First, it appears that *T. solenopsae* has some effect on the health of *S. invicta*, but the extent of its negative effect remains unquantifiable, partially because the exact transmission mechanism is unknown. Second, it will be some time until it is certain whether phorid flies can become established at Camp Maxey. They have established for at least a couple of generations, but it remains to be seen if they can withstand severe draught or extreme cold, both of which occur occasionally at Camp Maxey. Third, it is will be necessary to determine what effect each of these natural enemies, or a combination of the 2, have on the populations of fire ants at Camp Maxey. This cannot be determined at this time because populations of the phorid flies are not large enough to have any significant effect. We recommend that a study be conducted in 2 or 3 years to address these questions. At that time, it would be interesting to re-survey ant populations and make comparisons with the data collected by Will Godwin. This data can not only give indications of effects of the natural enemies but also can contribute to the status and trends of these ecologically important arthropods. The results of our project are encouraging, but it is too early to predict that it will be an effective management of *S. invicta* populations.

Cox LW. 2008. TMD training site deer survey results—fall 2008. Austin (TX): Cox McLain Environmental Consulting.
White-tailed deer surveys were completed at 4 TMD training sites (Camp Bowie, Camp Maxey, Camp Swift, and Fort Wolters) September/October 2008. Each survey occurred over 4 nights and were consistent with TPWD survey protocols. Incidental sightings of other mammals were recorded as well.

Farquhar CC, Baker CA, et al. 1999. Land condition-trend analysis: initial inventory and plot establishment, Fort Wolters, Parker County, Texas. Austin (TX): Wildlife Diversity Program, TPWD.
In 1999, the TPWD was contracted to conduct a Land Condition-Trend Analysis program at Fort Wolters. The purpose was to establish a permanent database for inventorying and monitoring landscape features, as well as vegetational and wildlife communities, in order to track and examine associated land use practices and installation activities. This report summarizes 12 core plots and 3 special-use plots. The special-use plots were designed to monitor succession in an oak/juniper woodland following clearing.

Farquhar CC, Maresh J, et al. 1996. Biological inventory of Texas Army National Guard training areas. Austin (TX): Resource Protection Division, TPWD.
These inventories focused on bird and plant surveys with incidental observations of herptiles and mammals over a 2-year period on several locations. The section for each facility addressed key areas to further survey, key practices, or land use that were damaging the resources and recommendations for management.

Gravatt DA, Martel D, et al. 1999. Delineation of wetlands and other regulated waters: Fort Wolters, waterways experiment station. U.S. Army Engineer Research and Development.
The purpose of this planning-level wetland project was to locate and map waters of the United States regulated by the USACE under Section 404 of the Clean Water Act. Fort Wolters has approximately 26 acres of regulated water bodies, including streams, ponds, lakes, and wetlands.

Hendrickson D, Cohen A. 2007. General fish surveys on selected Texas National Guard properties. Austin (TX): University of Texas at Austin.
A fish survey was conducted on 5 Texas Military Forces facilities in Texas including: Camp Mabry (Travis County), Camp Swift (Bastrop County), Camp Bowie (Brown County), Camp Maxey (Lamar County), and Fort Wolters (Parker County). This is the second fish survey completed for the properties. During the course of this survey, 39 species were collected representing 10 families compared to 27 species in 8 families in 1995. New records include *Aplodinotus grunniens*, *Carpiodes carpio*, *Cyprinus carpio*, *Esox niger*, *Etheostoma parvipinne*, *Lepisosteus oculatus*, *Minytrema melanops*, *Notropis texanus*, *Percina macrolepida*, *Percina carbonaria*, *Pomoxis nigromaculatus*, and *Pylodictis olivaris*. Species we were not able to re-collect include *Astyanax mexicanus* and *Pimephales promelas*. Three species were widely distributed and collected at every base: *Micropterus salmoides*, *Lepomis macrochirus*, and *Gambusia affinis*. The most species-rich family was Centrarchidae, and within that, *Lepomis* was the most species-rich genus with 8 species. Consistent amongst the 5 bases, diversity ranked highest in perennial streams, lowest in lentic habitats, and intermediate in intermittent streams.

Hunter B. 2005. Vegetation classification of Fort Wolters and Camp Maxey. Denton (TX): University of North Texas.
Summary of methods used to develop vegetation community land cover GIS layers for Camp Maxey and Fort Wolters in 2004.

Kennedy JH, Jackson T, et al. 2005. Fort Wolters, Parker County, Texas - arthropoda biodiversity study 2002-2004. Denton (TX): University of North Texas.
The main objective of this project was to inventory the Arthropoda, with an emphasis on insects, at Fort Wolters from October 2002 through August 2004. Arthropods are the most diverse group of animals on the facility and important contributors to ecosystem functioning. Understanding the biodiversity of the arthropods is a critical consideration in the development of management policies. This report makes no pretense that it is a complete survey, which would require years of collection and the efforts of hundreds of taxonomic specialists. Given the state of taxonomy for many groups, even with these efforts, a complete survey may never be completed. It is the goal of this report to provide baseline information for future studies and management decisions. Results indicate 363 invertebrate species in 138 families and 14 orders. A comprehensive list of taxa collected is given in Appendix Table 2. Each taxonomic group identified during the study is discussed in the report. General recommendations include continued management for healthy ecosystems, development of a terrestrial Index of Biotic Integrity for Fort Wolters, continuation of restoration efforts, protection of native bees, and monitoring of mosquitoes.

Leipnik MR. 2006. Baseline water quality monitoring project for Texas Army National Guard training areas. Huntsville (TX): Sam Houston State University.
This report summarizes the results of a baseline water quality monitoring project conducted on behalf of the Texas Army National Guard on 4 training areas (Camp Swift, Camp Maxey, Camp Bowie, and Fort Wolters) by Environmental Analytical Lab at Sam Houston State University in Huntsville, Texas. The results are from field data and from analysis of aqueous samples collected at 13 water monitoring locations across the 4 training areas. The testing and sampling were conducted over a 2-year period starting in February 2004 and continuing through March of 2006. In total, 7 rounds of visits were made during the Spring, Summer, Fall, and Winter Quarters respectively of each of the years. Most sites were sampled both with a Hydrolab Corporation model 4A water quality probe and with grab surface water samples. These samples were later subjected to detailed laboratory analysis at the TRIES Environmental Analytical Lab for a wide range of naturally occurring constituents and potentially present anthropogenic contaminants. The field results did not indicate any abnormal values, with the exception that the turbidity sensor on several occasions (as noted in the field results database) failed to function. The analytical lab results indicated generally very good water quality in all sampled streams, ponds, tanks, and lakes. The exceptions were detected in the first round of sampling for the upstream and to a lesser extent for the downstream portions of the stream draining from the rendering plant located adjacent to Camp Swift.

Linam GW, Seaman JR, et al. 1996. Aquatic survey results from seven Texas National Guard training installations. Austin (TX): Resource Protection Division, TPWD.
An aquatic survey was conducted in 1996 at Camp Barkley, Camp Bowie, Camp Mabry, Camp Maxey, Camp Swift, and Fort Wolters. This study analyzed physiochemical properties, habitat, contaminants, benthic macroinvertebrate, and fish.

Neudorf DLH. 2005. An inventory of birds at the Texas Army National Guard training site at Fort Wolters. Huntsville (TX): Sam Houston State University.
The purpose of this study was to provide an updated and comprehensive inventory of bird species occurring on the Fort Wolters training site. Species abundance, richness, and diversity were compared among habitat types and seasonal patterns were examined. The ultimate goal was to provide data on bird distributions that may be useful for future land use and management decisions at Fort Wolters. Ninety-three species representing 4,433 individuals were detected over the entire survey period. A diverse array of taxa including 13 orders and 38 families were observed. Species richness varied over the 12 months of the survey from 27 species detected in December 2003 to 37 species detected in June 2005. The northern bobwhite, a permanent resident, was detected frequently during the spring and summer. Fort Wolters supports a diverse array of avian species. Current land use practices at Fort Wolters seem to have minimal impact on avian communities. Future work should involve regular monitoring for the endangered black-capped vireo and golden-cheeked warbler as these species are potential breeders at the site.

Perry G. 2008. Horned lizard annual progress report for 2007. Lubbock (TX): Texas Tech University.
This reports sums up the field work conducted during 2007, primarily on TMD facilities. We located 12 adult horned lizards at Camp Bowie, and these were divided into 3 geographic clusters separated by 0.5 km or more. In addition, we located 1 nest site and 40 hatchlings emerging from at least 3 clutches. Camp Bowie adults were considerably smaller than those seen at our reference site near Post, Texas. This is counter to the pattern predicted by climate and latitude, and we do not yet know if it represents an actual characteristic of the population or a byproduct of the anomalously wet spring of 2007. Of these adults, 6 were large enough to radiotrack.

Pogue DW, Harbison LA, et al. 2008. Inventory of the amphibians, reptiles, and mammals of Fort Wolters, Texas Army National Guard training site (2006-2007). Tyler (TX): University of Texas at Tyler.

Surveys of the amphibians, reptiles, and mammals of Fort Wolters were conducted from September 2006 to October of 2007. Amphibians were surveyed by visual searches, trapping, or identified by calls. Ten species (all anurans) were recorded in the 14-month study period. The northern cricket frog was the most abundant anuran surveyed. Reptiles were surveyed by time-constrained searches and through incidental observations. Ten species of reptiles were recorded (1 turtle, 2 lizards, and 7 snakes). The western diamondback rattlesnake was the most frequently encountered snake species, and the spotted whiptail was the most frequently observed lizard species. The red-eared slider was the only species of turtle observed, and it was the most abundant reptile species encountered during the surveys. Mammals were surveyed using several collection techniques. Sherman and Tomahawk traps were used in addition to time constrained walking and driving searches. Incidental observations of mammals were recorded. Digital CamTrakker passive infrared cameras were employed during the study to observe more secretive and/or nocturnal species, such as the mountain lion. Eighteen species of mammals were recorded during the 14 month study. The most abundant mammal encountered was the white-tailed deer. The most frequently encountered medium-sized mammal was the raccoon. The most abundant small mammals were the Texas mouse and the hispid cotton rat. No mountain lions were encountered; however, mountain lion tracks were observed near 1 of the infrared camera locations. No new species records were added to the inventory list at Fort Wolters as a result of this study. Future surveys of mammals, amphibians, and reptiles should include additional sampling techniques not employed in this study (e.g., cover boards, turtle trapping, etc.). Also, more sampling targeting individual species could be conducted. Also, more intensive sampling of aquatic systems should be conducted at specific times that correspond to life history of particular species (e.g., pond breeding salamanders). It is our recommendation that the installation continue to be managed as a mosaic of habitats to maximize vertebrate diversity.

Quayle J, O'Kennon RJ, et al. 2004. Botanical survey of Fort Wolters, Parker County.

The objectives of the Fort Wolters flora survey were to thoroughly inventory rare native or naturalized flora, including wetland species, and to determine if any endangered or species of special concern were present. Fort Wolters is made up of 6 general vegetation types, and each was surveyed: Ashe juniper/post oak woodlands, post oak/blackjack oak woodlands, little bluestem/Indiangrass prairie, American elm/hackberry forests, permanent and ephemeral ponds and streams, and developed and disturbed areas. A total of 148 new, undocumented regional county records for Palo Pinto and Parker Counties were recorded. Collections were made for 360 of the 455 total species recorded. The document includes a list of noteworthy county records and rare or frequent species known from the region but not encountered. No species of federal or state concern were encountered during the survey. Several areas at Fort Wolters were designated as "botanically interesting" due to either relatively intact plant communities or interesting microhabitats. The author recommends management techniques, such as invasive plant management, prescribed fire, and the curtailing of certain mechanized disturbances, to allow the plant communities to persist.

Radke NJ, Wester AD, et al. 2008. Short-term effects of prescribed fire on lizards in mesquite-Ashe juniper vegetation in central Texas. Appl Herpetol. 5:281-292.

Prescribed fire is a common land management tool used to reduce undesirable shrubs, improve forage quality, and enhance wildlife habitat for game species. However, it also has impacts on nongame species. We examined whether a prescribed fire would affect the abundance of lizards and invertebrates in central Texas. In February 2004, 4 sites were treated with low-intensity prescribed fires; 4 adjacent non-burned sites served as controls. Vegetation structure (litter depth,

percent canopy cover, visual obstruction) and foliar cover were recorded prior to and seasonally following the burn. Lizards and potential invertebrate prey were collected from all plots between March and August 2004 (152 traps, 5,908 trap nights). Lizard numbers were not significantly ($P > 0.312$) affected by the fire, nor were their potential prey or habitat greatly affected. Burning reduced numbers of Homoptera ($P < 0.031$), and Diptera were more abundant in burned plots in May ($P < 0.002$), but no other effects were detected ($P > 0.05$ for all other taxa). Burning did not affect vegetation structure ($P > 0.25$ for all measures); however, foliar cover of Texas wintergrass was lower in burned plots in March but recovered to non-burned levels by May. Our results suggest that small-scale, low-intensity fires have minimal impact on central Texas lizards, the vegetation structure of their habitat, or the invertebrates of their diet.

Reinecke R, Schneider RL, et al. 2005. Watershed assessment of Fort Wolters, Texas, including wetland and other waters, erosion features, and watershed health. Baton Rouge (LA): Gulf South Research Corporation and Integrated Environmental Solutions, Inc.

This report documents an evaluation of watersheds, waters, and erosion features at Fort Wolters. The wetland and other water evaluation identified 90 water features totaling approximately 35 acres. There are 61 wetlands totaling approximately 24.0 acres delineated from hydrology and hydrophytic vegetation. The other waters (29 features totaling approximately 11.0 acres) were delineated based on the ordinary high water mark. There are approximately 153,624 linear feet of creeks or stream bed that are either providing drainage through Fort Wolters or originate with headwaters on Fort Wolters. There were 124 erosion features (totaling approximately 141.4 acres) investigated throughout Fort Wolters. These erosion features were a result of excavations (i.e., borrow pits), mass grading (i.e., historic runway construction), current and abandoned roads (i.e., tank trails, 2-tracts, etc.), stock piles, natural, or unknown sources. Of the erosion features identified, 5.4 acres were determined to be accelerating, 110.5 acres were determined to be in a static or undetermined condition, and 25.5 acres were stabilizing. Watersheds within Fort Wolters appeared to be in generally good health. Most of the installation is dominated by post oak woods, post oak savannah, and little bluestem grassland. There appears to be adequate cover of vegetation and litter to protect the soils. Steep hillside slopes are forested and have large rock out crops that are maintaining the slopes. The adjacent upstream land uses are agricultural and residential, which do not appear to be affecting the overall watershed health on Fort Wolters. The only areas of potential concern are the locations where there has been mass grading, plant communities dominated by lower successional species, and plant communities dominated by monocultures. All management at Fort Wolters must consider the soil properties. The soils at Fort Wolters are generally problematic because they are sandy loam or loamy sand over clay subsoil. These soil conditions are relatively fragile since sands erode relatively easily once vegetation cover is removed. Restoration of these soils, once erosion begins, is relatively difficult since precipitation events can erode soils faster than vegetation can colonize the sites.

Specific management recommendations are presented to ensure good plant and litter cover that minimizes future erosion on Fort Wolters. These recommendations include evaluation of frequency and intensity of fires, methodologies for clearing the vegetation on erosive soils, implementing buffers around erosion features, seeding in monocultural grasslands, reseeding and/or mulching after a training exercise if area is denuded, and development of restoration plans for erosional features.

Ryberg WA, Fitzgerald LA. 2003. Herpetofaunal inventory of Fort Wolters in north-central Texas. College Station (TX): Texas A&M University.

Herpetofaunal diversity of the Fort Wolters was surveyed from September 2002 through August 2003. A variety of herptile sampling methods resulted in 1,421 captures of 10 species of amphibians (all anurans) and 25 species of reptiles. This report documents a baseline survey of

amphibians and reptiles at Fort Wolters for future monitoring and management. Texas horned lizards or Brazos water snakes, both species of concern, and 36 other species known to occur in the county were not documented during this survey. Time-constrained searches and night driving yielded the greatest captures. Hylid frogs, particularly cricket frogs, were the most common captures with amphibians being 87% of all captures. GIS data on species observations were provided, as well as a complete list of species observed. Integration of this baseline information on amphibian and reptile species abundances and distributions with the INRMP will allow assessment of population fluctuations in response to management and land use practices both on and off TXARNG properties.

Sosebee RE, Fish EB, et al. 2005. Mesquite management on selected Texas National Guard training sites. Lubbock (TX): Texas Tech University.

Mesquite is not yet a major problem on any TXNG training sites, but where mesquite occurs, it interferes with training exercises and poses a safety hazard. It also threatens the ecological integrity of the plant communities it has invaded. The authors spent 3 weeks in July 2004 conducting site visits to Camp Swift, Camp Bowie, and Fort Wolters. The 10 priorities identified as a result include all drop zones, firing ranges at Camp Swift, compass courses, old fields at Camp Swift and Camp Bowie, open prairie at Fort Wolters, native plant area at Camp Bowie, obstacle course at Camp Swift, helicopter staging area at Fort Wolters, and all roadways and fence lines. We recommend focusing on individual plant treatments using trackhoe removal, spot foliar herbicide, or basal herbicide with an emphasis on small trees. If shredding is ceased, mesquite will become unmanageable quickly. Therefore, mesquite control must be incorporated into the management plan for each training site. All management methods recommended should have long duration effectiveness but must be followed by a maintenance control program to manage new plants.

Thies M. 2004. Mammals of the Fort Wolters training area. Huntsville (TX): Sam Houston State University.

Diversity at Fort Wolters was comparable with that known from Parker and Palo Pinto Counties generally. All species documented at Fort Wolters were to be expected. Bat surveys were generally unsuccessful, mostly due to the difficulty of doing both small mammal trapping and bat mistnetting with the same crew. Prescribed fires should be designed to provide refuge and corridors to allow recolonization of areas after fire. General improvements in habitat quality should improve mammal diversity. Mountain lion reports were unconfirmed during this survey.

Wolfe DW, Liu C, et al. 1996. Land cover analysis of Texas Army National Guard training sites. Austin (TX): Nature Conservancy of Texas.

This report contains the final results of an analysis of the response of cover types to past, present, and future training activities on Texas Army National Guard training sites (Camps Barkley, Bowie, Mabry, Maxey, and Swift and Fort Wolters). It also contains recommendations for future conditions for the conservation of significant natural features. Maps showing current land cover, potential natural vegetation, and significant natural features were created over color-infrared aerial photo base maps. A discussion of future conditions, ecosystem management recommendations, biodiversity benefits, and suggested research is provided.

Appendix J. Correspondence with Agencies

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
2005 NE Green Oaks Blvd., Suite 140
Arlington, Texas 76006

In Reply Refer To:
02ETAR00-2020-I-2368

July 24, 2020

Linda Brown, Ph.D.
TXARNG Natural Resource Manager Construction and Facilities Management Office
2200 West 35th Street Building 38
Austin, Texas 78703

Re: Revised Integrated Natural Resources Management Plan 2020 for Fort Wolters, Texas Military Department Training Facility, Palo Pinto and Parker Counties, Texas

Dear Dr. Brown:

Thank you for your June 23, 2020, e-mail requesting our review and concurrence on the Fort Wolters Integrated Natural Resource Management Plan (INRMP) Final 2020.

The U.S. Fish and Wildlife Service (Service) has reviewed the INRMP and provide the following comments pursuant to the Sikes Act Improvement Act of 1997 (Sikes Act), as amended (16 U.S.C. 670a-670o et seq.), and the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.). We received the Final INRMP and request for our Regional Director's concurrence signature without first receiving a draft allowing adequate time to provide comments, if needed, to be included within the Final INRMP. At this time, we are providing the comments below for your consideration in advance of concurrence signature. Fort Wolters is a 3,989-acre training center licensed to the Texas Military Department (TMD) from the Army Corps of Engineers. Fort Wolters is used primarily for military training activities by the Texas Air and Army National Guard, ranging from billeting and small arms ranges to drop zones and helicopter landing areas. The majority of training activities are related to infantry training by the Texas Army National Guard and drop zone use by the Texas Air National Guard.

General Comments:

We believe the natural resources management actions contained in the INRMP are generally appropriate to achieve the conservation, protection, and management of wildlife and plant resources, while considering the military operations, as required by the Sikes Act.

Specific Comments:

Appendix D, section D.2 Tree Management, p. D-6 - This section should reference the Migratory Bird Treaty Act (MBTA) and include guidelines to avoid tree removal/trimming etc. during migratory bird breeding season to avoid take as defined by the MBTA. Though breeding periods for different species vary, we typically recommend avoiding vegetation removal between March 1st and August 31st. Surveys can be conducted prior to removal in order to document nests or lack or nests if activities need to occur during breeding season. However, the best and most cost effective way to avoid take of active nests is to

conduct such activities outside of the breeding season. Although Appendix D, section D.7 does address migratory birds specifically including standard operating procedures for vegetation management, we believe section D.2 should also include guidance specific to migratory birds.

Section 3.5 Fire Management, p. 19 – This section states "All prescribed fires will go through a review of environmental concerns to mitigate the effects on matters, such as migratory birds and sensitive plants, as well as avoid cultural resources and specific training times for soldiers." This and other sections of the INRMP referring to prescribe fire do not specify when impacts to migratory birds should be considered. We recommend that the INRMP specify the period to avoid/minimize impacts to nesting migratory birds resulting from prescribe fire to be between March 1st and August 31st.

Appendix M, Section M.3, p. M-14 – We are aware that three populations of the federally listed threatened earth fruit (*Geocarpon minimum*) were identified on the west side Fort Wolters in the spring of 2019 during a rare plant survey. The INRMP indicates that Fort Wolters will (1) identify all areas with earth fruit populations and monitor known populations annually, (2) protect areas from woody encroachment and development, (3) continue with Prescribed Fire Program and managing wild pigs, and (4) management actions will be evaluated annually based on new data. We are very interested in the status of earth fruit at Fort Wolters and ask that the installation share any information regarding the species gathered during monitoring with the Arlington, Texas Field Office. We recommend further surveys to look for additional populations. We would also like to participate in the development of additional management actions should they be deemed necessary.

Thank you for your coordination and the opportunity to review the INRMP. We look forward to further coordination with your staff in this process. Please contact Sean Edwards of my staff at 817-277-1100 ext. 22127 or Allison Arnold, Regional Sikes Act Coordinator, Region 2, at 5125-490-0057, ext. 242 if you have any questions or require additional assistance.

Sincerely,

DEBRA BILLS Digitally signed by DEBRA BILLS Date: 2020.07.24 14:56:56 -05'00'

Debra Bills
Field Supervisor

cc: Allison Arnold, R2 Sikes Act Coordinator

S:\Correspondence\FY 2020\Signed Completed\2020-I-2368 Fort Wolters Draft INRMP Response.doc

From: Edwards, Sean
To: Brown, Linda A NFG NG TXARNG (USA)
Subject: [Non-DoD Source] Re: [EXTERNAL] RE: Fort Wolters INRMP comment letter
Date: Wednesday, July 29, 2020 4:23:53 PM

Dr. Brown,

Thank you again for our invitation to participate. The changes are noted and I will process the Final INRMP for our Regional Director's concurrence signature.

Kind Regards,

Sean Edwards
Fish & Wildlife Biologist
U.S. Fish & Wildlife Service
2005 NE Green Oaks Blvd. Ste. 140
Arlington, Texas 76006

From: Brown, Linda A NFG NG TXARNG (USA) <linda.a.brown110.nfg@mail.mil>
Sent: Wednesday, July 29, 2020 12:35 PM
To: Edwards, Sean <sean_edwards@fws.gov>
Subject: [EXTERNAL] RE: Fort Wolters INRMP comment letter

Please see attached updated INRM with your comments and letter included

---

From: Edwards, Sean <sean_edwards@fws.gov>
Sent: Monday, July 27, 2020 9:43 AM
To: Brown, Linda A NFG NG TXARNG (USA) <linda.a.brown110.nfg@mail.mil>
Cc: Arnold, Allison <allison_arnold@fws.gov>
Subject: [Non-DoD Source] Fort Wolters INRMP comment letter

Dr. Brown,

Please see our attached comment letter regarding the 2020 Fort Wolters INRMP. We look forward to coordinating further in preparation for our Regional Directors's concurrence signature.

Kind Regards,

Appendix K. Integrated Wildfire Management Plan on Record with CFMO/ENV/Natural Resources

Sample Prescription for Prescribed Fire

Prescribed Burn Plan

Unit 1

210 acres

Fort Wolters - Texas Army National Guard
Parker County

Reviewed by: _____ _____ _____
Signature **Date**

(Note any addendums to plan and attach)

Plan Execution: _____ _____ _____
Burn Boss **Signature** **Date**

Date of Ignition:

Date Fire Out: _____

Checked By: _____ _____ ____
Signature **Date**

Title: _____

Managerial Inputs
(* Indicates minimum which must be completed for pile burning)

***Project Location: Camp Bowie – Texas Army National Guard**

***Address: The burn site is located ½ mile north east of Mineral Wells.**

***County: Parker**

I. Resource Management Goals: Reduction of fuel load, removal of encroaching woody vegetation on grasslands, and restoration of oak savanna ecotype.

***II. Burn Objectives: (Specify in quantitative terms)**

A. Hazard Reduction: Remove grass litter layer by 75%
B. Silviculture: NA
C. Wildlife Habitat: Increase the palatability and nutrient content of herbaceous Vegetation
D. Range Management: Favor warm season grasses

E. Other: Training for area VFD's on wildland fire behavior

***III. Type of Burn: Broadcast ___X____ Pile_____**

Pre- & Post- Evaluation Techniques (give description): When possible develop a series of permanent photo points. Photos point collection should follow SOG's

Logistical Information:

A. Distance of Line to Construction: Improve line along existing roads. Hand line where necessary to improve holding along natural barriers. All holding lines will be inspected and prepared prior to any ignitions.

B. Equipment & Man Power Needs:
1. **Preparation: Mow areas adjacent to fence line.**
2. **Ignition: 2 drip torches, 15 gallons of torch fuel, 2 lighting personnel, one ignition boss.**
3. **Holding: Minimum of 2 type 6 engines or UTV with suppression unit.1 holding boss. Total of 5 personnel**
4. **Mop-Up: Minimum 1 type 6 engine, 1 engine boss, 2 Fire Fighters type II**

5. **Distance to water sources: On site at training area 1 Hydrant.**

IV. Lighting Plan Narrative: The test fire will be located in the downwind corner of the unit in representative fuels. (TBD by burn boss day of burn) Ignition operations should proceed from the test fire after the GO/NO GO criteria has been meet.
Ignition Strategy: Black line along the windward firebreaks and proceeds through the unit with a strip head-firing pattern. As the burn progresses in to the unit increase the strip distance accordingly. Adjust firing patterns to current weather and fire behavior as needed to meet objectives. The burn boss and ignitions boss will determine ignition pattern day of burn and utilize the ignition map to brief crews.

V. Holding Plan Narrative: Patrol flanks with type 6 engine. Ground crew will patrol all areas not accessible by engine. Suppress any spot fires that cross the containment line. Ground crews will sweep adjacent fuel beds for spot fires. On any spot overs, crews will call for adjacent holding crews as needed. If more than 1 piece of equipment is needed for suppression operations the holding boss will be informed. If 2 or more engines are committed ignition operations will be halted. Once slop over is contained firing will resume.

VI. Mop-Up Plan Narrative: All holding lines will be moped a distance of 30 feet interior. The burn block will be checked by 1000 hours the following day and any additional mop-up completed.

VII. Escaped Fire Contingency Plan:

Assessment: The potential for escape to no-target areas is moderate under these prescriptions

Treat of Life & Property: LOW – threats to improved adjacent property have been mitigated but will need to be checked prior to burning. Potential for spread to adjacent private property is moderate.

Escaped Fire Trigger Mechanisms and Confirmations: If more than 2 engines are committed to a spot over, all ignitions will stop until the spots are contained. If break over escape control of holding resources and spread in to adjacent burn units the burn will be declared escaped. The burn boss will function as IC. All resources will be committed to suppression mode. The holding boss will be in charge of operations. The burn will be managed with the objective to contain it to the adjacent block. If the burn escapes to adjacent property, the burn will be declared an escape. The SO will be notified, the above-mentioned procedures put in place; and the appropriate Fire Department toned. The burn boss will brief the responding units and will transition with the Fire department IC. Rx personnel and equipment will be merged in to the suppression command structure.

Additional Suppression Resources to be called for Escaped Fire:

Name:	**Distance:**
1. Camp Maxey	**On site**
2. Mineral Wells	**3 miles**
3. Garner	**8 miles**
4. Millsap	**12 miles**
5. Texas A&M Forest Service (Mineral Wells)	**On site**

6. Texas A&M Forest Service (Granbury) 50 miles

ENVIRONMENTAL INPUTS

I. Unit 1

A) Dominant Fuel Model: FM1, GS1, (short grass) 100%

B) Burn Acres: 210 acres

A) Burn Perimeter: 2.9 miles. The unit is surrounded by roads. Refer to unit map.

C) Fuels: Includes FM 1, GS 1, represents 100% of the area.

1. **Continuity: Continuous fuel bed of native and introduced warm season grasses.**

2. **Arrangement: Fuel is dominantly grasses vertical height of the fuel is 1 foot with some encroaching woody vegetation.**

3. **Distribution:**
   1 hour: 1.5 T/A 10 hour: 0 T/A 100 hour: .0 T/A 1000 hour: 0 T/A

   Depth of Duff: .25 inches Total Fuel Loading approx. 1.5 T/A

4. **Percent Cover:**
   Grass 100% Brush 0 % Timber 0%

D) Topographic Considerations:

1. Elevation: Bottom 890 feet above MSL Top 905 feet above MSL

2. Drainage Lake Mineral Wells Aspect: south east

E) Adjacent fuels and area.

- **The area to the west of the unit consists of improved pasture and is a property boundary.**
- **The area to the north of the unit is dominated by a grass and brush. The unit is bordered to the north by a gravel road on base.**
- **The area to the east of the unit consists of scattered brush with grass under story. There is a gravel road along the east flank and this is a property boundary with Mineral wells state park.**
- **The area south of the unit consists of grasslands and is a developed area. There is a gravel road along the south flank and this is a property boundary.**

II. Descriptive Elements:

A. Treatment Dates: Winter December – March

B. Time of Day: Afternoon 1100 – 1800

C. Ignition Method: Hand, Strip Head from Perimeter,

A. Preferred Weather Description: See Block F

B. Smoke Management:

	#Preferred	*Acceptable
1. Wind Direction	**#S**	*** S-SW**
2. Dispersion Day	**# High**	*** Moderate**
3. Mixing Height	**# 3,000 ft**	*** 1,500 ft**
4. Transport Wind	**# 20 mph**	*** 5 mph**

Identified Sensitive Areas: Mineral Wells to the south west. FM road and homes and businesses adjacent to the south flank. Mitigation Actions to be taken: Post warning signs on State HW, and FM road. Burn using a strip head fire. Complete all ignitions by 1700. Mop up all heavy fuels for a distance of 100 feet along all flanks. Do not burn if the green to dead ratio in grass is greater than 50%

C. Weather Prescriptions for conducting ignitions and holding.

(# Denotes preferred)	**(* Denotes acceptable range)**
1. Wind Direction: #South	*** S- SW**
2. Wind Speed: # 8 mph	*** 6 – 15 mph**
3. Rh: # 25%	*** 20 – 40%**
4. Temperature: # 60	*** 35 – 85**
5. Fine Dead FM # 6	*** 4- 10**
6. Herbaceous FM (Cured)	*** 25% - 150%**
7. Severe Fire Potential	*** low – Moderate**

III. SUMMARY COMPLEXITY RATING

RATIONALE:

The overall complexity for the unit is moderate. Under the prescriptions escape potential to adjacent burn units is low and will be mitigated through adjusting ignition operations. Escape

potential to off base properties is moderate on the east, south and west flank. Smoke management is of high complexity do to proximity for roads, subdivision, and businesses adjacent to the south and west flank of the unit. The city of Mineral Wells is to the south west and Mineral Wells state park to the east. To mitigate, the unit should be burned on a high dispersion day and preparations made to sign the road prior to ignitions and through the next day. Firefighter safety is moderate concern do the burn nature of flashy fuels, this will be mitigated through good safety briefings and carrying the black with crews.

Appendix

1) Unit Map
2) Topo Map
3) Area Map
4) Contact list
5) Go/No Go check list
6) Briefing check list
7) Organization chart

Fort Wolters Information

Palo Pinto County EMC- Keiffer "Buddy" Harwell
Keiffer.harwell@co.palo-pinto.tx.us 940-325-5762

Palo Pinto County SO Dispatch 940-659-2085

Mineral Wells Fire Department-Fire Marshal, Joel Thompson 940-328-7730

Fire Departments:

Mineral Wells Fire Department Station 1 (1st dispatched)
212 S. Oak
Mineral Wells, Texas 76067
940-328-7735 940-328-1211

Whitt VFD 940-798-3445
Garner VFD 940-325-4816
Milsap VFD 940-682-4825
Peaster VFD 817-594-4816

TFS:

FC-Russell Behlings 979-218-2408

Task Force Office-Mineral Wells

Medical:

Palo Pinto General Hospital (local-trauma)
400 Sw 25th
Mineral Wells, Tx
940-325-4471

Parkland Hospital (burn center)
5201 Harry Hines Blvd.
Dallas, Texas 75235
214-590-8000

Air Evac/Ground Ambulance- call 911 (multiple providers)

Media:

Mineral Wells Index (daily newspaper)
300 SE 1st St.
Mineral Wells, Texas

NWCG PRESCRIBED FIRE GO/NO-GO CHECKLIST

Yes	No	Questions
		Are ALL fire prescription elements met?
		Are ALL smoke management specifications met?
		Has ALL required current and projected fire weather forecast been obtained and are they it favorable?
		Are ALL planned operations personnel and equipment on-site, available, and operational?
		Has the availability of ALL contingency resources been checked, and are they available?
		Have ALL personnel been briefed on the project objectives, their assignment, safety hazards, escape routes, and safety zones?
		Have all the pre-burn considerations identified in the prescribed fire plan been completed or addressed?
		Have ALL the required notifications been made?
		Are ALL permits and clearances obtained?
		In your opinion, can the burn be carried out according to the prescribed fire plan and will it meet the planned objective?

If all the questions were answered "YES" proceed with a test fire. Document the current conditions, location, and results

PMS 421 (1/02

Organization Assignment List, ICS Form 203

ORGANIZATION ASSIGMENT LIST	1. INCIDENT NAME Blackwell	2. DATE PREPARED	3. TIME PREPARED
POSITION / NAME	4. OPERATIONAL PERIOD (DATE/TIME)		

5. INCIDENT COMMAND AND STAFF	
RXB 2	

6. AGENCY REPRESENTATIVES	
AGENCY	**NAME**

7. ignitions Boss	
West flank (Divs A)	Ignition member
	Ignition member
East Flank (Divs B)	
	Ignition Member
	Ignition Member

9. Holding Boss		
West Flank (DIVS A)		Typ 6 Eng
		Type 6 Eng
		Tractor plow
East Flank (Divs B)		**Type 6 Eng**
		Type 6 Eng

PREPARED BY (RESOURCES UNIT)

Sample Assignment List, ICS Form 204

1. BRANCH	2. DIVISION/GROUP A	ASSIGNMENT LIST
3. INCIDENT NAME	4. OPERATIONAL PERIOD DATE _____ TIME _____	

5. OPERATIONAL PERSONNEL

RXB 2 _____ DIVISION/GROUP SUPERVISOR _____

_____ AIR TACTICAL GROUP SUPERVISOR _____

6. RESOURCES ASSIGNED TO THIS PERIOD

STRIKE TEAM/TASK FORCE/ RESOURCE DESIGNATOR	EMT	LEADER	NUMBER PERSONS	TRANS. NEEDED	PICKUP PT./TIME	DROP OFF PT./TIME
ENG						
ENG						
Plow						
Ignition crew						

7. CONTROL OPERATIONS

8. SPECIAL INSTRUCTIONS

9. DIVISION/GROUP COMMUNICATIONS SUMMARY

FUNCTION		FREQ.	SYSTEM	CHAN.	FUNCTION		FREQ.	SYSTEM	CHAN.
COMMAND	LOCAL				SUPPORT	LOCAL			
	REPEAT					REPEAT			
DIV./GROUP TACTICAL					GROUND TO AIR				

PREPARED BY (RESOURCE UNIT LEADER)	APPROVED BY (PLANNING SECT. CH.)	DATE	TIME

Sample Assignment List, ICS Form 204

1. BRANCH	2. DIVISION/GROUP b	ASSIGNMENT LIST
3. INCIDENT NAME	4. OPERATIONAL PERIOD DATE _____ TIME _____	

5. OPERATIONAL PERSONNEL

RXB 2 _____ DIVISION/GROUP SUPERVISOR _____

_____ AIR TACTICAL GROUP SUPERVISOR _____

6. RESOURCES ASSIGNED TO THIS PERIOD

STRIKE TEAM/TASK FORCE/ RESOURCE DESIGNATOR	EMT	LEADER	NUMBER PERSONS	TRANS. NEEDED	PICKUP PT./TIME	DROP OFF PT./TIME
ENG						
ENG						
Ignition crew						

7. CONTROL OPERATIONS

8. SPECIAL INSTRUCTIONS

9. DIVISION/GROUP COMMUNICATIONS SUMMARY

FUNCTION		FREQ.	SYSTEM	CHAN.	FUNCTION		FREQ.	SYSTEM	CHAN.
COMMAND	LOCAL				SUPPORT	LOCAL			
	REPEAT					REPEAT			
DIV./GROUP TACTICAL					GROUND TO AIR				

PREPARED BY (RESOURCE UNIT LEADER)	APPROVED BY (PLANNING SECT. CH.)	DATE	TIME

Briefing Checklist

Situation
- Fire name, location, map orientation, other incidents in area
- Terrain influences
- Fuel type and conditions
- Fire weather (previous, current, and expected)
  - Winds, RH, temperature, etc.
- Fire behavior (previous, current, and expected)
  - Time of day, alignment of slope and wind, etc.

Mission/Execution
- Command
  - Incident Commander/Immediate supervisor
- Commander's intent
  - Overall strategy/Objectives
- Specific tactical assignments
- Contingency plans

Communications
- Communication plan
  - Tactical, command, air-to-ground frequencies
  - Cell phone numbers
- Medivac plan

Service/Support
- Other resources
  - Working adjacent and those available to order
  - Aviation operations

Risk Management
- Identify known hazards and risks
- Identify control measures to eliminate hazards/reduce risk
  - **MANDATORY - Anchor point and LCES**
- Identify trigger points for disengagement/re-evaluation of operational plan

Questions or Concerns?

EVERY FIREFIGHTER IS OBLIGATED TO PAUSE OPERATIONS UNTIL SAFETY CONCERNS ARE ADDRESSED.

Appendix L. Priority Invasive Species Summaries

L.1 *Lonicera japonica* – Japanese Honeysuckle

L.1.1 TMD Facilities Affected

- Camp Maxey
- Camp Swift
- Fort Wolters

L.1.2 Scientific Name: *Lonicera japonica*

- **Other Scientific Names:** *Lonicera japonica* var. *halliana*, *Lonicera japonica* var. *chinensis*
- **Most Accepted Common Name:** Japanese honeysuckle
- **Other Common Names:** Hall's Japanese honeysuckle, woodbine, Chinese honeysuckle

L.1.3 Taxonomic Description

Life Form: climbing woody vine, semi-evergreen to evergreen
Height: 6.5-10 ft. long (less often to 30 ft.)
Vegetative Characteristics:
Stems: young stems are reddish brown to light brown, usually pubescent, and about 3 mm in diameter; older stems are glabrous, hollow, with brownish bark that peels in long strips.
Underground (roots, rhizomes, etc.): rhizomes and runners present
Leaves:
Arrangement: opposite
Type: oblong-ovate to oblong-lanceolate
Sheaths and Ligules (of grasses):
Size: 1.5-3 in. long
Margins: entire
Surfaces (pubescence): variable pubescence
Attachment: petiolate
Petiole: short petiole
Floral Characteristics:
Inflorescence:
Type: solitary, axillary peduncles
Size: 5-0 mm long
Flowers:
Bracts: 1-2 cm long
Calyx:
Corolla: tubular with a fused 2-lipped corolla 1-1.5 in. long
Color: white with pink and purple, turning yellow with age
Anthers and Ovary:
Fruit Characteristics:
Type: berry
Shape: round
Size: 5-8 mm in diameter

Color: black

Attachments for Dispersal:

L.1.4 Biology and Ecology

Origin: East Asia, including Japan and Korea

Habitat: fields, forest edges and opening, disturbed woods, and floodplains

Distribution:

Current: throughout the eastern half of the United States, south of a line extending from Massachusetts west to Lake Michigan, Illinois, and Missouri, and the southwest through Texas to Mexico

Historical: native to East Asia and spread to England, Portugal, Brazil, Argentina, and Hawaii

Climatic and Ecological Range:

Soils:

Disturbances:

Temperature: low temperature of -8 °C to -15 °C

Precipitation: 39-47 in. annually

Soil Moisture: tolerates drought as well as soggy soils

Light: grow vigorously in full sun but is shade tolerant

Fertility:

Other:

Reproduction:

Type (asexual or sexual): sexual and asexual

Rate: 2-3 seeds per fruit produced

Seed Production: September through November

Dispersal: spread by birds, which consume the seeds

Longevity in Seed Bank:

Germination: Japanese honeysuckle can be grown from seed planted as soon as it is ripe. Older seed will require cold stratification for several weeks.

L.1.5 Control

Considerations: It is difficult to control once established; an appropriate control program goal would be 100% kill of all plants in the target area.

Mechanical: Removing stems by cutting or pulling will temporarily weaken but not kill because it will re-sprout from subterranean buds and roots as well as from cut branchlets. An Invasive Plants Association of Wisconsin (IPAW) listserv posting by Marc Imlay described removal of *L. japonica* by pulling from the base of the plant and hanging it upside down to facilitate drying and death.

Cultural: Burning will temporarily weaken a mature plant; however, combining fire and herbicides can be effective. Later autumn or winter burns are used to reduce the plant, and all re-sprouts are treated with glyphosate about a month after they emerge. Prescribed fires may also be used to prevent the spread of the plant because seedlings and young plants are most susceptible to fires.

Chemical: The most effective treatment is a foliar application of glyphosate (Roundup™, Rodeo™, or Accord™; 1.5 v/v), applied after native vegetation is dormant and when temperatures are near and preferably above freezing. Application within 2 days of the first killing frost is more effective than applications later in the winter.

Biological: None

L.1.6 References

The Nature Conservancy: http://tncweeds.ucdavis.edu/esadocs/documnts/lonijap.html

L.1.7 Local Control Experts

Dr. Paul Bauman – Texas Cooperative Extension Weed Specialist
Heep Center 349B
2474 TAMUS
College Station, Texas 77845-2474
Phone: (979) 845-4880
Email: p-bauman@tamu.edu

Dr. Allan McGinty – Texas Cooperative Extension Range Specialist
7887 U.S. Highway 87 N.
San Angelo, Texas 76901
Phone: (915) 653-4576
Email: a-mcginty@tamu.edu

L.2 *Solenopsis invicta* – Red Imported Fire Ant

L.2.1 TMD Facilities Affected

- Camp Bowie
- Camp Maxey
- Camp Swift
- Fort Wolters (and others)

L.2.2 Scientific Name: *Solenopisis invicta*

- **Other Scientific Name(s):** *Solenopsis wagneri* Santschi
- **Most Accepted Common Name:** red imported fire ant

L.2.3 Taxonomic Description

Life Form: ant, insect

Size: about 1/8-1/4 in. long, with wide variation in size

Distinguishing/Diagnostic Features: Only the red imported fire ant has a median clypeal tooth and a striated mesepimeron (see Appendix M, Figure M-1), although these may be difficult to see at first. Other characters that might help in the identification include: 1) the antennal scape nearly reaches the vertex, 2) the post-petiole is constricted at back half, and 3) the petiolar process is small or absent. Of all the native fire ants, the southern fire ant (*Solenopsis xyloni*) looks the most like the red imported fire ant. The southern fire ant can be identified by its brown to black color, well-developed petiolar process, and no median clypeal tooth.

Other: Fire ants will crawl up vertical surfaces. Fire ant stings will usually create a blister or pustule filled with white fluid

L.2.4 Bilogy and Ecology

Origin: South America, imported in 1930s in ship ballasts

Habitat: Mounds can reach 18 in. in height, depending on the type of soil, and they are found in all types of soil. They generally do better in open pastures and sunny, grassy places than in thick, shaded woods. Grassy medians of freeways and mowed pipelines and powerline right-of-ways provide prime "freeways" for the ants, too. Often mounds are located in rotting logs and around stumps and trees. Colonies also can occur in or under buildings. Fire ants live in underground nests that consist of a network of tunnels and chambers that occupy a vertical column 12-18 in. in diameter and approximately 36 in. deep. After cool, rainy, weather in spring and fall, the ants clear blocked tunnels and expand chambers to create a conspicuous mound of loose soil above the nest. The colony dwells in this above ground extension when the temperature there is optimal for brood development. Though above-ground mounds harden and persist in some soil types, their absence does not mean fire ants are not present or receding.

Distribution:

Current (non-native): southeastern United States and most of way across Texas with occasional pockets further west

Historical (native): South America

Climatic and Ecological Range:

Soils: any soils

Disturbances: seem to prefer disturbed or landscaped areas

Temperature: appear to be limited by cold winters but are being found further north than was assumed possible

Precipitation: appear to be limited by low rainfall, but the level of rainfall required to support them is unclear

Other:

Food: live and do most of their foraging for food through underground tunnels

Hosts (if any):

Reproduction:

Season: Fire ants reproduce opportunistically when conditions are wet and warm. Mating flights are most common in spring and fall. Males die soon after mating, while the fertilized queen alights to find a suitable nesting site, sheds her wings, and begins digging a chamber in which to start a new colony. Sometimes, several queens can be found within a single nesting site.

Rate/Fecundity: A newly mated queen lays about a dozen eggs. When they hatch 7 to 10 days later, the larvae are fed by the queen. Later, a queen fed by worker ants can lay up to 800 eggs per day. Larvae develop 6 to 10 days and then pupate. Adults emerge in 9 to 15 days. The average colony contains 100,000 to 500,000 workers and up to several hundred winged-forms and queens.

Behavior: There are 2 kinds of red imported fire ant colonies—the single queen colony and multiple queen colony. Workers in single queen colonies are territorial. Workers from multiple queen colonies move freely from one mound to another, which has resulted in a dramatic increase in the number of mounds per acre. Areas infested with single queen colonies contain 40 to 150 mounds per acre (rarely more than 7 million ants per acre). In areas with multiple queen colonies, there may be 200 or more mounds and 40 million ants per acre.

Development Phases (if any): 1) egg laid by queen; 2) larva hatches and grows through 4 larval developmental stages or instars between which molts of larval skin occur; 3) at 4th molt a pupa is produced; 4) pupa hatched into adult ant.

Dispersal: Colony establishment by winged queens can occur miles beyond source populations. This mode of spread may be promoted by prevailing winds and is the only way that monogyne or single queen colonies reproduce. Polygyne colonies (those with multiple queens/mound) can reproduce by budding off new colonies and spread by walking a few meters per year. Judging from the spread across Texas, natural dispersal was on the order of 10-20 miles/year. Of course, transport in nursery products spread the ants beyond the boundary of natural dispersal. Flooding causes colonies to leave their mounds and float until they can reach land to establish a new mound.

Life Span: Queen fire ants can live 7 years or more, while worker ants generally live about 5 weeks, although they can survive much longer.

Other: There are 2 basic types of eggs. 1) unfertilized eggs become males with wings whose only function is to mate with queens; 2) fertilized eggs become females that are either winged virgin queens or various castes of sterile workers. How the colony feeds and cares for female larvae determines their caste, i.e., whether they behave as workers (all are sterile females) or queens. Male ants develop from unfertilized eggs and therefore possess only one set of chromosomes, i.e., they are haploid. Thus, male ants have no father, but they have a grandfather. Females develop from fertilized eggs and are typical diploids.

L.2.5 Control

Considerations: It is unlikely red imported fire ants will ever be eradicated from the United States. At best, they will become a part of the ant communities instead of dominating them. There appears to be some evidence this is happening already due to changes in the native ants. Introduction of biological controls will help that as well.

Mechanical: Boiling water poured on the mound shortly after a rain can remove a mound

Behavioral: Some native ant species compete with the red imported fire ant for territory and resources, and these are particularly affective predators on newly mated fire ant queens.

Chemical: Amdro® or similar reduces colony quickly. Extinguish® or similar is an insect growth regulator that slows population growth up to 1 year. Boric acid can even be used to reduce colonies. Widespread broadcast baits can severely reduce ALL ants, including native ants, so it is not recommended away from built areas. Use bait applied to specific mounds to distribute chemicals to minimize damage to other ant species. Follow the SOP RIFA Treatments for TMD facilities.

Biological: Some pathogens are known to attack ants, and several have been marketed for fire ant control, including the microsporidian *Thelohania solenopsae*, Pseudomonas bacteria, and several parasitic fungi, including *Beuvaria bassiana*, which is currently being evaluated for control. Parasitic nematodes (*Steinernema* spp.) seek out and enter insects, paralyzing them and developing in their bodies. Species and strains vary in their effectiveness. Strains tested to date caused ants in treated mounds to temporarily move away from the treated mound, but few colonies were actually eliminated. There is great hope for success from the introduction of biological control agents such as parasitic phorid fly species (*Diptera*) currently being released in the United States and showing successful establishment at some locations in Texas, including Camp Swift. If successfully introduced and established, they are expected to provide only a measure of suppression over large areas, but not eradicate the imported fire ant.

L.2.6 References

Texas A&M website: http://fireant.tamu.edu/

USDA Species summary: http://www.invasivespeciesinfo.gov/animals/rifa.shtml

UT Austin website: http://uts.cc.utexas.edu/~gilbert/research/fireants/

L.2.7 Local Control Experts

Local extension office for each site

Dr. Bastiaan "Bart" Drees – Texas A&M University
412 Heep Center
College Station, Texas 77843-2475
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L.3 *Sorghum halapense* – Johnsongrass

L.3.1 TMD Facilities Affected

- Camp Bowie
- Camp Maxey
- Camp Swift
- Fort Wolters

L.3.2 Scientific Name: *Sorghym halapense*

- **Most Accepted Common Name:** Johnsongrass
- **Other Common Names:** Egyptian millet

L.3.3 Taxonomic Description

Life Form: graminoid
Height: 1.5-4.5 ft.
Vegetative Characteristics:
- Stems:
  - Underground (roots, rhizomes, etc.): extensive roots and rhizomes
- Leaves:
  - Arrangement:
  - Type:
  - Sheaths and Ligules (of grasses): sheath is ribbed and distinguishing
  - Size:
  - Margins:
  - Surfaces (pubescence): a distinctive white mid-rib
  - Attachment:
  - Petiole:

Floral Characteristics:
- Inflorescence: purple panicle
  - Type:
  - Size: large
- Flowers:
  - Bracts:
  - Calyx:
  - Corolla:
  - Color:
  - Anthers and Ovary:

Fruit Characteristics:
- Type: awned
- Shape: ovoid
- Size:
- Color: brown

Attachments for Dispersal: water, wind, livestock, machinery, birds, vehicular traffic; seeds known to be viable and dormant in seedbank for several years

L.3.4 Biology and Ecology

Origin: thought to be from the Mediterranean

Habitat: low-elevation wet places, irrigation ditches, waste areas, roadsides, cropfields, and other disturbed places in temperate climates

Distribution:

Current:

Historical: throughout the United States and the world in temperate regions

Climatic and Ecological Range:

Soils: adapted to a wide variety of soil types

Disturbances: thrives on disturbances

Temperature: below 13 °C inhibits flowering

Precipitation:

Soil Moisture: tolerates drought and inundation

Light: grows vigorously in full sun

Fertility: one plant may produce 200-100 ft. of rhizomes in a month

Reproduction:

Type: sexual and vegetative (by rhizomes)

Rate: rapid

Seed Production: prolific; up to 10 bushels of seed in one growing season

Dispersal:

Germination:

L.3.5 Control

Considerations: It is virtually impossible to eradicate this species completely. Spot control of individual plants while encouraging native plant establishment is recommended. Disturbances should be minimized.

Mechanical: Mowing the plant for several years weakens it and reduces rhizome growth, but it is unlikely this will control growth or spread as it does not kill the plant. Several fallow plowings during the summer will bring the rhizomes to the surface where they dry out. Plowing is appropriate for older, established plants with extensive rhizome systems in an extremely infested area, but if the machinery is used in areas that are free of Johnsongrass, this practice may actually facilitate its spread. Hoeing is only practical when the plants are very young (under 3 weeks old) and without an extensive rhizome system.

Cultural:

Chemical: Herbicides alone will not eliminate Johnsongrass and yearly applications will be required.

Foliar Sprays: Glyphosate (Roundup™) and dalapon (Dowpon) are the only foliar sprays that are mildly toxic and rapidly degrade in the soil. These chemicals are not specific to grasses and will kill any plant that is sprayed. Glyphosate (Roundup™) is recommended in controlling Johnsongrass in non-agricultural settings, such as training sites. A spot application with a backpack-type glyphosate herbicide application is an efficient way to control small areas. This is most effective when the plants are actively growing and have reached the flowering stage. Blooms should be removed to prevent further dispersal of seeds. Multiple applications for several years will be required. Up to an 85% control rate within the first year of treatments has been observed using this approach. Re-growth is mostly attributed to seeds and unaffected rhizomes. A relatively new herbicide, Poast®, is specific to

monocots and may be sprayed on to kill an infested field, but it will also kill all native grasses present. This herbicide is more expensive than the other two. Dalapon should be applied before flowering, early in the growth stage.

Basal Bark Application: N/A

Cut Stump Bark: N/A

Biological: N/A

L.3.6 References

Fire Effects Information System: http://www.fs.fed.us/database/feis/

Native Plants of South Texas: http://uvalde.tamu.edu/herbarium/soha.htm

The Nature Conservancy: http://tncweeds.ucdavis.edu/esadocs/documnts/sorghal.pdf

L.3.7 Local Control Expert

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L.4 *Tamarix ramosissima* – Tamarisk

L.4.1 TMD Facilities Affected

- Fort Wolters

L.4.2 Scientific Name: *Tamarix ramosissima*

- **Other Scientific Names:** *Tamarix pentandra*, *Tamarix chinensis*, *Tamarix parviflora*, *Tamarix gallica*
- **Most Accepted Common Name:** Tamarisk
- **Other Common Names:** saltcedar, salt cedar, tamarix

L.4.3 Taxonomic Description

Life Form: shrub
Height: average < 5 m tall (but can grow to 12 m)
Vegetative Characteristics:
    Stems: branchlets
        Underground (roots, rhizomes, etc.): taproot that can reach 30 m down with a root spread of 50 m
    Leaves:
        Arrangement: appressed and scaly
        Type: rhombic to ovate, sharply pointing to gradually tapering
        Sheaths and Ligules (of grasses):
        Size: 0.5-3.0 mm long
        Margins: thin, dry, and membranaceous
        Surfaces (pubescence):
        Attachment:
        Petiole:
Floral Characteristics:
    Inflorescence: raceme
        Type: grouped in terminal panicles
        Size: 2-5 cm long
    Flowers: parts in 5s
        Bracts: scarcely translucent
        Calyx:
        Corolla:
        Color: whitish or pinkish
        Anthers and Ovary:
Fruit Characteristics:
    Type: capsule Shape: lance-ovoid
    Size: 3-4 mm long
    Color:
    Attachments for Dispersal:

L.4.4 Biology and Ecology

Origin: Asia

Habitat: riparian

Distribution:

Current: all western and Great Plains states

Historical: southern Europe to Asia Minor and eastward to Mongolia, Tibet, central China, and North Korea

Climatic and Ecological Range:

Soils: mostly on fine textured soils

Disturbances:

Temperature: seed bank does not survive winter

Precipitation:

Soil Moisture:

Light: poor in shade

Fertility: highly fecund

Other: very tolerant of inundation, desiccation, and nutrient stress

Reproduction:

Type (asexual or sexual): sexual and asexual

Rate: seedlings often grow slower than native vegetation; typically reproduce in second year

Seed Poduction: massive amounts of minute seeds

Dispersal: wind and water

Longevity in Seed Bank: up to 45 days

Germination: within 24 hours of water contact

Other: vegetative reproduction (will produce roots from buried or submerged stems or stem fragments)

L.4.5 Control

Considerations: It is difficult to control once established, and an integrated approach with a consistent monitoring program is required. Tamarisk increases the salinity of surface soil due to deposition of highly saline leaf litter, which may make it difficult for native plants to colonize once tamarisk is controlled.

Mechanical: Grubbing techniques can be somewhat successful if you take care to extract the entire crown and root portions from the ground; however, this can be expensive and can be limited by topography. Mechanical removal of dead and standing debris resulting from a previous herbicide control should wait a minimum of 2 years after initial herbicide treatment.

Cultural: Typically, it resprouts vigorously after burning; however, burning followed by herbicide application to the resprouts can achieve excellent control in monotypic stands of tamarisk. Summer fire is likely to achieve greatest effects.

Chemical: Herbicides are successful as both individual plant treatment (IPT) and broadcast applications. For IPT applications, be sure to treat all leaves and growing tips (a dye can help). For younger, smooth-bark plants a basal stem spray method or cut stump method with Triclopyr and vegetable oil mix. This treatment works best when applied during the growing season when plants have mature leaves. Broadcast applications use at least 10 gallons per acres total spray volume with a surfactant, and Imazapyr and Glyphosate mix is suggested.

Biological: In Texas, a mealybug (*Trabutina mannipara*) and a leaf beetle (*Diorhabda elongate*) are being studied for their efficacy but have not been approved for widespread use yet.

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The Nature Conservancy: http://tncweeds.ucdavis.edu/esadocs/tamaramo.html

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Appendix M. Priority Rare Species Summaries

M.1 *Phrynosoma cornutum* – Texas Horned Lizard

Scientific Name:	*Phrynosoma cornutum*	**Common Name:**	Texas horned lizard, horny toad
Family:	Phrynosomatidae	**Order:**	Squamata
TSN:	173938	**Synonymy:**	

Figure M-1. Adult Texas horned lizard, TPWD photo

Figure M-2. Texas horned lizard, TPWD photo

Federal Status:	N/A	**State Status:**	Threatened	**Other:**	
Global Rank:	G4G5	**State Rank:**	S3	**Rarity at Facility:**	Rare

M.1.1 Status Summary and Threats

Widespreadh and still relatively common in some areas of the south-central United States and northern Mexico. Declines have been noted in portions of the range, but it is doing well in many areas. Apparently, it is moderately threatened by fire ants, insecticides, loss of habitat, and over collecting. This species apparently has declined in area of occupancy and population size near the northeastern margins of the range in Texas, Oklahoma, and Kansas, but it is doing well in most of the range. Moderate decline to relatively stable (25% change to 50% decline).

Declines may be related to the spread of fire ants, use of insecticides to control fire ants, heavy agricultural use of land and/or other habitat alterations, and over collecting for the pet and curio trade (Price 1990; Carpenter et al. 1993; Donaldson et al. 1994). The widespread use of broadcast insecticides is thought to contribute to declines by directly causing illness or death or indirectly by severely reducing or eliminating harvester ants (Henke and Fair 1998). In the past, this lizard was collected for the pet trade, by Boy Scout troops for trading at jamborees, for the curio trade, and by tourists (Donaldson et al. 1994; Henke and Fair 1998). Mortality from road traffic is also an important local threat in some areas. Males are particularly vulnerable during May-June in Arizona and New Mexico (Sherbrooke 2002). A high level of road mortality may lead to significant local declines.

This species is extremely vulnerable to changes in habitat, especially the loss of harvester ants (Carpenter et al. 1993). Harvester ants comprise up to 69% of the diet (Pianka and Parker 1975), and fire ants are thought to out-compete native harvester ants for food and space (Henke and Fair 1998). This threat may be significant in parts of Texas but probably not elsewhere. Intensive agriculture (plowing) could destroy adults and their eggs (Carpenter et al. 1993; Donaldson et al. 1994) but, according to Henke and Fair

(1998), reports of declines due to loss of habitat caused by urbanization, suburban sprawl, and conversion of native rangeland to agricultural crops are mostly unsubstantiated (Henke and Fair 1998).

Habitat alteration, both urban and agricultural, in Texas and the southeastern United States has promoted the spread of a terrible introduced pest, *Solenopsis invicta*, the red imported fire ant. These ants, accidentally introduced from South America, pose a significant threat to all wildlife in the southern United States. Fire ants can kill almost anything given the chance, and they are fierce competitors against native ants that horned lizards require for food. Horned lizards do not eat fire ants probably due to the ants' different natural history than the native harvesting ants, different venom in the sting apparatus, and different nutritional component.

M.1.2 Distribution

M.1.2.1 Global

The range extends from extreme southwestern Missouri and central Kansas to southeastern Colorado, and south and west throughout most of Oklahoma and Texas (including coastal barrier islands), eastern and southern New Mexico, and southeastern Arizona to northeastern Sonora, Chihuahua, and Durango east of Sierra Madre Occidental, Coahuila, Nuevo Leon, Tamaulipas, San Luis Potosi, and Zacatecas (Price 1990). The native eastern limit is uncertain. Records for Missouri and Arkansas have been questioned (now extirpated from Arkansas; Trauth et al. 2004), and possibly the species is not native to Louisiana (Price 1990). This species has been introduced and is established in several areas in the southeastern United States, including North Carolina (Herpetol. Rev. 20:12), Florida (Jensen, 1994; Herpetol. Rev. 25:165), and elsewhere (see Price 1990 for references). Total adult population size is unknown but surely exceeds 10,000 and likely exceeds 100,000. This species can be locally abundant in undeveloped areas with appropriate habitat (Carpenter et al. 1993; Hammerson 1999).

A 1992 Oklahoma survey found the species to be rapidly disappearing in eastern areas of Oklahoma where it was once known to be abundant (Carpenter et al. 1993). A 1993 survey of the northern Flint Hills of Kansas suggested that populations were possibly declining (Busby and Parmalee 1996), and local collectors reported declines in the southeastern portions of Kansas (Bill Busby, pers. comm., 1998). In Colorado, no trend information is available, but recent surveys indicate that the species appears to be locally common and stable (Siemers, pers. comm., 1998; Hammerson 1999). According to Rosen (Herp. Diversity Review 1996), populations are thriving and plentiful in extreme southeastern Arizona. New Mexico densities have not changed historically, and populations are considered stable (Charles Painter, pers. comm., 1998). Its status is unknown in Sonora, Mexico (Andres Villareal Lizarraga, pers. comm., 1998).

M.1.2.2 State

According to Price (1990), the Texas horned lizard has virtually disappeared from Texas east of a line from Fort Worth through Austin and San Antonio to Corpus Christi (formerly widespread and abundant in that area). It has also declined in range and/or abundance in areas where it was formerly common in parts of north-central Texas, the Texas Panhandle, and parts of Oklahoma. Price's conclusions are supported by more recent surveys in Texas, Oklahoma, and Kansas. A 1992 Texas survey found the greatest declines in east Texas (where no individuals were found) and apparent declines also in central Texas. While the species appeared to be doing well in northern and western Texas (Donaldson et al. 1994). Bartlett and Bartlett (1999) stated that the decline may have halted in at least some parts of Texas, and they found numerous individuals in areas where searches in several previous years yielded few. A 1999 survey in Texas was unable to determine if the decline has halted or if it continues today (Henke 2003).

M.1.2.3 On Fort Wolters

Texas horned lizards have been observed infrequently in the last decade at Fort Wolters, but there are abundant harvester ants and excellent habitat. An occasional sighting has occurred but no captures. Texas horned lizards were considered common in 1996 during original planning level surveys..

M.1.3 Diagnostic Characteristics

The Texas horned lizard is a flat-bodied and spiny lizard with an adult snout-vent length 6.2-12.5 cm, with an average of 6.9 cm (Munger 1984, 1986; Stebbins 1985). The head has numerous horns, all of which are prominent, with 2 central head spines being much longer than any of the others. This lizard is brownish to yellow to gray with 2 rows of fringed scales along each side of the body. On most Texas horned lizards, a light line can be seen extending from its head down the middle of its back (middorsal stripe). It is the only species of horned lizard to have dark brown stripes that radiate downward from the eyes and across the top of the head.

In other words: (1) single pair of occipital spines (2) 2 rows of lateral abdominal fringe scales (3) enlarged modified dorsal scales with 4 distinct keels (4) single row of enlarged gular scales (5) keeled non-mucronate ventral scales (6) postrictal scale absent and (7) white middorsal stripe.

P. cornutum differs from *P. solare* in lacking 4 large horns with bases that touch at the back of the head and from *P. coronatum* in having a single (vs. 2-3) row of enlarged scales on each side of the throat. *P. cornutum* also differs from *P. platyrhinos* in having a double row rather than a single row of pointed fringe scales on each side of the body. Other horned lizards have either much smaller horns or a dark middorsal stripe rather than a pale one.

M.1.4 General Ecology

Desert populations cycle in abundance, possibly following similar cycles of their primary prey (*Pogonomyrmex* harvester ants) (Price 1990). They can be found in arid and semiarid habitats in open areas with sparse plant cover. Because horned lizards dig for hibernation, nesting, and insulation purposes, they commonly are found in loose sand or loamy soils. At least 4 species of horned lizards (but not all species), including *P. cornutum,* squirt blood (up to 1/3 of their blood volume) from their eyes when attacked, especially by canine predators such as foxes and coyotes (Middendorf and Sherbrooke 1992). The canine will drop a horned lizard after being squirted and attempt to wipe or shake the blood out of its mouth, clearly suggesting the fluid has a foul taste.

The main methods of behavioral thermoregulation used by the Texas horned lizard are basking and burrowing. Throughout the morning hours, the lizard angles itself to maximize the amount of heat received when basking in the sun (Heath 1965). In order to keep cool, Texas horned lizards will burrow in the sand or hide in the shade. The burrowing process involves pushing the pointed snout into the sand and moving it from side to side. While continuing this movement, the body is inflated and is moved in the same way until the entire body is covered with sand (Heath 1965). The burrowing process is an important behavior in thermoregulation, since it can protect the lizard from heat or cold depending on the temperature of the soil in which the animal is buried (Potter and Glass 1931).

Hibernation is much like the daily burrowing activities of the lizard. However, during hibernation the animal will slow down its metabolism and can persist for long periods of time without food or water (Potter and Glass 1931). The hibernation season lasts from late summer to late spring (Bockstanz 1998). When they emerge from hibernation, the breeding season begins (Bockstanz 1998).

Another interesting behavior that may explain how it can persist in arid habitats is the process of "rain-harvesting." During heavy rains, the lizard will stand high on its feet, spread the body out flat, and lower the head so that falling rain will be funneled to the mouth through interscalar channels (Sherbrooke 1990).

M.1.5 Life History

M.1.5.1 Reproduction

P. cornutum females lay clutches of 14 to 60 eggs from May-July. Eggs hatch in about 6 weeks (Behler and King 1979). The breeding season begins in late April and continues into July (Seymour and Royo 1996). These lizards are oviparous and will lay their eggs in moist, sandy areas (Bartlett 1999). The eggs have a flexible, white shell, which measures 1.5 in.in diameter (Seymour and Royo 1996). The incubation period for the eggs is 45-55 days (Bartlett and Bartlett 1999). The hatchlings are approximately 1.25 in. long and are relatively smooth. However, the hatchlings do have the spines around their heads. There is no evidence of parental care for the young, so they must find food and defend themselves against predators immediately after hatching. The age of reproductive maturity is not known; however, they are full-grown adults at 3 years of age (Seymour and Royo 1996).

M.1.5.2 Phenology

Diurnal; Hibernates/aestivates. *P. cornutum* is active April to September in the north (Collins 1982; Hammerson 1982). Sometimes found on warm roads at night (Hammerson 1982).

M.1.5.3 Mobility/Migration

It is non-migratory. Home range size and movements seem quite variable. Munger (1984) found that single-season home range size in southern Arizona averaged 3 acres (1.3 ha) in females and 6 acres (2.4 ha) in males. Home range length extended up to about 400 m but often was 100-300 m, and some individuals that were observed more than 30 times moved over an area less than 55 m across. Some individuals tended not to remain in a limited area. Overlap of home ranges occurred but was not extensive.

In southern New Mexico, home range size was about 2 acres (1 ha) or less (Worthington 1972). Whitford and Bryant (1979) recorded movements of 9-91 m per day (average 47 m) in New Mexico. Individuals followed a zig-zag course and rarely crossed their own path.

In Colorado, Montgomery and Mackessy (in Mackessy 1998) reported that a juvenile moved approximately 100 m in 2 days. Another juvenile was recaptured 480 m from its original capture location after 47 days.

In Texas, total area of use varied from 291 square meters (25 days) to 14,690 square meters (116 days). Weekly home ranges appeared to be mobile (Fair and Henke 1999). Annual adult survival rate was between 9% and 54%.

In Oklahoma, average individual daily linear movements for all lizards was 45.0 m (range 10-220 m). Males moved significantly farther than females in but not after May when their average daily movements were very similar. Average individual daily activity area for all lizards was 232.8 square meters (range 1.7-3,011.4 sq. m), and males covered drastically larger areas in a day during May than did females (Stark et al. 2005).

M.1.5.4 Barriers to Movement

Busy highway or highway with obstructions such that lizards rarely if ever cross successfully; major river, lake, pond, or deep marsh; urbanized area dominated by buildings and pavement.

M.1.5.5 Habitat

Desert, Grassland/herbaceous, Shrubland/chaparral. *P. cornutum* burrows and/or uses soil, fallen logs, and debris. *P. cornutum* inhabits open arid and semiarid regions with sparse vegetation (deserts, prairies, playa edges, bajadas, dunes, and foothills) with grass, cactus, or scattered brush or scrubby trees (Degenhardt et al. 1996; Bartlett and Bartlett 1999; Hammerson 1999; Stebbins 2003). Soil may vary in texture from sandy to rocky. When inactive, individuals burrow into the soil, enter rodent burrows, or hide under rocks. Sheffield and Carter (1994) reported individuals that climbed 1-2 m up tree trunks when soils were wet after heavy rains. Eggs are laid in nests dug in soil or under rocks (Collins 1982). Since *P. cornutum* has declined extensively in Oklahoma, east Texas, and Arkansas, habitat use in these more forested ecosystems is not well documented.

M.1.5.6 Associated Species

Pogonomyrmex harvester ants are assumed to be an associated species.

M.1.5.7 Food

Invertivore. *P. cornutum* eats mainly ants but also other small insects (Stebbins 1985). The Texas horned lizard eats mainly harvester ants, *Pogonomyrmex* spp., but it will also eat grasshoppers, isopods, beetles, and beetle larvae. In order to obtain enough energy, adult Texas horned lizards must forage from several colonies of harvester ants. The Texas horned lizards' daily activities coincide with the times of highest ant activity (Donaldson et al. 1994).

M.1.6 Management Summary

In 1967, the Texas legislature passed protective legislation preventing collection, exportation, and sale of *Phrynosoma cornutum* from the state. Prior to this legislation, hundreds of thousands of horned lizards were exported (dead and alive) from Texas every summer to tourists, curiosity seekers and would be pet owners, leading only to demise of the lizards. Prohibitions against collecting and sale continue to be essential to conservation. Management of fire ants and conservation of native ants and habitat are likely essential to maintaining healthy populations.

Little is known about management needs, but increasing numbers of researchers in different parts of their range are conducting research on ecology, life history, and management. They seem dependent upon harvester ants, although maybe not as tightly as previously assumed. They may not survive well in areas with heavy Bermuda grass (similar to quail) and other non-native grasses. They may be dependent upon prescribed fire to maintain the habitat matrix they require. The majority of management recommendations are purely speculative.

M.1.7 Research Needs

Determine the number of populations and abundance. Monitor selected populations across the range to determine trends. Determine threats and monitor the spread of fire ants and their effect.

M.1.8 Observations at Fort Wolters

From TMD database

Scientific Name	Source	Facility	Obs. Date	No. Obs	Frequency	Capture Method
P. cornutum	Seen by LTC Huffman	Wolters	6-May-04	1	Rare	Visual
P. cornutum	TPWD	Wolters	1999	1		

Table M-1. Observations of *P. cornutum* on Fort Wolters

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M.2 *Dendroica virens* – Golden-cheeked Warbler

Scientific Name:	*Setophaga chrysoparia*	**Common Name:**	Golden-cheeked Warbler
Family:	Parulidae	**Order:**	Passeriformes
TSN:	178901	**Synonymy:**	

Figure M-3. *Dendroica virens*, TPWD file photo

Federal Status:	Endangered	**State Status:**	Endangered	**Other:**	PIF
Global Rank:	G2	**State Rank:**	S2B	**Rarity at Facility:**	Transient

M.2.1 Status Summary and Threats

The golden-cheeked warbler has a small breeding range in Central Texas with a winter range in the highlands of Southern Mexico and Central America. The species is vulnerable to habitat loss and fragmentation due to urbanization and landscape alteration. Land clearing to increase livestock production eliminates habitat. Harvesting of juniper trees for use as fence posts also impacts habitat (Campbell 2003). Another cause of habitat loss has resulted from the construction of reservoirs that flood deep canyons and riverbeds (Guilfoyle 2002). The bird is also vulnerable to nest and brood parasitism by the brown-headed cowbird and scrub jay. In its winter range, threats include deforestation for agriculture. The current population trend is declining in most of its breeding range with the possible exception of populations at Fort Hood, Texas (NatureServe Species Summary).

Population estimates from the period beginning in 1974 are as follows. The total population in 1974 was estimated at 15,000-17,000 individuals (Pulich 1976). A reassessment in 1990 suggested that only 4800-16,000 pairs could be supported in available breeding habitat (Collar et al. 1992). According to Ehrlich et al. (Ehrlich et al. 1992), an estimated 2,200-4,600 remained in 1990 (NatureServe Species Summary). Additional studies based on habitat availability corroborate this estimate with population estimated to be between 4,822 and 16,016 pairs (Ladd and Gass 1999).

M.2.2 Distribution

M.2.2.1 Global

Golden-cheeked warblers have a small breeding range in the Edwards Plateau, Lampasas Cut-Plain, and Llano Uplift regions of Central Texas. Their winter range is in pine-oak woodlands of Chiapas, Mexico, through Guatemala, Honduras, and Nicaragua (USFWS 1992).

M.2.2.2 State

The golden-cheeked warbler's breeding range is confined to approximately 33 counties in Central Texas, from Dallas south through the eastern and south-central portions of the Edwards Plateau.

M.2.2.3 On Fort Wolters

Transient, not observed

M.2.3 Diagnostic Characteristics

The golden-cheeked warbler is a small migratory songbird averaging 12 cm in length with a wingspan of approximately 20 cm. The male has a black back, throat, and cap. Both sexes have yellow cheeks with a black stripe through the eye and white breasts with black streaks on the flanks. Males and females have similar markings overall with the females being less colorful (Campbell 2003).

The golden-cheeked warbler's appearance differs from the black-throated green warbler (*Setophaga virens*) in that it lacks yellow on the under-parts and has a more clearly defined yellow ear patch (NatureServe Species Summary).

M.2.4 General Ecology

Migratory songbird that nests in Central Texas during April through July, and it spends winters in Southern Mexico and Central America. The species prefers mature dense oak-juniper woodland habitat and eats insects.

M.2.5 Life History

M.2.5.1 Reproduction

Nests are built and tended primarily by the females. Nests are constructed from juniper bark and camouflaged to look like the bark of the tree it is in. The nest is cuplike and placed in the fork of a vertical limb from 15 to 32 ft. above the ground (Campbell 2003). Clutches of 3-5 eggs are laid in April. Incubation, by female, lasts about 12 days. Young are tended by both parents, fledge in about 9 days, and may accompany adults for 30-40 days after fledging. Warblers usually nest only once per season unless a nest is lost to predation. Nesting into May and June represents additional attempts after failed nests (NatureServe Species Summary).

M.2.5.2 Phenology

Diurnal

M.2.5.3 Mobility/Migration

Golden-cheeked warblers arrive in Texas in early to mid-March. They depart for their winter range beginning in late June to mid-August (Campbell 2003).

M.2.5.4 Habitat

The golden-cheeked warbler's preferred nesting and breeding habitat is typically a dense mature oak and juniper woodland consisting of tall stands of Ashe juniper interspersed with other trees such as Texas oak, live oak, shin oak, post oak, cedar elm, hackberry, pecan, escarpment black cherry, and other deciduous trees. These woodlands are most commonly found in relatively mesic areas on steep slopes, in canyons, draws, and creek bottoms. A mixture of oaks and juniper is required for successful nesting. Golden-cheeked warblers can occasionally be found in arid oak-juniper woodlands and uplands on level or gently sloping areas (Campbell 2003).

Golden-cheeked warblers build nests from thin strands of juniper bark that slough off mature juniper trees. Therefore, the presence of mature juniper trees at least 20 years old and 15 ft. tall with bark sloughing off the trunks is required for suitable nesting habitat. The composition of woody vegetation varies within the habitat requirement with Ashe juniper frequently being the dominant species. Ashe juniper has represented from 10% to 90% of the trees in occupied habitats (Campbell 2003).

M.2.5.5 Associated Species

N/A

M.2.5.6 Food

Invertivore. Golden-cheeked warblers feed almost entirely on caterpillars, spiders, beetles, and other insects found in foliage (Campbell 2003).

M.2.6 Management Summary

In areas of golden-cheeked warbler habitat, disruption of the tree canopy should be avoided. Projects in or adjacent to habitat should be avoided during the breeding season. In areas where cowbirds are present, management strategies should be used to reduce nest parasitism (Campbell 2003).

In areas of marginal habitat, it is beneficial to reduce browsing pressure to allow for the reestablishment of shrubs, hardwood trees, and juniper. Allowing for re-growth of juniper in previously cleared areas or on mesic hillsides would allow for the eventual development of suitable habitat (Campbell 2003). In mesic areas where small junipers are dominant, selective thinning can encourage faster growth of remaining trees and can encourage the establishment of hardwood species, particularly if juniper slash is left in place as protection for seedlings (Campbell 2003).

The amount of edge in golden-cheeked warbler habitat should be minimized whenever practicable. Golden-cheeked warbler abundance and habitat quality is negatively affected by the amount of both large and small edge in a patch (Reidy 2014). Large edge is larger openings in the canopy created by fields and roads. Small edge is created by trails and smaller gaps that do not allow the canopy to close completely. Golden-cheeked warblers are also negatively affected by increased densities of small stems/twigs of both non-native and native species (Reidy 2014).

M.2.7 Research Needs

M.2.8 Observations at Fort Wolters

None

M.2.9 References

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M.3 *Geocarpon minimum* – Tiny Tim, Earth Fruit

Scientific Name:	*Geocarpon minimum*	**Common Name:**	Tiny Tim or Earth fruit
Family:	Caryophyllaceae	**Order:**	Caryophyllales
TSN:	200997	**Other Info:**	

Figure M-4. *Geocarpon minimum* at Fort Wolters, March 2019

Federal Status:	Threatened	**State Status:**		**Other:**	
Global Rank:	G2	**State Rank:**	S1	**Rarity at Facility:**	Uncommon

M.3.1 Status Summary and Threats

Species extant is at about 40 sites in Missouri, Arkansas, Louisiana, and Texas. Some sites are protected and appear to have good viability. Total population size is difficult to estimate due to great fluctuations. Threatened from hydrology changes, heavy disturbance, and development. This species is a specialist only growing in salt prairies of one kind. For example, in Texas, this species is only known from one salt prairie type, and even though the other type is very similar, the *Geocarpon* is not found there. It is suspected that the salinity may be a factor driving the presence/absence of the species. *Geocarpon* is found on the saltier salt prairie type (pers. comm. E. Keith).

M.3.2 Distribution

M.3.2.1 Global

Geocarpon is found in southwestern Missouri (Dade, Polk, Greene, and Lawrence Counties). Historically found in St. Clair and Jasper Counties, Missouri. It is found in 3 southeastern counties in Arkansas (Cleveland, Drew, and Bradley) and 1 northwestern county (Franklin). The species is also found at 2 locations in Louisiana (Wynn Parish). This species was discovered in Texas in 2004 in Anderson County (Keith et al. 2004)

M.3.2.2 State

The species is known from 4 counties in Texas (Anderson, Gregg, Harrison, and Panola). It was identified at Fort Wolters, Parker County, in 2019.

M.3.2.3 On Fort Wolters

Population appears to occur on the west side of Fort Wolters in 3 locations.

M.3.3 Diagnostic Characteristics

A small (1-4 cm tall) annual, ephemeral, succulent winter annual that usually completes its life cycle within a 4-week period in the spring. Young plants are grayish; mature plants reddish-purple. Flowers are inconspicuous with no petals but 5 minute reddish to red-green leaf life structures and 5 male pollen bearing structures.

M.3.4 General Ecology

Winter rosettes can begin producing flowering stems in early spring with flowering usually complete by the end of April. Tucker (1983) states that the life cycle of individual plants are completed in a 4-week period, and Morgan (1986) indicates that a period of 4-6 weeks passes from the initiation of growth in spring to senescence. Flower production varies from plant to plant with some plants producing 5-7 stems with 2-4 flowers per stem, and other plants being single stemmed with only 1-2 flowers produced (Morgan 1986). Seeds remain in dead capsules, and they are likely dispersed near the parent plant by wind or rain or by plants simply falling over.

M.3.4.1 Habitat

In Texas, earth fruit occurs in poorly draining, saline soils along the edges of shallow depressions in sparsely vegetated areas. In Missouri, *Geocarpon* grows on moist, sandy soils on exposed sandstone outcrops or glades, where ledges of fine sandstone, interbedded with shale, are exposed along small streams. The surrounding area, where deeper soils prevail, is savannah. Sites in Arkansas and Louisiana are characterized by very thin soils that are high in sodium and magnesium. Woody plants are nearly absent. In these saline prairies, the species occurs mostly in very thinly vegetated, barren-like areas.

M.3.5 Management Summary

A major threat to *Geocarpon* is the destruction or adverse modification of its habitat. In Missouri, some sites have been damaged by trampling and grazing by cattle. It has been suggested that physical disturbance may actually benefit *Geocarpon* at some sites by maintaining bare substrate for seedling establishment. A more serious threat is from pasture improvement with the subsequent invasion by prairie species. Natural recolonization of *Geocarpon* to areas of suitable habitat is not likely due to the low vagility of the species.

M.3.5.1 On Fort Wolters

Identify all areas with populations and monitor known populations annually. Protect areas from woody encroachment and development. Continue with Prescribed Fire Program and managing wild pigs. Management actions will be evaluated annually based on new data.

M.3.6 Research Needs

Seed germination and genetic variation of different populations.

M.3.7 Observations at Fort Wolters

All observations are from 2019 and made by either Eric Keith of Raven Environmental Services or Jason Singhurst of TPWD.

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