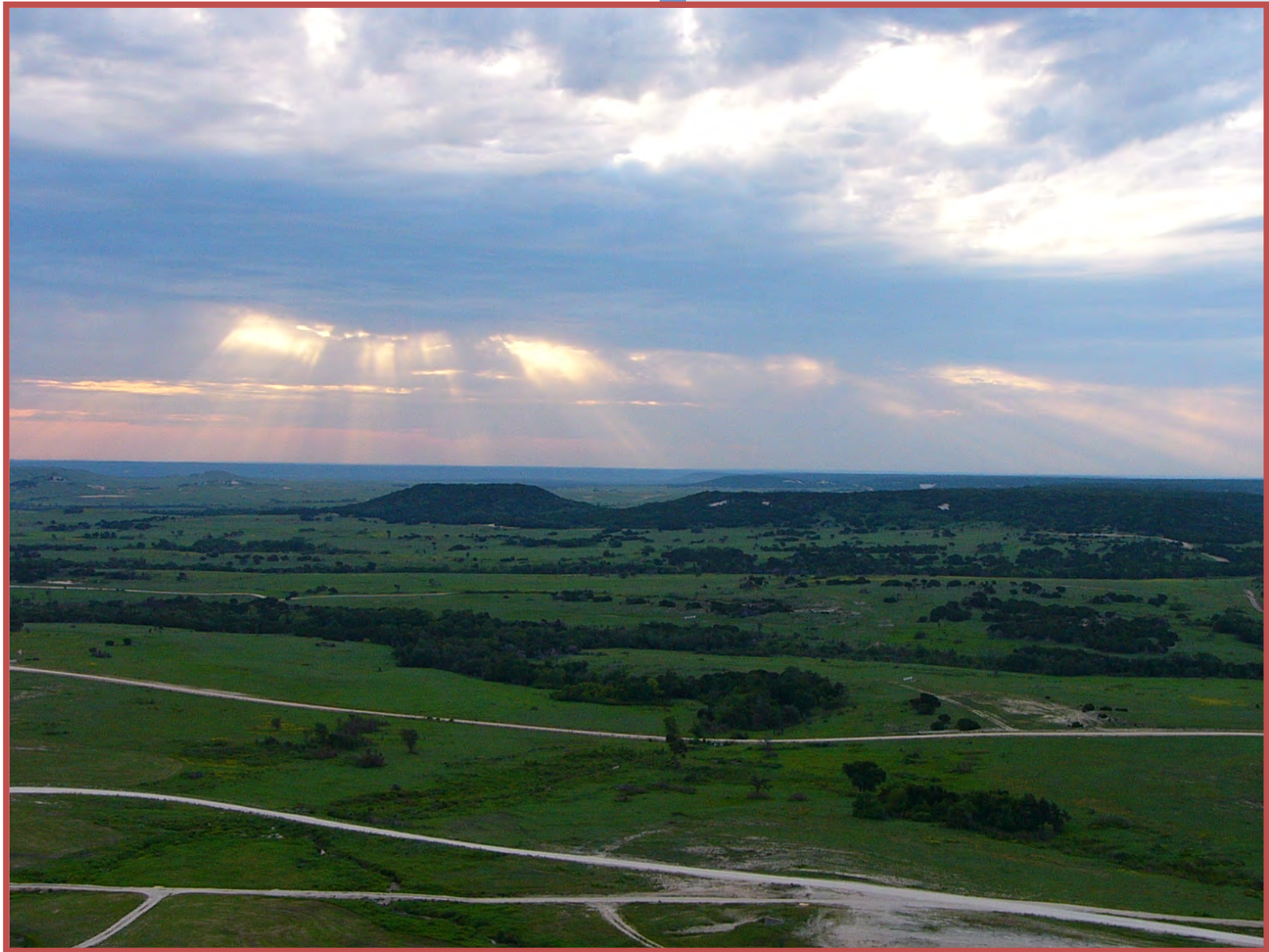


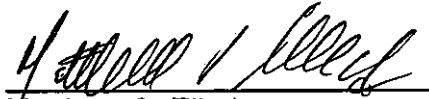
FY 2013- 2017

Fort Hood Integrated Natural Resource Management Plan



This Integrated Natural Resource Management Plan (INRMP) has been developed by III Corps and Fort Hood, Texas, in cooperation with the United States Department of the Interior, Fish and Wildlife Service, and the Texas Parks and Wildlife Department. The signatures below indicate the mutual agreement of the parties concerning the conservation, protection, and management of the installation's natural resources as presented in this plan.

Plan Approval


Matthew G. Elledge
Colonel, US Army
Garrison Commander

06 MAR 13
Date

Agency Agreement


Carter Smith
Executive Director
Texas Parks and Wildlife Department

16 January 2013
Date


Benjamin N. Tuggle, Ph.D.
Regional Director
U.S. Fish and Wildlife Service

12/27/2012
Date

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EXECUTIVE SUMMARY

PURPOSE

The purpose of this Integrated Natural Resources Management Plan (INRMP) is to guide the natural resources management program at Fort Hood, Texas, from fiscal year (FY) 2013 to 2017. An annual review is required to track any changes and evaluate the effectiveness with the Fish and Wildlife Service (FWS) and other appropriate state agencies. Each INRMP must be reviewed for operation and effect at least every 5 years. This INRMP will allow Fort Hood to achieve its goal to ensure the sustainability of desired future conditions while maintaining ecosystem viability. In addition, this INRMP will ensure that natural resource conservation measures and Army activities on Fort Hood land are integrated and consistent with federal stewardship requirements.

This plan also contains the associated documentation required for compliance with the National Environmental Policy Act (NEPA), which requires federal agencies to consider the environmental consequences of major proposed actions. The NEPA documentation is in the form of an Environmental Assessment (EA), which analyzes the potential consequences of the proposed action to implement the Fort Hood INRMP.

SCOPE

This EA identifies, documents, and evaluates the effects of implementing the INRMP for Fort Hood. The INRMP addresses the geographic area associated with the contiguous properties of Fort Hood, with particular emphasis on the training areas. The INRMP portion of the document provides management measures that were developed by considering various alternatives for meeting resource-specific goals and objectives at Fort Hood. The INRMP also provides the rationale for why certain management measures have been selected for implementation and others have not, based on analysis of resource-specific screening criteria. The EA portion of the document carries the INRMP's selected management measures forward as the proposed action. Some management alternatives were considered and dismissed from further consideration in developing the INRMP; therefore, the EA addresses only the proposed action and a no action alternative.

ENVIRONMENTAL COMPLIANCE

Under the Natural Resource Management on Military Lands Act of 1960 (Title 16 of the *United States Code* [U.S.C.] Sections 670a *et seq.*), commonly known as the Sikes Act, as amended by the Sikes Act Improvement Act of 1997,

The Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation in the United States under the jurisdiction of the Secretary. Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments shall carry out the program to provide for the conservation and rehabilitation of natural resources on military installations; the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses; and subject to safety requirements and military security, public access to military installations to facilitate the use.

Per 16 U.S.C. § 670a(b) of the Sikes Act Improvement Act of 1997, to the extent appropriate and applicable, this INRMP provides for the following:

- Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation
- Fish and wildlife habitat enhancement toward desired future conditions
- Wetland protection, enhancement, and restoration (where necessary) for the support of fish, wildlife, or plants
- Integration of, and consistency among, the various activities conducted under the plan
- Establishment of specific natural resource management goals and objectives and time frames for the proposed action
- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources
- Public access to the military installation that is necessary or appropriate for the use described above, subject to the requirements necessary to ensure safety and military security
- Enforcement of applicable natural resource laws (including regulations)
- No net loss in the capability of military installation lands to support the military mission of the installation
- Such other activities as the Secretary of the Army determines appropriate

In preparing this INRMP, Fort Hood has maintained its commitment to ensure that environmental considerations are integral to the mission and has complied with Army Regulation 200-1, *Environmental Sustainability and Stewardship*; the Department of the Army's INRMP Policy Memorandum (21 March 1997), titled *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)*; and Title 32 of the *Code of Federal Regulations*, Part 651, *Environmental Analysis of Army Actions*. In addition, this INRMP provides the guidance necessary for Fort Hood to maintain compliance with the Endangered Species Act, the Clean Water Act, and Executive Order 11990 (Protection of Wetlands).

SUSTAINABILITY AND THE MILITARY MISSION

Fort Hood has developed Desired Future Conditions of the installation to accommodate the expected increase in training, ensure the long-term sustainability of the training lands, and provide protection for sensitive and federally protected species. The implementation of this INRMP is expected to maintain the ecological integrity of the landscape and ensure that there is no net loss in the capability of Fort Hood training lands to support the military mission. In addition, the implementation of this INRMP will allow Fort Hood to continue to promote compatible multiple uses of its training lands, such as grazing, hunting, fishing, and other outdoor recreational pursuits to occur in conjunction with military training.

HIGH-PRIORITY PROJECTS

The prioritization of the projects is based on need, and need is based on a project's importance in moving the natural resources management program closer to successfully achieving its goal. Projects will be conducted subject to the availability of funding. The high-priority projects identified by the NRMB, in alphabetical order, are as follows:

- Brown-headed cowbird control
- Bat habitat and roost management
- Carnivore population monitoring
- Cave microclimate monitoring
- Cave survey, mapping, and inventory
- Cave fauna survey and monitoring
- Construct off-site wetland mitigation banks if required
- Construction and maintenance of fire breaks

- Ecosystem plantings
- Endangered species research
- Fire damage abatement projects
- Fisheries management
- Endangered species habitat delineation
- Implementation of karst management plan
- Lake and pond management
- Migratory Bird management
- Oak wilt management in endangered species habitat
- Planning Level Surveys
- Prescribed burning for ecosystem management
- Protection and conservation of T&E species: golden-cheeked warblers
- Protection and conservation of T&E species: black-capped vireos
- Repair of eroded and damaged trails
- Salamander habitat (springs and caves) monitoring
- Stream water sampling stations and mitigation
- Survey of Texas horned lizard, as needed
- Training lands management plan
- Wetland surveys
- Wildlife management

ENVIRONMENTAL CONSEQUENCES

The EA findings, summarized in Table ES-1, are consistent with the goals of the natural resources management program to ensure the long-term sustainability of desired future conditions; to maintain, protect, and improve ecological integrity; to protect and enhance biological communities, particularly sensitive, rare, threatened, and endangered species; to protect the ecosystems and their components from unacceptable damage or degradation; and to identify and restore degraded habitats. The implementation of the INRMP would directly and positively affect the health and condition of natural resources at Fort Hood. No significant cumulative effects would be expected. Because no significant environmental impacts would result from implementation of the proposed action, preparation of an Environmental Impact Statement is not required and preparation of a Finding of No Significant Impact is appropriate.

Table ES-1
Summary of Potential Environmental Consequences

Resource Area/Environmental Condition	Environmental Consequences	
	No Action	Proposed Action
Land Use	Moderate adverse effects	Beneficial effects
Soils	Moderate adverse effects	Beneficial effects
Water Resources	Moderate adverse effects	Beneficial effects
Wetlands	Moderate adverse effects	Beneficial effects
Aquatic Habitat	Moderate adverse effects	Beneficial effects
Terrestrial Habitat	Moderate adverse effects	Beneficial effects
Fish and Wildlife	No effects	Beneficial effects
Endangered, Threatened, and Rare Species	No effects	Beneficial effects
Cultural Resources	Minor adverse effects	Beneficial effects
Facilities	No effects	No effects
Air Quality	No effects	No effects
Noise	No effects	No effects
Hazardous and Toxic Materials	No effects	No effects
Socioeconomic Resources	No effects	No effects
Environmental Justice	No effects	No effects

Cumulative Effects

Adverse effects

Beneficial effects

SECTION 1.0: OVERVIEW

The Army is committed to environmental stewardship in all actions as an integral part of its mission and to ensure sustainability. (Army Regulation 200-1, Environmental Sustainability and Stewardship, 2007)

The purpose of this Integrated Natural Resources Management Plan (INRMP) is to guide the natural resources management program at Fort Hood, Texas, from 2013 through 2017. An annual review is required to track any changes and evaluate effectiveness with the Fish and Wildlife Service (FWS) and other appropriate state agencies. Each INRMP must be reviewed for operation and effect at least every 5 years. This INRMP will allow Fort Hood to achieve its goal to ensure the sustainability of desired future conditions while maintaining ecosystem viability. In addition, this INRMP will ensure that natural resource conservation measures and Army activities on Fort Hood land are integrated and are consistent with federal stewardship requirements.

1.1 INRMP VISION

Under the Natural Resource Management on Military Lands Act of 1960 (Title 16 of the *United States Code* [U.S.C.] Sections 670a *et seq.*), commonly known as the Sikes Act, as amended according to the Sikes Act Improvement Act of 1997,

The Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation in the United States under the jurisdiction of the Secretary. Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments shall carry out the program to provide for the conservation and rehabilitation of natural resources on military installations; the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses; and subject to safety requirements and military security, public access to military installations to facilitate the use.

Per 16 U.S.C. § 670a(b) of the Sikes Act Improvement Act of 1997, to the extent appropriate and applicable, this INRMP provides for the following:

- Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation
- Fish and wildlife habitat enhancement or modifications
- Wetland protection, enhancement, and restoration (where necessary) for the support of fish, wildlife, or plants
- Integration of, and consistency among, the various activities conducted under the plan
- Establishment of specific natural resource management goals and objectives and time frames for proposed action
- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources, or mission requirements
- Public access to the military installation that is necessary or appropriate for the use described above, subject to the requirements necessary to ensure safety and military security
- Enforcement of applicable natural resource laws (including regulations)
- No net loss in the capability of military installation lands to support the military mission of the installation
- Such other activities as the Secretary of the Army determines appropriate

The Army's commitment to the conservation of its natural resources is further reflected in Army Regulation (AR) 200-1, *Environmental Sustainability and Stewardship* (2007) and Headquarters, Department of the Army's (HQDA's)

INRMP Policy Memorandum (21 March 1997), titled *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)*. Two of the major program goals of AR 200-1 are to “integrate environmental stewardship and compliance responsibilities with operational requirements to help achieve sustainable ranges and training areas” and to “develop, initiate, and maintain forward-looking programs for the conservation, utilization, and rehabilitation of natural resources on Army lands” (HQDA, 2007). The INRMP Policy Memorandum states that the purpose of completing the INRMP is “to ensure that natural resource conservation measures and Army activities on mission lands are integrated and are consistent with federal stewardship requirements” (HQDA, 1997).

Title 32 of the *Code of Federal Regulations* (CFR) Part 651, Environmental Analysis of Army Actions, “sets forth policy, responsibilities, and procedures for integrating environmental considerations into Army planning and decision making” (67 FR 15290, March 29, 2002). In particular, 32 CFR 651.12, Integration with Army Planning, states that “The Army goal to integrate environmental reviews concurrently with other Army planning and decisionmaking actions avoids delays in mission accomplishments. To achieve this goal, proponents should provide complete environmental documents for early inclusion with any recommendation or report to decisionmakers (Master Plan, Natural Resources Management Plan, Remedial Investigation, FS [Feasibility Study], etc.). The same documents will be forwarded to planners, designers, and/or implementers so that recommendations and mitigations on which the decision was based may be carried out.”

This document reflects Fort Hood’s commitment to conserve, protect, and enhance the natural resources necessary to provide sustainable military training for soldiers.

1.2 STRATEGIC GOALS AND OBJECTIVES

The strategic goal of this INRMP for Fort Hood conforms to the goal of the Conservation Program of the Department of Defense (DoD), which is to support the military mission by:

- Providing for sustained use of its land and air resources
- Protecting valuable natural and cultural resources for future generations
- Meeting all legal requirements
- Promoting compatible multiple uses of those resources

Fort Hood’s Natural Resources Management Branch (NRMB) has identified a number of objectives necessary to achieve this goal:

- Manage all resources to support long-term sustainment of the installation’s training mission.
- Implement a natural resources management program that reflects the principles of ecosystem management.
- Provide special protection and management that leads to the recovery of threatened and endangered species and conserve species of special concern and their habitats so that new species are not listed.
- Manage wildlife and fisheries resources within the principles and guidelines of ecosystem management to maintain productive habitats and viable populations of native species.
- Monitor outdoor recreational opportunities to ensure they do not conflict with the military mission.
- Use adaptive techniques to provide the flexibility to management strategies based on increased knowledge and data gained from monitoring programs and scientific literature.
- Seek to maintain or increase the level of biodiversity of native species.
- Prevent the degradation of water quality, protect aquatic and riparian habitats, and identify and restore degraded habitats.

- Protect soil resources from erosion and destabilization through prevention and restoration efforts.
- Protect and preserve cultural resources.
- Protect rare and unique plant species identified as state or locally rare, but without legal protection status, to the extent practical without restrictions on operations.
- Protect sensitive and ecologically significant habitats located on Fort Hood.
- Provide a positive contribution to the community by offering informative and educational instruction and opportunities.
- Protect forest and woodland resources from unacceptable damage and degradation resulting from insects and disease, animal damage, invasive species, and wildfire; and manage the resources in a manner that supports the military mission.

The primary goals of the natural resources management program, as established by Fort Hood and described above and in detail in Section 3.0, are to maintain ecosystem viability and ensure the sustainability of desired future conditions; to maintain, protect, and improve ecological integrity; to protect and enhance biological communities, particularly sensitive, rare, threatened, and endangered species; to protect the ecosystems and their components from unacceptable damage or degradation; and to identify and restore degraded habitats. There are many ways to further define degraded habitats. For example, fisheries habitat restoration may involve adding underwater structure or reducing algae growth. Prescribed burning, another example, is a major habitat restoration tool for improving white-tailed deer food sources or improving the composition of native grassland species. Prescribed burning (and other mechanical methods) can also be used to improve degraded black-capped vireo habitat, which is habitat that has become too overgrown to support vireos.

The ability to achieve these goals depends directly on the health and condition of the natural resources. Protecting the ecological and biological integrity of the training lands ensures that those lands will continue to provide the vegetation, soil, and water resources necessary for sustainable military training. Such protection will also preserve popular outdoor recreational activities at Fort Hood, such as hunting, fishing, birding, boating, and hiking. Implementing ecosystem management principles will provide the quantity and diversity of fish and game for enjoyable hunting and fishing experiences. Proper management of the terrestrial ecosystems will maintain the water quality at a level that can support fisheries and presents no potential risks to human health from swimming or boating.

To protect cultural resources, the military trainers and the natural resources staff will maintain adequate communication with the cultural resources staff. All activities on the reservation having the potential to affect cultural resources will be coordinated with the cultural resources staff.

The natural resources management program must remain flexible if it is to achieve long-term success. The program will achieve and maintain this flexibility by incorporating adaptive management techniques.

Adaptive management is a process by which new information from monitoring data, scientific literature, or both is used to evaluate the success of the management measures currently in place. This information is then used to determine changes in the management approach needed to ensure continued success of the program. The natural resources management program might also be required to adapt to unforeseen changes in military mission and legal requirements.

Since maintaining optimal environmental conditions on training lands is essential for the success of the military mission at Fort Hood, the focus of this INRMP is on management of natural resources in the training areas. Management measures have been developed based on current conditions of the resources, and the military mission and activities as they are anticipated.

1.3 RESPONSIBILITIES AND INTERESTED PARTIES

The level of success of this INRMP can be enhanced by forming partnerships with other parties that have a vested interest in the responsible management of the natural resources at the installation. A brief description of the parties directly responsible for the implementation of this INRMP, as well as other interested parties, is provided below.

1.3.1 Fort Hood

The roles of the organizations at Fort Hood that are directly responsible for, or are providing assistance in, the implementation of this INRMP are described below.

Commanding General. The Commanding General has the overall responsibility for the implementation of the INRMP, including sustaining readiness training and complying with all laws and regulations associated with the protection of the installation's natural resources.

Garrison Commander. The Garrison Commander conducts base operations in support of Fort Hood and tenant activities, including the preparation and implementation of an INRMP for the installation.

Directorate of Public Works (DPW). DPW develops coordinated master plans for future development and allied construction programs, coordinates utility and environmental programs, conducts high-visibility and command-interest studies to evaluate the effectiveness of current operations, and ensures that construction projects comply with the terms of the INRMP.

Environmental Division (ENV). ENV is responsible for the conservation, restoration, protection, and enhancement of the environment at Fort Hood. This includes the management and oversight of the natural resources (land, fish and wildlife), water pollution abatement, pest management, cultural resources, recycling, hazardous waste management, NEPA, and energy programs, as protected in the INRMP.

Environmental Management Branch. The EMB manages, coordinates, and monitors a variety of environmental plans and programs, requests and maintains certain state and federal operating permits or exemptions for solid waste, hazardous waste, air emissions, water use, and storm water and wastewater discharges. The EMB reviews the INRMP for correctness in the areas related to their functional areas of expertise and provides data on an annual basis.

Natural Resources Management Branch (NRMB). ENV's NRMB is charged with managing all aspects of the INRMP, including the review of information, the addition of data as required, and the collection of comments from other agencies and directorates, both on and off post. NRMB manages, coordinates, and monitors natural resources, fish and wildlife, land, and pest management. It also protects and improves fish and wildlife habitats; establishes and recommends protective measures and practices in construction and maintenance activities to avoid pollution, burning, and unnecessary destruction of habitat; monitors, investigates, and recommends management and procedures related to game animals, birds, and fish; surveys and recommends improvements for food, cover, and water sources for wildlife; develops and monitors fish and wildlife inventories and population indices; maintains liaison with state land grant colleges and other local, state, and federal wildlife management agencies; recommends, implements, and inspects fish and wildlife development projects through unimproved grounds section and rehabilitation contracts; prepares reports, interagency agreements, and long-range plans related to program development and future planning; coordinates with the Directorate of Family, Morale, Welfare, and Recreation (DFMWR), and other elements to ensure safe and efficient conduct of hunting and fishing activities; collects and analyzes biological data during annual deer and turkey harvests; manages the funds and budget for fish and wildlife activities; performs the function of staff agronomist and entomologist; develops, prepares, and monitors long-range plans for the use and improvement of natural resources programs; develops, manages, and coordinates agricultural out-lease programs and pest management plans; prepares and reviews plans for service projects and in-house landscape, natural resources, and pest control projects; operates a

geographic information system for the collection and analysis of automated natural resource databases; monitors projects and coordinates with proponent and regulatory agencies to ensure compliance with Section 404 of the Clean Water Act; coordinates and consults with the U. S. Fish and Wildlife Service (USFWS) to ensure compliance with the Endangered Species Act; conducts endangered species research and provides oversight and approval for all endangered species research conducted by university personnel, students or other researchers; and coordinates the clearance of machine-assisted excavation in unimproved grounds.

Directorate of Plans, Training, Mobilization, and Security (DPTMS). DPTMS, particularly the Range Division, assists NRMB in natural resource management because they work directly with troops training in the field. DPTMS is responsible for the scheduling of training lands and range complexes and for training land management and repair, administering the Integrated Training Area Management (ITAM) program in close coordination with the NRMB. The DPTMS also provides awareness training to the troops on the importance of protecting natural resources when in the field. The Integrated Training Area Management (ITAM) program relies on its five components and integrated management Headquarters Department of the Army (HQDA), Army Command (ACOM), Army Service Component Command (ASCC), Direct Reporting Unit (DRU), and Installations to accomplish its mission. The five components are Training Requirements Integration (TRI); Land Rehabilitation and Maintenance (LRAM); Range and Training Land Assessment (RTLA); Geographic Information Systems (GIS) and Sustainable Range Awareness (SRA). These components combine to provide the means to understand how the Army's training requirements impact land management practices and what the impact of training is on the land, how to minimize and/or mitigate and repair the impacts, and communicate the ITAM message to Soldiers and the public. The ITAM plan is included in the Land Sustainment Management Plan which can be found in Appendix A of this document. ITAM also conducts short range training plans in its 5 Year Workplan. (Integrated Training Area Management Work Plan, March 2011).

Directorate of Family, Morale, Welfare, and Recreation (DFMWR). DFMWR is responsible for administration of the outdoor recreation program, including the sale of hunting and fishing permits and licenses through the Sportsmen's Center, and the guided hunt program.

Directorate of Emergency Services (DES). The DES provides natural resources law enforcement on the installation, including enforcement of hunting, fishing, archaeological, and environmental statutes and regulations. The DES has partial responsibility for conducting domestic animal control. The DES documents reports of endangered species habitat violations and works with NRMB to ensure compliance with wildlife harvest quotas, disposes of dead wildlife resulting from motor vehicle operations, and provides a portion of the training required for hunter safety certification. The DES serves as fire marshal, providing fire prevention and protection for the installation, as well as manages the prescribed burn program on Fort Hood.

1.3.2 Other Defense Organizations

U.S. Army Corps of Engineers (USACE), Fort Worth District. The Fort Worth District has responsibility for some military construction on Fort Hood. The USACE has jurisdiction over the waters of the U.S. and the Fort Worth District, Regulatory Branch administers permits for impacts to waters of the U.S. on Fort Hood in accordance with Section 404 of the Clean Water Act. In addition, the District assists Fort Hood with the administration of a livestock grazing lease, as well as other natural resource management needs.

U.S. Army Corps of Engineers Environmental Research Laboratory (CERL). Tim Hayden of USA-CERL collaborates with a number of universities for research studies at Fort Hood. Details are provided below under Section 1.3.5, Universities.

U.S. Army Environmental Command (USAEC). USAEC is a field operating agency under the Assistant Chief of Staff (Installation Management), Department of the Army. USAEC is responsible for providing support for conservation programs to Army installations, and provides direct support/guidance on programs such as the Army Compatible Use Buffer (ACUB) program.

1.3.3 Other Federal Agencies

A number of federal agencies, in addition to DoD and Fort Hood, have an interest or a role in the management of natural resources at Fort Hood. The involvement of these agencies is based on signatory responsibilities, cooperative agreements, regulatory authority, and technical assistance as required by federal laws and regulations. The participating agencies include U.S. Department of the Interior (DOI), USFWS, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), and the USDA Forest Service.

1.3.4 State Agencies

In addition to federal agencies, the Texas Parks and Wildlife Department (TPWD) is a state agency who also plays an important role in the management of natural resources, specifically with fish and wildlife management, at Fort Hood.

1.3.5 Universities

Several universities are active participants in projects at Fort Hood. An overview of this research is provided below.

Texas AgriLife, Blackland Research Extension Center (BREC). ITAM funds BREC RTLA to document off post, oncoming sediment monitoring, gully plug erosion monitoring, and the installation flood warning system.

The University of Illinois (U of I) collaborates with USA-CERL on a number of projects at Fort Hood.

Past investigations include a radiotelemetric study of the rat snake (a major nest predator) and research on a new species of Plethodontid salamander. Fort Hood and USA-CERL recently received a Section 6 grant from the State of Texas and the USFWS to conduct a radio-telemetry study of fledgling black-capped vireos to determine habitat utilization and dispersal patterns. U of I currently manages NRMB's seasonal personnel.

The University of Texas provides expertise to Fort Hood for karst invertebrate taxonomy.

University of North Texas (UNT) assists Fort Hood with several projects related to white-tail deer in Central Texas. A past project included implementation of a deer population and migration study on the installation, which includes netting, collaring, and tagging of white-tail deer. Collars collected data through GPS transmitters.

University of Washington is collaborating with NRMB personnel on a SERDP-funded project that seeks to develop an understanding of source-sink dynamics in the black-capped vireo.

In recent years, Fort Hood has sponsored graduate projects at the University of Oklahoma, University of Vermont, University of Missouri, and the University of Illinois.

TAMU has conducted an annual forage inventory to provide information necessary for determining grazing allotments.

1.3.6 Contractors

Contractors provide DPW with technical support for natural resources and environmental management projects. This technical support includes preparation of the INRMP, National Environmental Policy Act (NEPA) analyses and documentation, cultural and biological resource surveys, and general natural resources support.

1.3.7 Other Interested Parties

The Nature Conservancy (TNC). TNC provided support to Fort Hood's endangered species management program since 1993 through cooperative agreements. The cooperative agreement provided a mechanism for transfer of funds to TNC for implementing tasks required under the terms and conditions of the Biological Opinion agreement with the USFWS. The flexibility provided by the agreement allowed for the application of dynamic processes driven by the data, rather than being dictated by contract terms. The nonprofit status of TNC reduced administrative costs, provided an excellent value to the Army, and the cost-reimbursement basis for payment added flexibility by allowing for minor refinements in project scopes and requirements within the general budget framework. TNC provided support to Fort Hood in the following areas:

- Black-capped vireo research and monitoring
- Golden-cheeked warbler research and monitoring
- Brown-headed cowbird management and research
- Vegetation ecology research and management
- Mapping and remote sensing
- Prescribed fire and habitat management
- Karst management and survey
- Off-post habitat protection
- Invasive species management

More detailed information on these projects and work areas will be provided in Sections 2.0 and 3.0.

In January 2011, the **University of Illinois (U of I)** took over some of TNC's responsibilities on Fort Hood such as hiring seasonal personnel and managing the karst research and contract. Fort Hood personnel have assumed full responsibility for other tasks such as research and monitoring of endangered species, mapping and remote sensing, and prescribed fire and habitat management.

Cooperation with Other Agencies. At the request of the USFWS, the Fort Hood Endangered Species Management Program serves as the coordinator for all color-banding efforts across the ranges of both the black-capped vireo and the golden-cheeked warbler. This occurred because the volume of banding data produced by the Fort Hood effort vastly exceeded that from the combined efforts of all other banders, and because Fort Hood personnel had developed a computer program to generate all possible color combinations with a designated number of colors. Fort Hood serves as the issue point and clearinghouse for all colorbanding data and maintains a cooperative relationship with the Balcones Canyonlands National Wildlife Refuge, the Texas Department of Transportation, and the Texas Parks and Wildlife Department, along with a number of private consulting agencies. In addition, Fort Hood personnel served on the Biological Advisory Team during the development of the Austin Regional Habitat Conservation Plan.

1.4 MILITARY MISSION

1.4.1 Military Mission and Strategic Vision of Future Land Use

Fort Hood's mission is to provide an efficient and effective power projection platform—training, mobilization, deployment, and sustainment support—to produce the world's best trained and most lethal war fighters. Fort Hood provides state-of-the-art facilities to support the full spectrum of training requirements of today's modern armed forces. Installation lands and ranges provide excellent training opportunities for mechanized maneuver and small unit exercises, combined arms training, and live-fire training.

Many different types of military units conduct a variety of training on Fort Hood. Representative units and their subsequent activities are listed below.

Headquarters III (US) Corps ("The Phantom Corps"): A major subordinate command of US Army Forces Command (FORSCOM), provides command and staff oversight of all assigned units at five installations, including Fort Hood. In January 2005, Headquarters III Corps returned from a year-long deployment to Iraq as Headquarters, Multinational Corps-Iraq, responsible for all tactical operations and intelligence functions in the theater.

1st Cavalry Division ("America's First Team"): A fully modernized armored division of 17,000 personnel. In March, 2005, the division returned from a year long tour of duty in support of Operation Iraqi Freedom 2, having helped establish the stability and security required for Iraq's January 30, 2005 national elections.

1st Army Division West: First Army's Division West conducts training readiness, oversight, and mobilization of designated active and reserve component forces in the western area of responsibility in order to provide trained and ready forces to regional combatant commanders.

Division West supports pre-mobilization training for reserve component forces, assesses and reports pre-mobilization readiness for reserve component forces, conducts mobilization and demobilization operations, conducts counter-improvised explosive device, counter insurgency and escalation of force training, provides command and control over assigned and mobilized forces, and provides operational force protection.

13th Sustainment Command (Expeditionary) ("Phantom Support"): With 6,000 Soldiers, this is the "Logistical Backbone" of III Corps, providing supply, maintenance, transportation, field services, medical, engineering construction, smoke generation, and decontamination services. Virtually all 13th COSCOM units have deployed at least once to Operation Iraqi Freedom; many two or three times and a few are on a fourth rotation to Iraq now.

3rd Cavalry Regiment ("Brave Rifles"): Organized in May, 1846 as a Regiment of Mounted Riflemen, the 3d CR is a combined arms organization of 5,000 personnel with highly specialized scouting and security capabilities. The Regiment has completed a one year tour in Iraq, has returned to its current duty station at Fort Hood.

21st Cavalry Brigade (Air Combat): A unique unit of 100 aviator-instructors and support personnel, responsible for fielding and training all U.S. active Army AH-64 "Apache" attack helicopter battalions and squadrons. The brigade has also fielded National Guard units, U.S. Army Reserve aviation battalions, the Royal Netherlands and Singapore Air Force squadrons, and other allied units.

36th Infantry Division (Texas ARNG): Formally 49th Armor Division (Texas ARNG), the ARNG, with 4,800 personnel, has a partnership with Fort Hood that prioritizes their training during the summer months of June and July, plus the unit has training priority on weekends throughout the year, if scheduled.

Other Major Tactical Units: Fort Hood is also home to 3,300 soldiers assigned to corps-level communications, military police, military intelligence and finance units. In FYs 04 through 06, 80% of the personnel assigned to these units deployed at least once in support of Operation Iraqi Freedom. Many are back in Iraq on second or third tours, or in the process of returning before the end of 2012.

Consolidated Technical Support Facility (CTSF): The CTSF is the Department of Defense's only facility for the rapid development, fielding, and support of leading edge, survivable, secure, and interoperable tactical/theater/strategic Command, Control, Communications and Computer (C4) systems. It provides "system of systems" integration testing and configuration management to support Army digitization and Transformation requirements.

Reserve Components: Since 9/11/01, over 30,000 U.S. Army Reserve and Army National Guard Soldiers have been mobilized, trained, equipped, and deployed from Fort Hood. On average, 22,000 Reserve Component Soldiers train at Fort Hood each year and much of their equipment is stored at the installation. The Military Equipment and Training Site (MATES) at North Fort Hood provides storage and support for 850 pieces of heavy equipment assigned to the 36th Infantry Division (Texas ARNG) and 256th Infantry Brigade (Louisiana ARNG), while an Equipment Concentration Site (ECS) stores and supports 1700 additional pieces of equipment for the Army Reserve. Fort Hood's ability to provide both garrison and field exercise support remains key to our nation's Reserve Component readiness.

Fort Hood's strategic vision reflects the Army Strategy for the Environment, which is "Sustain the Mission. Secure the Future," and the installation is committed to observing applicable federal, state, and local laws and regulations aimed at sustaining the installation and the environment. The lands at Fort Hood are used primarily for military training, and environmental compliance is necessary to conserve the land and its natural resources (Fort Hood, 2004e). The strategy for a sustainable Army is it supports the Army in all its missions and applies to all Army units, organizations, personnel, suppliers, support contractors, and partners. The Strategy for the Environment is designed to accelerate the Army's potential to successfully innovate and improve operations. It provides a continuing return on Army investment by more effectively applying resources to meet the Army's mission. It commits to a focus that meets today's needs and anticipates tomorrow's challenges.



The purposes of the strategy are to:

- Strengthen the Army contribution to joint operational capability
- Meet current and future training, testing, and other mission requirements
- Improve our ability to operate installations, to include growing joint interdependency
- Reduce costs and minimize impacts so the Army can do more, and do it better
- Enhance human health, safety, and well-being
- Be an active citizen within our communities, as well as a good neighbor

In a June 2010 memorandum, MG William Grimsley reiterated the importance of Fort Hood's Environmental Policy. He states that, in accordance with E.O. 13423, Fort Hood has an Environmental Management System, or EMS, that conforms to the International Organization for Standardization (ISO) 14001. It states that Fort Hood is committed to managing the environment through leader involvement. The management practices implemented now will facilitate our ability to fight and win wars today, without compromising the ability of future generations of Soldiers to do the same.

The commitment to comply with all legal requirements is the minimum standard. Fort Hood must strive for performance beyond compliance in all operations. It is Fort Hood's responsibility to ensure we are using our natural resources in a manner that provides a clean, healthy, and safe environment today and in the future.

Fort Hood's EMS is best represented in the SCALE logo which is posted at hundreds of locations across the installation.



Further, the installation follows a specific set of guiding principles:

- All personnel are responsible for protecting and sustaining the environment.
- Minimize or eliminate waste generation from all operations to reduce impact on the air, water, land, and surrounding community.
- Sustain effective partnerships with community stakeholders and remain attentive to their concerns.
- Prevent pollution.

1.4.2 Mission Statement

Fort Hood Garrison's Mission. U.S. Army Garrison Fort Hood provides and maintains the installation infrastructure to support power projection and training of Fort Hood units and Soldiers; maintains a quality living and working environment for Soldiers, Families, retirees, and authorized civilians; sustains an effective partnership with

surrounding communities; serves as Commanding General (CG) Fort Hood's executive agent for mobilization; and supports the III Corps/Fort Hood transformation process.

Fort Hood Garrison's Vision. The Army's model power projection platform, training installation, and community. A "Great Place" to train, work, and live.

1.4.3 Future Mission Requirements

Army operations are changing significantly. Conflict is persistent rather than episodic. The new security environment and corresponding changes in strategy have profound implications for the Army. To deal with a state of persistent but uncertain conflict, the forces the Army builds for the future must be versatile and led by agile, adaptive leaders. These forces must be prepared to face unexpected circumstances, complex challenges, asymmetric threats, and a full spectrum of conflict from peacetime engagement to conventional war. The Army must continue to build that force keeping two goals in mind: (1) creating a campaign-quality and expeditionary Army capable of supporting the needs of combatant commanders in a joint, multi-National, or coalition force; and (2), preserving the all-volunteer force so they and their Families are ready when and where we need them. Training will look like today and pre 9-11 full-spectrum, deep-battle training, with the exception of the conversion of 3rd ACR to Stryker.

1.5 INSTALLATION LAND USE

1.5.1 Location and Brief Description

Fort Hood occupies approximately 218, 419 acres in central Texas in Bell and Coryell counties. It is 58 miles north of Austin, Texas, and 39 miles southwest of Waco, Texas (Figure 1-1) (USACE, 2003).

The installation has three cantonment areas (designated the Main Cantonment Area, West Fort Hood, and North Fort Hood) on 8,604 acres, two instrumented airfields on 2,915 acres, and maneuver and live-fire training areas on 197,603 acres (Figure 1-2). The cantonment areas have primarily urban land uses. The Main Cantonment Area is at the southern edge of the large, central portion of the installation and is adjacent to Killeen, Texas. West Fort Hood is near Copperas Cove, Texas, in the center of the southern extension of the installation. North Fort Hood is near Gatesville, Texas, in the northernmost part of the installation (USACE, 2003).

Both urban and rural areas surround Fort Hood. The urban areas include the cities of Killeen, Harker Heights, and Copperas Cove near the southern boundary and the city of Gatesville north of the installation. Urban land uses are primarily residential, business, and industrial. The rural areas surrounding Fort Hood support the agricultural land uses of farming and ranching (cattle). Nearby Belton and Stillhouse Hollow reservoirs provide excellent recreational opportunities for surrounding communities and Fort Hood residents (Fort Hood, 2004a).

1.5.2 Historic Land Use

Before Pioneer settlement, Fort Hood was a mixture of grasslands, oak mottes/savannahs, shrubland, oak-juniper forests, and riparian corridors. These vegetation communities reflect Fort Hood's location at the intersection of the Edwards Plateau and Cross Timbers and Prairies ecoregions. The historic extent of these vegetation communities is unknown. Oak-juniper forests occurred on mesa slopes and tops, canyons, and rolling uplands. Deciduous shrublands nested in a grassland matrix were interspersed on mesas and rolling uplands; these shrublands were the result of wildland fire and storm disturbances. Grassland valleys and riparian corridors separated forested mesas and rolling lowlands.

1.5.3 Current Land Use

Land use at Fort Hood is allocated primarily to cantonment areas, maneuver/live-fire training areas, and airfields (Figure 1-2 and Table 1-1). The cantonment areas are essentially urban and contain all the administrative, maintenance, housing, logistical, and other installation support land uses. The maneuver/live fire training areas are where combat training activities occur. Two airfields are adjacent to the cantonment areas. The Belton Lake Outdoor Recreation Area (BLORA) is at the southeastern edge of the installation adjacent to Belton Lake. Other miscellaneous land uses, such as roads and easements, traverse the installation's land. Table 1-1 lists current land uses and their acreages at the installation (USACE, 2003).

Table 1-1
Land Use at Fort Hood

Primary Land Uses	Acreage	Percent
Training and Live Fire Areas	195,430	89.3
Heavy maneuver land	83,700	38.2
Light training	49,125	22.4
Live-fire	62,605	28.6
Cantonment Area and Belton Lake Outdoor Recreation Area (BLORA)	23,394	10.7
Total Acreage	218,824	100.0

Source: Paruzinski, Capps and Noble, personal communication, 2012.

The Main Cantonment Area houses the administrative operations of III Corps, its subordinate commands, and the Garrison Commander. Most of the family and single-Soldier housing and social facilities such as dining halls, gymnasiums, stores, and daycare facilities are in the Main Cantonment Area. Motor pools along its northern edge support all of the installation's motorized operations (USACE, 2003). Hood Army Airfield (HAAF) is adjacent to the Main Cantonment Area (Fort Hood, 2000).

West Fort Hood contains the Robert Gray Army Airfield (RGAAF), research and administrative facilities, support facilities, military personnel housing, and ammunition storage. Training activities on West Fort Hood consist mostly of dismounted training, such as land navigation (USACE, 2003).

NFH is the primary site for reserve component training and mobilization. In a period of continuous combat operations, NFH is the primary mobilization platform for reserve component (RC) Army forces, joint or interagency training, deployment, and demobilization. All phases of preparation for Overseas Contingency Operations (OCO) deployment and redeployment personnel recovery operations are conducted at NFH. NFH serves as the mobilization platform for RC aviation units, which are supported by two auxiliary airstrips, configured to support aviation training. USAR units draw equipment from ECS #64 located at NFH. The maneuver area training site serves a similar function in support of reserve deployment units training at NFH.

Figure 1-1 Location Map

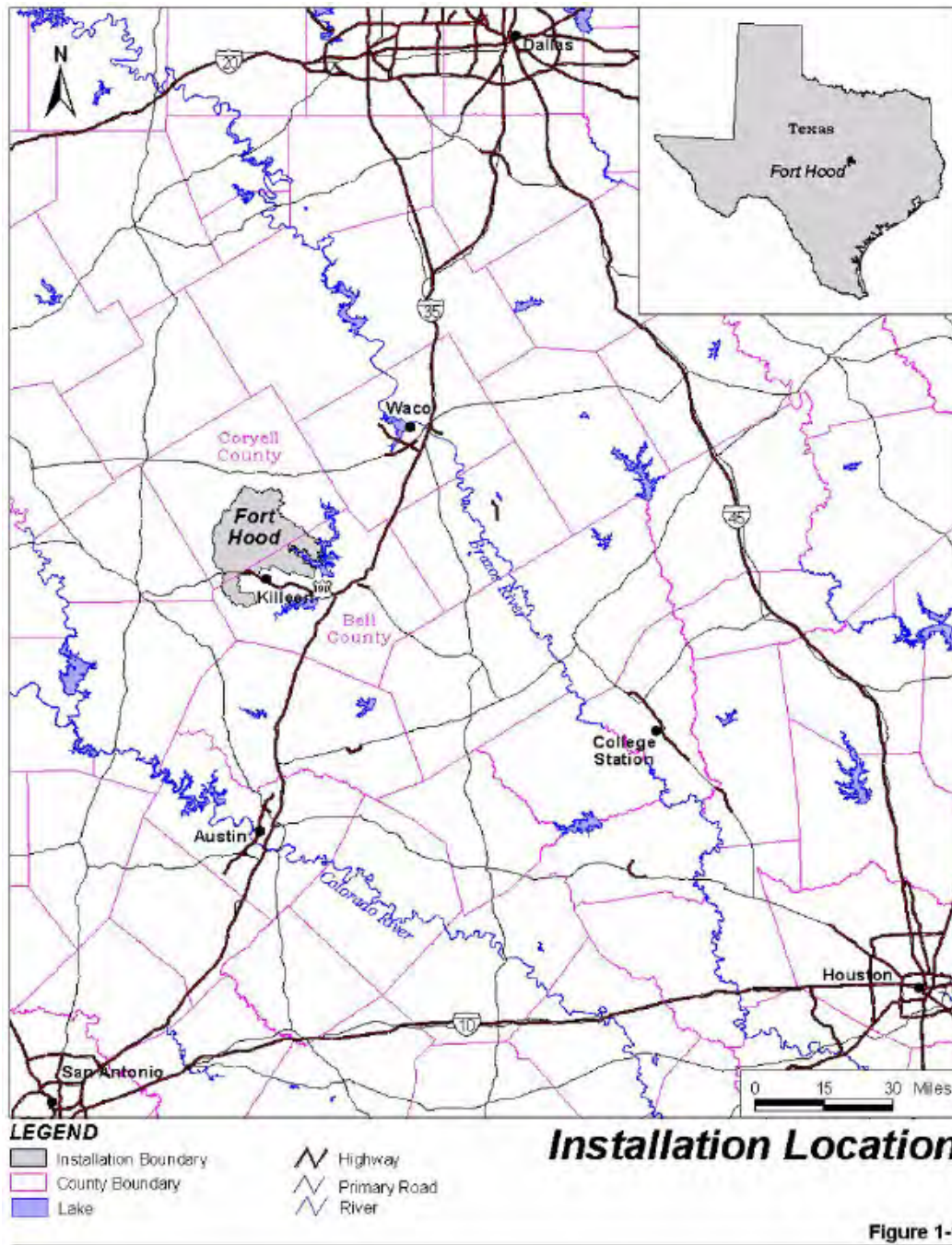
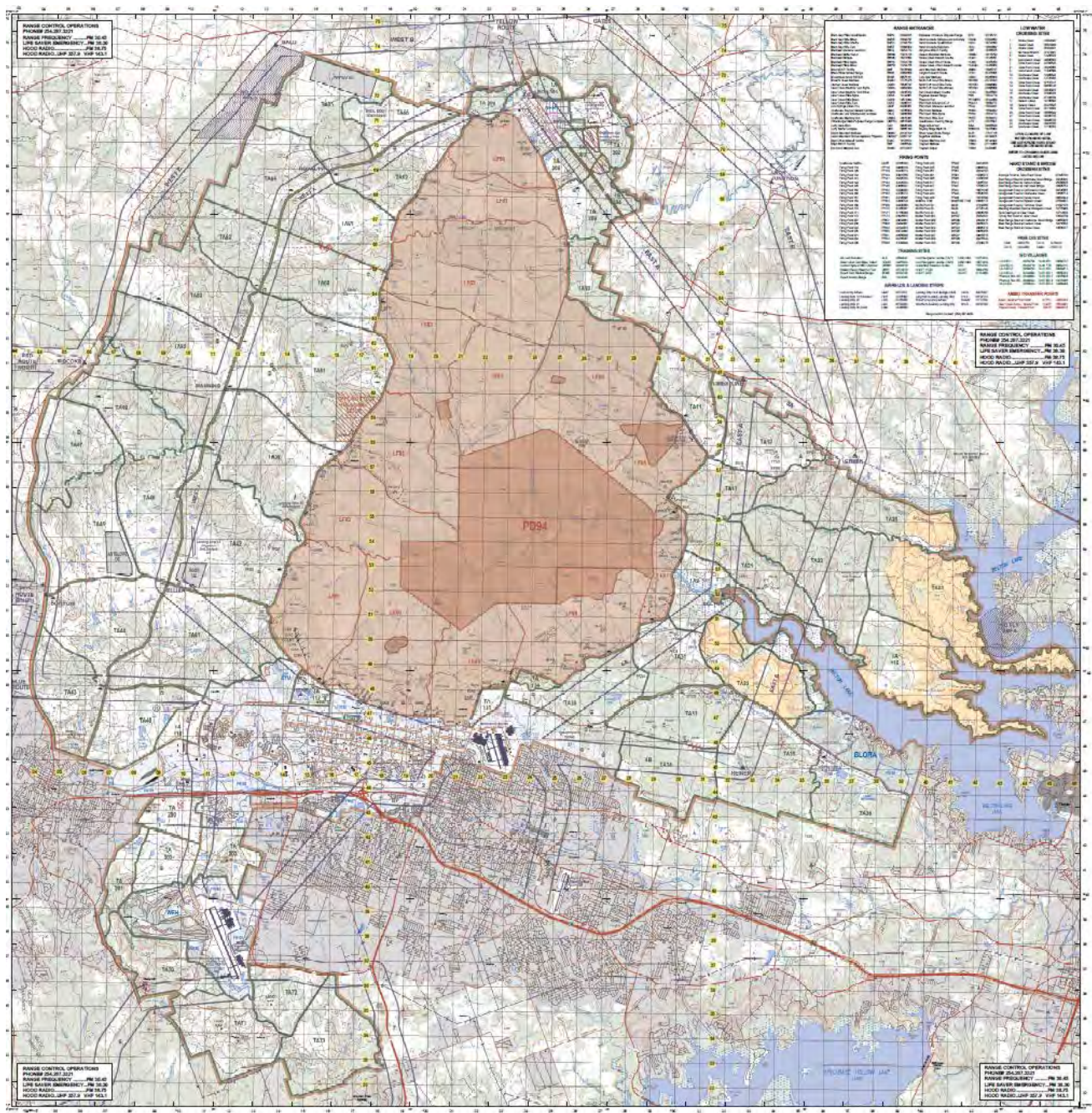


Figure 1-2 Site Map of Installation



The remainder of the installation outside the cantonment areas is primarily used for training and preparedness. More than 60 percent of the land (132,295 acres) is used for maneuver training that involves combat, combat support, and combat service support elements training under simulated battlefield conditions. The full spectrum of training activities at Fort Hood includes infantry, mechanized infantry, armored units, artillery, and air support with helicopters, fixed-wing tactical aircraft, high-speed interceptors, and large bombers (USACE, 2003).

Other land uses on the installation include the Belton Lake Recreation Area (BLORA), roadways, easements, and cattle grazing (Fort Hood, 2000; USACE, Fort Worth District, 1998, 1999).

Mounted training uses combined arms, deep battle maneuver and Brigade Combat Team (BCT) tactics which can include tank, Bradley, Stryker, dismount, artillery, helicopter, aircraft, and supporting vehicle training. Dismounted training areas support dismounted squad through battalion maneuver and tactics which can include Stryker, wheeled, aircraft, and infantry support vehicles. Stryker units can be attached or combined with heavy teams, and vice versa.

To describe forest conditions, there is a need for a determination of the acceptable range of tree spacing and size as well as the amount and types of underbrush and mid-story (Cannon, 2010). This particular section of vegetation management is currently being integrated into Training Circular 25-1; the draft is still in review.

Land Group 1, in the northeast, is used year round to support dismounted training with support vehicles, attached elements, and some tracked vehicle maneuver in the bottom of TA12 in support of Crittenberger and Hubbard Ranges.

Land Group 2, in the northeast, is primarily used year-round for wheeled, dismounted infantry, military police, improved explosive device (IED)/village, and aviation training.

Land Group 3, in the southeast, is used year-round for some tracked-vehicle maneuver and dismounted training. Tracked-vehicle training is normally restricted to about 15 vehicles per event. This land group has most of the installation's artillery firing points. Artillery units fire 155mm cannon and Multiple Launch Rocket System rockets from this land group weekly, which accounts for additional tracked-vehicle traffic. Some excavation and use of smoke occurs in this area (USACE, 2003).

Land Groups 4, 5, and 6, the northwestern and central-western portions of the installation, are full-spectrum, Heavy BCT maneuver areas. Training with up to 3,000 vehicles is conducted year-round, approximately 21 days per month. Digging of vehicle fighting positions, construction of obstacles, and use of smoke and pyrotechnics also occur in the land groups (USACE, 2003).

In Land Groups 2 and 3, vegetation thinning and removal has occurred to support dismount training of troops in the area. Thinning and removal of vegetation in LG 2 is complete, and LG3 is programmed to be finished by October, 2012.

The live-fire and impact areas, in the central portion of the installation, do not host maneuver training. Individual, crew-served, and major weapons systems up to battalion strength are fired in the areas. The range area contains more than 79 live fire ranges, all oriented to direct firing at the large impact area. Traffic in the live-fire and impact area consists of vehicles moving to and from the ranges (Navarro, 2011).

1.5.4 Future Land Use

Fort Hood has planned to upgrade a number of ranges to support the modernization of combat vehicles and their missions (RCMP, 2011). The range upgrade projects are listed below:

Programmed Range Projects (MCA):

Pilot Knob CLF, PN 66532 (2012); Pilot Knob MRF, PN 67020 (2013); Crittenberger DAGIR, PN 52005 (2015); Owl Creek ISBC, PN 71715 (2016); Hubbard IPBC, PN 71777 (2016); House Creek ISBC, PN 71694 (2017);

Unprogrammed Range Projects (MCA):

Owl Creek ISBC, PN 17895 (2016); Trapnell MPMG (2014); Blackwell DMPTR (2017); Sugar Loaf DMPTR (2017); House Creek ISBC (2017)

Unprogrammed Range Projects (OMA/OPA & OPA only):

Trapnell Sniper (2012); Hargrove MOUT (2012); Elijah MOUT (2012);

Future Development in the Region

The area immediately south of Fort Hood is undergoing rapid urban growth, thus reducing the amount of available agricultural land. Development and improvement of regional transportation routes have accompanied this growth, especially along the I-35 and US 190 corridors. The road system and adjacent railroad lines have added to the urban opportunities of the region and have shaped the expansion into a crescent-shaped corridor that extends from Copperas Cove on the west to Temple on the east. In 2005, a new joint use civilian element was added to Robert Gray Army Air Field (RGAFF), which opened the airfield to commercial flight operations in the area of West Fort Hood. The Killeen-Temple Metropolitan Transportation Plan predicts the region will grow by 69 percent by the year 2020 (K-TUTS, 1999). Community planning is under way to prepare for this influx including the growth attributed to Fort Hood (Fort Hood, 2004a).

1.6 LAND USE PLANNING

1.6.1 Land Use Planning Standards and Decision-Making Processes

Installation training and maneuver areas are subject to multiple uses, and managed by Fort Hood to give consideration to all demands for use of the land and water resources consistent with the military mission, conservation, and environmental concerns.

The primary use of installation lands is for military activities. Leased use of installation lands is subordinate to military requirements, and all leased operations are conducted in a manner that does not interfere with or disrupt military activities.

Fort Hood's Land Use Regulations govern grazing use of training lands. Lessees, or their representatives, must closely coordinate grazing operations with the commander.

The installation reserves certain rights on installation lands subject to lease, including the right to permit use of the land by the public for outdoor recreational purposes, the right to conduct range management programs and projects, and the right to require lessees to remove and withhold all livestock from any designated area when the commander determines that the lands are required for military training or land management purposes.

It is the express intent of Fort Hood that the land be used in accordance with proper range management practices consistent with concurrent multiple-purpose uses. The lessee is expected to be familiar with and to conduct grazing operations in accordance with the prescribed conservation standards for grazing on perennial grasslands. In particular, the lessee must conduct grazing operations in a manner that gives full consideration to the significant variation in the availability of forage that can occur from year to year and within a grazing season due to the amount and distribution of precipitation, wildland fires, and military training activities. The protection of the soil and its vegetative cover from deterioration by erosion, overutilization, wildfire, noxious and other weed infestation, or other causes is part of proper range management.

1.6.2 Relationship of This INRMP to Other Plans

Land Sustainment Management Plan (LSMP). The LSMP identifies land repair requirements; holds Installation agencies responsible for land repair and maintenance; and ensures that agencies plan, work, repair, and sustain training lands. The primary installation agencies responsible for sustaining Fort Hood training lands are the Garrison Commander, DPW, and DPTMS. Supporting agencies to the LSMP are the USDA-NRCS and Texas A&M University System (TAMUS), Blackland Research Center (BREC), and Institute for Renewable Natural Resources (IRNR). Supporting agencies provide expertise for land monitoring, area conditions, trends, health, land repair, conservation and sustainment practices, and compliance to ensure that land repair efforts promote land sustainment.

Land sustainment involves myriad complex issues, and it is the responsibility of the LSMP agencies to protect and sustain the land resources to meet all land use requirements. The agencies balance execution of the LSMP with mission requirements. A copy of the current LSMP can be found at Appendix A. Training land sustainment responsibilities focus on both the live-fire training areas and maneuver training areas.

Training Out Area Program. Most land repair and sustainment work occurs under the Training Out Area Program. The program divides Fort Hood into six sections to balance training requirements and land repairs to sustain the installation. Each Out Area becomes the primary land repair area for the installation. During the year an area is out, training is deferred to restore vegetation and ground cover. With six out areas, each area is normally visited for repairs every 6 years. When conditions necessitate earlier repairs, priority land repair work can be required outside the Training Out Area Program. Unit co-use of the Out Areas can be allowed to support readiness training.

Maneuver Damage Program (MDP). The MDP was designed to maintain maneuver training areas by reporting maneuver damage that impacts unit training or renders land unserviceable to training. Implementation of the program does not restrict maneuver training opportunities (Fort Hood, 2004c). Units are to report damage to Range Control and DPW. Damage is either repaired by ITAM or DPW. Refer to the LSMP (Appendix A) for further information on the Maneuver Damage Program (Fort Hood, 2004c).

1.7 STRATEGIC DESIGN OF THE INRMP

1.7.1 INRMP Preparation Methods

The preparation of this INRMP involved the review and analysis of past natural resource management practices, ongoing programs, and the current conditions of the existing resources as detailed in Section 2.0. The review process included interviewing Fort Hood personnel, as well as key individuals from state and federal agencies (e.g., TPWD and USFWS), collecting existing environmental documentation, and conducting field reconnaissance of the installation.

The findings from the interviews, field reconnaissance, and document review process have been synthesized and incorporated into this INRMP using the ecosystem management approach (see Section 1.7.2). Where data gaps exist, inventorying and monitoring programs have been proposed. These programs are designed to collect the data necessary to fill the information gaps and to achieve the objectives of the natural resources management program.

1.7.2 Approach and Strategies

The approach used to develop the discussion of the management strategies for each resource followed three general steps:

Goals and Objectives. The goal and objectives for the management of the resource, as well as the relationship of the resource to other components of the ecosystem (including the human component) and the military mission, were described.

Management Strategies. Past management strategies, current conditions, and an array of management strategies based on a more informed knowledge of ecosystem management principles were evaluated and considered to develop management strategies that would achieve the goals and objectives for the resource, as well as those of the overall natural resources management program. An inventory of needs and monitoring programs necessary to generate data to ensure the continued success of the program and to provide the information needed to facilitate the integration of adaptive management techniques was included.

Ecosystem Management. This INRMP follows the direction set forth in the Department of Defense Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*, issued March 18, 2011, regarding implementation of ecosystem management in the DoD. The memorandum states that ecosystem management is to be the basis for management of DoD lands and waters. In this context, The INRMP shall include the following:

- Incorporate the principles of ecosystem-based management.
- Contain information needed to make appropriate decisions about natural resources management.
- Maintain a relevant and updated baseline list of plant and animal species located at each installation for all pertinent taxonomic and regionally important groups.
- Ensure that biologically or geographically significant or sensitive natural resources, such as ecosystems or species, are monitored and managed for their protection and long-term sustainability.
- Ensure no net loss to the training and testing capability and capacity of the installation and range and enhance those capabilities to the maximum extent practicable.

DoD's overall goal regarding ecosystem management is to preserve, improve, and enhance ecosystem integrity. Over the long term, this approach will maintain and improve the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable economies and communities. The specific principles and guidelines that DoD has identified to achieve this goal are listed below. They are reflected in the management measures set forth in Prescriptions.

- Maintain and improve the sustainability and native biodiversity of ecosystems.
- Administer with consideration of ecological units and time frames.
- Support sustainable human activities.
- Develop a vision of ecosystem health.
- Develop priorities and reconcile conflicts.
- Develop coordinated approaches to work toward ecosystem health.
- Rely on the best science and data available.
- Use benchmarks to monitor and evaluate outcomes.
- Use adaptive management.
- Implement through installation plans and programs.

Ecosystem management recognizes that humans are ecosystem components and that sustainable human activity does not mutually exclude the preservation and enhancement of ecological integrity. Therefore, ecosystem management provides Fort Hood the means to both protect biodiversity and continue to provide high-quality military readiness.

The management measures and strategies that will be implemented at Fort Hood have been developed with consideration for the interrelationships between the individual components of the ecosystem, the requirements of the military mission, and other land use activities. The focus is on maintaining the structure, diversity, and integrity of the

biological communities, while recognizing that the Soldiers and military mission are a vital component of the ecosystem. An adaptive management strategy has been incorporated into this INRMP to monitor the temporal and spatial dynamics of the ecosystems and to adjust the management measures and strategies based on improved knowledge and data. The monitoring programs will generate the data needed to determine whether the management measures and strategies are effective in achieving their intended goals and objectives. This management approach will preserve and enhance the natural resources while providing the optimum environmental conditions required to sustain the military mission and realistic training conditions.

1.7.3 Plan Organization

The INRMP is composed of four sections:

- 1. Overview** provides general background information about the mission and installation and identifies key issues, as well as any issues that may be unresolved.
- 2. Current Conditions/Use** provides a brief baseline condition to be used as background and as a context for future management goals, objectives, and actions to be presented in detail in Section 3.0.
- 3. Future Management** proposes an array of management approaches needed to fully integrate natural resources management with military use on the land. This section describes strategies for complying with environmental laws and conserving, managing, and restoring habitats, species, soil, and water. It also addresses inventory, monitoring, and research programs that provide the foundation for sound, performance-based environmental compliance and form the basis for responsive, adaptive management in support of military land and water use requirements.
- 4. Implementation** shows how the installation uses scheduling and funding to ensure the implementation of strategies to achieve goals and objectives and the desired future condition, as well as the ways the INRMP will be supported through the implementation of funding options.

The **Appendices** contain the individual plans (components), such as the Endangered Species Management Plan, Karst Management Plan, and Soil Erosion Management Plan.

The **Supplements** present Standard Operating Procedures (SOPs) for various NRMB programs, such as wildlife, grazing, endangered species, hunting, and fishing.

The **Prescriptions** are the specific objectives and projects to be carried out as part of the management plan.

1.7.4 Key Issues

The Fort Hood NRMB must address three key issues to support the military mission and to maintain and conserve the installation's natural resources:

- Minimizing erosion and degradation of training lands resulting from training and grazing.
- Protecting and maintaining black-capped vireo and golden-cheeked warbler habitat.
- Maintaining, and, where possible, increasing vegetative cover to minimize erosion.

These issues are addressed in Sections 2.0 and 3.0.

1.7.5 Implementation of Funding Options

The natural resources program at Fort Hood receives financial support from appropriated funds (e.g., operations and maintenance), funded reimbursements (grazing), and user fees (hunting, fishing, and outdoor recreation). The use of funded reimbursements and user fees is restricted by federal law. For example, funded reimbursements can be used only for grazing-related expenses, and user fees may be used only to fund projects related to hunting and fishing. Expenses not directly associated with grazing management or with hunting, fishing, trapping, and outdoor recreational activities must be funded from appropriated funds.

The following paragraphs describe the funding options expected to be available to support the natural resources program at Fort Hood for the current year and their criteria.

Fish and Wildlife Conservation Funds. Pursuant to 16 U.S.C. § 670a–f and AR 200-1, Chapter 4-3.d. (9)(c), Installations may establish and collect fees for hunting, fishing or trapping. These fees are solely for defraying costs incurred for fisheries and wildlife management on the installation. Fees are deposited into the “Army Fish and Wildlife Conservation Fund (21X5095)”.

Agricultural Outleasing Funds. All revenue from agriculture and grazing out-leases, forest product sales (not applicable at Fort Hood), or sale of equipment procured with Conservation Reimbursable funds are to be deposited into the Army Agriculture/Grazing Account (account 21F3875.3950, HQDA Budget Clearing Account). Revenues generated from the reimbursable programs are to be used for administration and operational expenses of agricultural leases; initiation, improvement, and perpetuation of agricultural leases; preparation, revision, and requirements of integrated natural resources management plans; and implementation of integrated natural resources management plans. Funds required to make up shortfalls between the funds generated by out-leases and the funds required to operate the agricultural out-leasing program may, if available, come from the Army Agriculture/Grazing Account.

1.7.6 Updating the INRMP

AR 200-1 requires installations to review their INRMPs annually and to revise them as necessary. Major revisions to the INRMP are to be undertaken every 5 years, or as needed, if annual reviews have adequately addressed all issues. Previous NEPA documentation should be assessed to ensure that the effects of the natural resources management practices in future INRMP updates have been adequately addressed.

1.8 PENDING AND UNRESOLVED ISSUES

1.8.1 Pending Issues

None.

1.8.2 Unresolved Issues

The primary unresolved issue involves the extent of grazing that will occur on Fort Hood lands. The land that makes up Fort Hood was purchased from the original landowners over a long period. The original landowners have been allowed to graze the lands through the out-lease programs, first directly through the owner, and later through the Central Texas Cattlemen’s Association.

Since the inception of the original lease, grazing has occurred concurrently with military training activities on the installation. These activities include full-scale battle scenarios using tracked and wheeled vehicles, infantry, live-fire munitions, and aerial support.

In recent years, the combined effects of military maneuver and continuous grazing on the training lands at Fort Hood has adversely affected the military mission, readiness, and training, as well as the current condition and long-term sustainability of the training lands. Because there are no fences to contain cattle, the animals are free to move about the installation with little regard for the actual stocking rates on any one training area. As a result, the vegetative communities on many of the training areas have been reduced to species types with shallow root systems that are unsuitable for holding soils and preventing or minimizing erosion. Stormwater runoff has severely eroded the training areas, creating extensive gullies that impede vehicle and troop movement. This forces Fort Hood to divert its limited financial resources to repairing training lands rather than improving them to meet the ever-increasing demands of training Soldiers. In 2010, a new 5-year grazing lease was executed with terms to annually assess the forage consumable quantity and military training intensity, considering both when determining a stocking rate for the next grazing year. While the lease itself establishes the methodology, one of the key lease terms is to finalize and implement a Grazing Management Plan that clearly defines the approach and procedures used annually to establish a stocking rate with the overall goal of maintaining and improving the ecological condition of military training lands.

1.9 NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE AND INTEGRATION

1.9.1 National Environmental Policy Act of 1969

Under NEPA, federal agencies take into consideration the environmental consequences of proposed major actions. The intent of NEPA is to protect, restore, or enhance the environment through well-informed federal decisions. The act is premised on the assumption that providing timely information to the decision maker and the public concerning the potential environmental consequences of proposed actions will improve the quality of federal decisions. Thus, the NEPA process includes the systematic, interdisciplinary evaluation of the potential environmental consequences expected to result from implementation of a proposed action.

The Council for Environmental Quality (CEQ) was established under NEPA to implement and oversee federal policy in this decision-making process. To this end, CEQ has issued *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (40 CFR Parts 1500–1508). The CEQ regulations specify that an EA must be prepared to:

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

In addition, according to CEQ regulations (40 CFR Part 1500.2(c)), NEPA's requirements should be integrated "with other planning and environmental review procedures required by law or by agency practice so that all such procedures run concurrently rather than consecutively."

1.9.2 32 CFR Part 651 (AR 200-2)

32 CFR Part 651, *Environmental Analysis of Army Actions* (AR 200-2) (29 March 2002), provides Army guidance and procedures for complying with NEPA and sets forth policy for integrating environmental considerations into Army planning and decision making. Embodying the intent and spirit of NEPA, 32 CFR Part 651 (AR 200-2) directs installations to integrate environmental reviews concurrently with other Army planning and decision-making actions. This regulation specifically identifies the Natural Resources

Management Plan as a type of document that should be environmentally reviewed prior to implementation. Therefore, the requirements of 32 CFR Part 651 (AR 200-2) must be addressed in the context of assessing the potential

environmental effects of a proposed action to *implement* a Natural Resources Management Plan once it has been developed.

1.9.3 INRMP and NEPA Integration

In the past, the Army and other DoD agencies have prepared NEPA analysis and documentation for proposed actions to implement plans, such as INRMPs, *after* such plans have been developed. Although this approach complies generally with NEPA regulations and policies, it is cumbersome and often results in the inefficient repetition and redundancy associated with developing completely separate documents.

32 CFR Part 651, *Environmental Analysis of Army Actions*, states (in § 651.12(e)) that “Environmental analyses and documentation required by this regulation will be integrated as much as practicable with other environmental reviews...” (40 CFR 1502.25). Section 651.12 (e)(5) identifies as falling into this category “Installation management plans, particularly those that deal directly with the environment. These include the Natural Resources Management Plans (Fish and Wildlife Management Plan, Forest Management Plan, and Range Improvement or Maintenance Plan).”

The CEQ regulations encourage combining NEPA documents with other agency documents to reduce duplication and paperwork (40 CFR 1506.4) so that agencies can focus on the real purpose of the NEPA analysis making better decisions. Although this recommendation is not routinely or regularly followed for a variety of reasons, it is supported by Army leadership, the USEPA, and CEQ.

Army guidelines recommend that the INRMP and its associated NEPA analysis and documentation be prepared concurrently. Recognizing the efficiencies in cost and time that could be realized from a fully integrated approach to the planning development process, Fort Hood has fully integrated the INRMP and its associated NEPA analysis and documentation into a single report. Combining an INRMP and its associated EA is an alternative approach for integrating environmental analysis and documentation. This approach embraces the intent and spirit of NEPA, as well as the requirements of 32 CFR Part 651 and AR 200-1. The resultant “planning assessment” includes a comprehensive description, analysis, and evaluation of all environmental components at a given location. It also formalizes existing natural resource practices and can be used as an effective tool for future planning and decision-making purposes.

The INRMP portion of the document provides management measures that have been developed by considering various alternatives for meeting resource-specific goals and objectives at Fort Hood. The INRMP also provides the rationale for why certain management measures have been selected for implementation and others have not, based on analysis of resource-specific screening criteria. The EA portion of the document carries the INRMP’s selected management measures forward as the proposed action. Because other management alternatives are considered and dismissed from further consideration in developing the INRMP, the EA addresses only the proposed action and a no action alternative.

To allow the reader to readily identify elements of the NEPA analysis, Table 1-2 presents a “road map” to the corresponding EA sections embodied in this document. All remaining sections pertain primarily to the INRMP.

Table 1-2
Road Map Indicating NEPA Analysis and Corresponding INRMP Sections

Required NEPA Analysis	Corresponding INRMP Section
The Executive Summary briefly describes the proposed action, environmental consequences, and mitigation measures.	Provided immediately following the Preface
The Purpose of and Need for the Proposed Action summarizes the proposed	Section 1.9.4

Action’s purpose, explains why the action is needed, and describes the scope of the environmental impact analysis process.

Description of the Proposed Action and Alternatives describes the proposed action of implementing the INRMP (i.e., the selected management measures) and an alternative to implementing the proposed action (i.e., the no action alternative). **Section 1.9.5**

Scope of Analysis describes the scope of the environmental impact analysis process. **Section 1.9.6**

Affected Environment describes the existing environmental setting. **Section 2.0**

Environmental Consequences identifies potential environmental effects of implementing the proposed action and the no action alternative. **Section 5.0**

References provides bibliographical information for cited sources. **Section 6.0**

Persons Consulted provides a list of persons and agencies consulted during preparation of the EA. **Section 7.0**

Distribution List indicates recipients of the EA. **Section 8.0**

The **Appendices** include agency consultation letters and supplemental to develop the NEPA analysis. **Section 8.0** Provided immediately information used following **Section 8.0**

1.9.4 Purpose of and Need for the Proposed Action

The purpose of the proposed action is to carry out the set of resource-specific management objectives developed in the INRMP, which would enable Fort Hood to effectively manage the use and condition of natural resources on the installation to protect the natural setting primarily for training purposes. Implementation of the proposed action would support the Army’s continuing need to train Soldiers in a sustainable, natural setting while meeting other mission and community support requirements and complying with environmental regulations and policies.

1.9.5 Description of the Proposed Action and Alternatives

Proposed Action. The proposed action is to implement the INRMP for Fort Hood, Texas. This action would meet the Army’s underlying need to train Soldiers in a sustainable, setting that is in compliance with environmental regulations and policies. The proposal includes natural resource management measures involving geographic areas associated with the contiguous properties of the installation. The INRMP is a “living” document that will be modified (adaptively managed) over time. The proposed action focuses on a 5-year planning period, which is consistent with the time frame for the management objectives described in the INRMP. The proposed action involves putting in place the management measures and objectives presented in Section 3.0 and Prescriptions. Additional environmental analyses might be required as new management objectives are developed over the long term (beyond 5 years). Implementation of some INRMP related projects might also require evaluation to determine the need for and appropriate level of NEPA documentation.

Alternatives. Alternatives considered for the management of Fort Hood’s natural resources are described and evaluated within the sections of this document that address the ecosystem-based management of each specific resource (see Section 3.0). The selection of management measures for the INRMP involved a screening analysis of resource-specific

management alternatives. The screening analysis involved the use of accepted criteria, standards, and guidelines when available, as well as best professional judgment, to identify management practices for achieving Fort Hood's natural resource management objectives. The outcome of the screening analysis led to the development of the proposed action. Obviously, an infinite number of permutations of specific management alternatives are possible. Consistent with the intent of NEPA, this process focused on considering a reasonable range of resource-specific management alternatives and, from those, developing a plan that could be implemented, as a whole, in the foreseeable future. It then omitted from detailed analysis management alternatives deemed to be infeasible. Management alternatives considered during the screening process but not analyzed in detail are discussed in Section 3.0, as is the rationale for their being omitted from detailed analysis. Application of this screening process in developing the proposed action (implementation of the management measures contained in the INRMP), eliminated the need to define and evaluate hypothetical alternatives to plan implementation. As a result, the EA that is an integral part of this document formally addresses only two alternatives, the proposed action (implementation of the INRMP) and the no action alternative described below.

No Action. Under the no action alternative, the management measures set forth in the INRMP would not be implemented. Current management measures for natural resources would remain in effect, and existing conditions would continue as the status quo. This document refers to the continuation of existing (baseline) conditions of the affected environment, without implementation of the proposed action, as the no action alternative. CEQ regulations prescribe inclusion of a no action alternative, which serves as a benchmark against which proposed federal actions can be evaluated.

1.9.6 Scope of Analysis

The potential environmental effects associated with the proposed action must be assessed in compliance with NEPA, regulations of the CEQ, and AR 200-2. This EA identifies, documents, and evaluates the effects of implementing the INRMP for Fort Hood. The INRMP addresses the geographic area associated with the contiguous properties of Fort Hood, with particular emphasis on the training areas. As discussed, this EA examines the Army's preferred alternative (the proposed action, as described in Section 1.9.5 and Prescriptions) and a no action alternative (see Section 1.9.5 and Prescriptions). The document analyzes potential environmental effects.

The objective of this analysis is to provide an unbiased evaluation of the environmental consequences of an implementable INRMP for Fort Hood that can guide the installation in the following activities:

- Meeting training needs and military mission requirements
- Achieving natural resource management goals
- Meeting legal and policy requirements, including those associated with NEPA, that are consistent with current national natural resources management philosophies

To meet this objective, an interdisciplinary team of environmental scientists, biologists, planners, engineers, archeologists, historians, and military technicians developed the EA. The team identified the affected environment, analyzed the proposed action against existing conditions, and determined the potential beneficial and adverse effects associated with the proposal. It was found that a Finding of No Significant Impact (FNSI) is warranted. No additional NEPA documentation is anticipated.

1.9.7 Interagency Coordination and Review

Interagency participation is invited throughout the process of developing the INRMP. Once the INRMP has been drafted, the EA may be used as a tool to inform decision makers and the public of the likely environmental and socioeconomic consequences of implementing the proposed action and alternatives. In addition, Fort Hood provides for public participation in the NEPA process to promote open communication and better decision making.

Interagency Coordination. Annually, formal agency consultation letters are e-mailed to the USFWS and the TPWD. These letters officially notify USFWS and TPWD of Fort Hood's intent to prepare an INRMP and associated NEPA documentation. The agencies' responses are presented in Appendix B. A list of the persons consulted during the preparation of this INRMP is provided in Section 7.0. Appropriate notes and written records documenting the consultations have been maintained in the official Administrative Record and are hereby incorporated into this document.

Project Review and Comment. The primary responsible agencies (see Section 8.0, Distribution List) will be given an opportunity to review and comment on the stakeholders' draft version of the document. Comments will be incorporated into the document and distributed to these agencies for additional review and comment. These additional comments will be incorporated into the final version of the INRMP/EA, and a Draft Finding of No Significant Impact (FNSI) will be prepared, if appropriate.

Public Participation. The public and concerned organizations, including minority and low-income, disadvantaged, and Native American groups, will be notified of the findings and conclusions of the EA by an announcement of the availability of a FNSI (see Appendix C) in the local newspapers and by the availability of the INRMP/EA for public review for 30 days before Fort Hood implements the proposed action. The FNSI will be published in the *Killeen Daily Herald*, and the INRMP/EA will be made available for public review at Killeen Public Library, 205 East Church Avenue, Killeen, Texas; the Temple Public Library, 100 West Adams Avenue, Temple, Texas; the Copperas Cove Public Library, 501 South Main Street, Copperas Cove, Texas; the Gatesville Public Library, 111 North 8th Street, Gatesville, Texas; and at the Fort Hood Environmental Management Office, located at the Directorate of Public Works (DPW), Environmental Management Branch, Bldg 4219, 77th and Warehouse Avenue, Fort Hood, Texas. The INRMP/EA will also be available online at the Fort Hood DPW Public Notice Web site: <http://www.dpw.hood.army.mil/HTML/PPD/Pnotice.htm>.

SECTION 2.0: CURRENT CONDITIONS AND USE

2.1 CURRENT USES

2.1.1 Military Mission

Fort Hood dates to 1942, when the Army established Camp Hood to prepare Soldiers for tank destroyer combat during World War II. Renamed Fort Hood, it became a permanent installation in 1950. Various armored divisions have been assigned to Fort Hood since 1946.

Fort Hood is home to the 1st Cavalry Division, 3rd Cavalry Regiment (3d CR), 1st Army Division West, and various other entities. The installation also provides the infrastructure and training lands for III Corps Headquarters and its combat aviation assets, combat support, and combat service support units. With increased emphasis on force structure changes and Base Realignment and Closure (BRAC) initiatives, Fort Hood will likely remain one of the largest active U.S. installations in terms of assigned personnel. The total assigned personnel authorization is approximately 50,000 Soldiers.

Fort Hood provides state-of-the-art facilities to support the full spectrum of training requirements of today's modern armed forces. Installation lands and ranges provide excellent training opportunities for mechanized maneuver and small unit exercises, combined arms training, and live-fire training.

2.1.1.1 Maneuver Training

Maneuver training exercises are conducted at all unit levels to ensure a combat-ready fighting force. Training programs focus on units attaining and maintaining proficiency in collective tasks that support mission-essential tasks. Units involved in the training process span all echelons from section to corps. III Corps's primary training focus at Fort Hood is the brigade level and below.

Training exercises replicate combat conditions as closely as possible. Combat effects such as smoke, noise, and simulated nuclear, biological, and chemical conditions are integrated into every training event to condition units for operations in a difficult, stressful battlefield environment. Trainers are careful not to "simulate" or "assume away" any facet of a training mission. For example, units conducting defensive operations "dig-in" vehicle fighting positions and actually emplace the barrier and obstacle plan in those areas which have been previously approved for subsurface excavation by environmental and archeological managers. This level of training realism ensures a high level of combat readiness.

Units train for combat in a task-oriented manner. Trainers integrate combat, combat support, and combat service support elements to conduct multi-echelon, combined arms training. Combined arms training involves formations that include members of the entire fighting force. Commanders synchronize the activities of these forces within a battlefield framework that includes maneuver and operations within the deep, close-in, and rear battle areas. Such exercises involve greater depth and rapidity of movement dimensions and, therefore, also incur greater demands for concurrent land use.

Maneuver training areas are located west and east of the live fire area and south of HWY 190. Maneuver training areas constitute 132,295 acres or 61 percent of the entire installation. The West Range Maneuver Training Areas (Land Groups 4–6) provide excellent training opportunities for large armored and mechanized infantry forces. The training area averages 7–10 km (4 - 6 miles) east to west and 30 km (19 miles) north to south. The area features a wide variety

of terrain and vegetation characteristics that greatly enhance cross country, combined arms maneuver. Because of its large, contiguous size, this is the only maneuver area on Fort Hood capable of supporting brigade-level operations.

The Northeast (Land Groups 1 and 2) and Southeast Range Maneuver Training Areas (Land Group 3) are divided by Belton Lake Reservoir. The northeast sector is heavily vegetated and cross compartmentalized, providing an excellent dismount and infantry training maneuver area.. The southeast sector provides more favorable terrain for mechanized units, but it is only 4–7 km (2.5 – 4 miles) north to south and 15 km (9.5 miles) from east to west. Because of limited area, the Northeast and Southeast Range Maneuver Training Areas are best suited for unit assembly and logistical areas, artillery firing points, and company- and platoon-level mounted and dismounted training. In addition, these eastern training areas support engineer, combat support, and combat service support training and provide locations for amphibious and river-crossing operations.

The South Maneuver Training Area is not used for maneuver training because of its small size and isolated location. The South Maneuver Training Area (Land Group 7, "South Fort Hood") is separated from the main cantonment area by U.S. Highway 190. This training area includes many restricted areas, including Robert Gray Army Airfield and the Ammunition Supply Point (ASP). The South Maneuver Training Area is used primarily for small mechanized unit and dismounted infantry training and for logistical sites.

2.1.1.2 Live-fire Training

Weapons proficiency is a critical component of combat power. Fort Hood units train with the most modern and sophisticated weapon systems available. These weapons evolve constantly to stay ahead of advancements in armament technology by threat forces. Fort Hood has some of the most modern live-fire training ranges in the world. These ranges provide realistic combat conditions and scenarios to train crews to exacting standards of gunnery proficiency as well as to test the capabilities of new weapon systems. Live-fire training facilities must be continually upgraded to keep pace with evolving technology and changes in war-fighting doctrine. Fort Hood uses a 5-Year Range Modernization Program to manage upgrades and expansion of existing facilities and new construction projects to meet future training and evaluation requirements. Live-fire training facilities are located primarily in Live-Fire Areas (LF) 80–93 and Permanent Dudded Area (PD) 94 (Figure 1-2).

The Live-Fire Areas and PD94 cover about 24,000 ha (62,605 acres) in the central portion of the installation, bounded on the east, west, and south by the East Range, West Range, and South Range roads, respectively. Direct fire occurs inside these roads and is directed toward the Artillery Impact Area and other target arrays. Indirect fire from artillery and Multiple Launch Rocket Systems (MLRSs) is directed from numerous locations in surrounding maneuver areas. Much of the Live Fire Areas provides a buffer zone for PD94 and has limited impacts from exploding ordnance. The Live-Fire Areas provide training and evaluation facilities for all individual, crew-served, and major weapon systems, up to and including brigade live-fire. The Live-Fire Areas are used by all active units assigned to III Corps and Fort Hood, as well as by attached units from the Army National Guard and the Army Reserve.

Modernized live-fire training facilities require continuous maintenance to maximize range design capability. Sensor devices must be serviced and cleared of concealing vegetation to ensure unimpaired operation. Target arrays must be visible at maximum engagement ranges. A range maintenance program to routinely clear vegetation from target arrays and sensor devices is a critical component of range operation.

2.1.1.3 Aviation Training

Fort Hood has one of the largest military aviation commands in the United States. The aircraft, primarily rotary-wing, are some of the most modern and sophisticated in the world. Aviation units on Fort Hood train at all echelons from individual through battalion/squadron.

The training tasks accomplished in the training areas include all tactical maneuvers, performed in accordance with each aircraft's aircrew training manual and the unit's standard operating procedures. These maneuvers include nap-of-earth, contour, and low-level flight. Fixed-wing aircraft of the Air Force and Air National Guard also conduct training missions in Fort Hood airspace and use impact areas on the installation for weapon delivery practice.

Fort Hood has two major airfields. Hood Army Airfield is a 293-ha (724 acres) area at the eastern end of the cantonment area. Hood Army Airfield is the primary airfield for rotary-wing air operations, and it has a 1,436-m (4,712-ft) runway. Robert Gray Army Airfield is an 867-ha (2142 acres) area at West Fort Hood, and it has a 3,050-m (10,000-ft) runway. There are several dirt landing strips on the installation for tactical air supply and support training.

Aircraft gunnery for AH-64 units is conducted on multipurpose training ranges and PD94. However, the Dalton-Henson Range Complex (LF 80–82) is used most often for this training. Hellfire missile shots are conducted at Blackwell Multi-Use Range's Impact Area (PD94). Helicopter door gunnery is conducted primarily at Dalton Mountain Range or Crittenger Range (LF 85 and 86). National Guard and Army Reserve units use the Dalton-Henson Range Complex for aviation training.

2.1.1.4 Operational Testing

Fort Hood's large maneuver and Live-Fire Areas, coupled with III Corps's modernized force, provide excellent conditions for operational testing of various weapons, equipment, and doctrine. The U.S. Army Operational Test Command (OTC) is a tenant activity at West Fort Hood directly involved in training, doctrine, and combat development of the products that Soldiers use on a daily basis and will use on a future battlefield.

Most OTC tests employ "user testing," allowing front-line Soldiers to try out new equipment or concepts. The tests generally encompass activities similar to those described in this plan's sections on maneuver, live fire, and aviation training.

2.1.2 Operations and Activities

2.1.2.1 Relationship between the Military Mission and Natural Resources

The Army recognizes that a healthy and viable natural resource base is required to support the military mission. Areas that are unusable for training due to previous training activities detract from the current training activity. Vegetation is necessary for cover and concealment, and therefore areas that are stripped of their vegetation no longer represent the undisturbed lands that might be encountered during real conflicts. In addition to providing cover and concealment, vegetation protects soils from erosion. Eroded soils are unable to support vegetation, which results in a loss of realism; eroded areas also represent a safety hazard to the Soldiers. This INRMP helps to ensure that environmental considerations are an integral part of planning activities at Fort Hood and that natural resources are protected in accordance with Army regulations and policies.

Ongoing military operations performed in support of the Fort Hood mission might alter the environmental setting and condition of the natural resources. For example, the operation of tanks and other tracked vehicles, as well as standard military practices like the construction of ditches, foxholes, and tank trails, can result in vegetation loss and soil erosion or compaction. Although even with short-term changes the environmental setting might provide for adequate

training opportunities, the absence of long-term management measures to properly conserve and restore natural resources could impede Fort Hood’s ability to continue to adequately train Soldiers. In addition to the impacts mentioned above, environmental damage can place other artificial constraints on training, such as the following:

- Loss of training acreage
- Decreased tactical maneuverability
- Increased land and natural resource maintenance costs
- Increased safety hazards
- Civil or criminal liability

The trainers and Soldiers who use Fort Hood are being trained to be aware of the environmental effects of training and to recognize that their actions in the field directly affect the long-term sustainability of the training lands and their ability to continue training. Training the leaders to understand their environmental stewardship responsibilities can help to prevent environmental degradation during training activities.

Implementing appropriate management measures, as well as considering alternatives to these measures as they are developed, limits the potential for serious alterations to the natural resources that are critical to providing a sustainable training environment. In addition, such measures likely result in a more effective long-term approach to natural resource protection and conservation.

Because the primary mission of Fort Hood is to conduct readiness training, promote survivability of Soldiers, and provide combat-ready forces for worldwide deployment, any environmental initiatives and plans are generally considered secondary and should not inhibit meeting military requirements. It is important to consider limitations due to the presence of naturally occurring resources that cannot be altered, as well as limitations resulting from natural resources that have already been affected.

Existing natural resources on Fort Hood lands can influence the manner in which the Fort Hood mission is executed. Although natural resources provide a sustainable training environment for meeting mission requirements, their existence also has the potential to limit certain military plans and activities. For example, topographic features of the land or the presence of wetlands or threatened and endangered species might prevent military activities, such as range construction, from occurring because of the potential for adverse impacts on those sensitive resources. In addition, any permanent degradation of natural resources as a result of ongoing military use would, in turn, ultimately lead to further mission impairment should realistic training conditions no longer be available. Therefore, not only is proper management of natural resources and their use by the military a sound environmental practice, but it also directly supports the Fort Hood mission to provide sustainable training. This INRMP considers the effects of such natural resources on the mission. Examples of training activities and their effects on the environment, as well as examples of how degradation to natural resources adversely affects the military mission, are provided in Table 2-1.

Table 2-1
Mission Activities and Their Potential Effects

Potential Effects on:		
Activity/Use	Natural Resources	Training/Combat Readiness
Vehicles operated off-road	Degradation of soil, water, and vegetation	Loss of training realism
	Erosion gullies	Safety hazards in eroded areas
	Soil compaction	Contamination of soils could limit avail. of training areas

	Soil and water contamination from field maintenance	Increased maintenance costs
Foxholes and	Soil displacement Erosion; eroded soils unable to support Vegetation	Loss of training realism Defilades Safety hazards in eroded areas
Bivouac areas	Soil compaction and/or erosion	Loss of training realism
	Loss of vegetation/forest understory and overstory	Loss of camouflaging for vehicles and troop locations
		Limit usable training areas
Range firing	Soil compaction, erosion, and inversion	Immobilized vehicles mired in mud
	Loss of vegetation/forest understory and Overstory	Loss of training realism
		Potential administrative restrictions as a result of disturbance to federally protected species or habitat
	Wildfires from pyrotechnics, tracer ammunition, or shell detonation	Accidental fires result in loss of usable training areas
	Artillery training produces a heavy metals residue	May result in administrative restrictions

Training leaders and Soldiers are encouraged to use practices that prevent environmental degradation during training activities (Fort Hood Regulation [FH Reg] 200-1). Implementing environmentally sound training practices, as well as considering alternatives to these practices as they are developed, limits the potential for serious alterations to natural resources that are critical to providing a sustainable training environment. Presented below are examples of practices used to avoid permanent and serious environmental degradation at Fort Hood. (Some management measures employed to reduce or prevent environmental degradation of resources at Fort Hood are discussed in other sections.)

Fort Hood Regulation 200-1, *Environment and Natural Resources*, prescribes policies, assigns responsibilities, and establishes procedures for protecting the environment and preserving natural and cultural resources. Commanders are responsible for integrating environmental management principles and environmental protection activities and programs, to the fullest extent possible, into the planning and execution of the command basic mission. The following are measures outlined in FH Reg 200-1 and FH Reg 350-40 to avoid permanent and serious environmental degradation of the training lands at Fort Hood:

2.1.2.1.1 Excavation and Digging

Units will restore maneuver areas at the completion of training as outlined in FH Reg 200-1. Any person, military or civilian, conducting any type of excavation (digging) on Fort Hood is required to obtain an approved Excavation and Water Use permit prior to the start of excavation.

- Excavation requests for military training activities outside the cantonment areas are forwarded to Range Control for one-stop dig approval requests. Those requests are sent via courtesy copy to other organizations on Fort Hood.
- Excavations in the maneuver area will be restored to the previous contour.
- Because of the presence of numerous historic properties, caves, fossils, and endangered species areas on Fort Hood, all excavations require coordination.
- Dig the minimum number of emplacements, foxholes, and field fortifications consistent with training objectives. Save topsoil to refill holes once training is completed. Upon completion of training, fill and restore the ground surface where foxholes, battle positions, tank ditches, and emplacements have been dug. Mark unused, open holes to prevent personnel from driving into them until sites are refilled.
- Do **not** excavate within 164 feet (50 meters) of streams, ponds, or lakes, and minimize tactical digging that orients the length of excavations up and down the inclination of slopes. Do not excavate or deposit materials within 33 feet (10 meters) of trees.
- Do **not** excavate within 164 feet (50 meters) of an installation boundary fence, a tank trail, or a paved road.
- The four bermed "free dig" sites are to support training. These sites do not require a dig permit and are adequate to support several units training at the same time. Units using these sites are responsible for site recovery after training events. These sites are in TA 30, TA 110, TA 112, and TA 300. Site locations are marked on the Fort Hood Military Installation Map.
- Excavation sites should be monitored with global positioning system (GPS) devices. If part of an excavation extends outside the approved excavation site or "free dig" site, the unit must stop work and initiate an FHT Form 200-X10 request through the normal approving agencies to dig in the new area.

2.1.2.1.2 Threatened and Endangered Species

- For military training exercise planning purposes, contact DPW Natural Resources Management Branch (NRMB) for consultation or a site visit regarding planned activities that infringe upon known endangered species nesting areas.
- Endangered species habitat on Fort Hood is identified as "core" habitat or "non-core habitat". Core habitat is located on the eastern side of the installation and comprises approximately 8,934 acres. Non-core habitat is present throughout the training areas and comprises 64,795 acres. Core habitat and non-core habitat are military training classification terms only, not an indication of habitat quality. Endangered songbirds need both habitat types to ensure long-term viability.
- Vehicular travel through core species nesting areas is **not** considered harmful if such movement is transient and confined to established roads and tank trails.
- In core habitat areas, do **not** drive vehicles or equipment through or over woody vegetation. Other uses of the areas are subject to the specific restrictions promulgated in this regulation.
- During the annual nesting season occurring from 1 March through 30 June, the use of core habitat areas is limited to transient travel on established trails and emergency stops only.
 - The time spent in activities in core bird habitat areas must **not** exceed 2 hours in a calendar day.
 - Do **not** circumvent or defeat this limitation through rotation of subordinate elements, brief displacements, or yielding training areas to other organizations.
 - Drive vehicles on established roads and tank trails.
 - Do **not** create new roads and trails without written permission from DPW NRMB.
 - Park vehicles in open areas.
 - Prevent damage to woody vegetation.
 - Do **not** cut brush or trees within habitat areas.
 - Do **not** use smoke or chemical agents in or within 328 feet (100 meters) of core habitat.

- Non-core habitat areas have fewer training restrictions and do **not** appear on the Fort Hood Military Installation Map (MIM). FHT Form 200-X10 will **only** be approved for digging, construction, or other activities on a limited basis in habitat areas that will result in a permanent loss of habitat. In Non-core habitat areas, off-trail maneuver is authorized if necessary to accomplish mission-essential task elements. Use of obscurants is **not** restricted in Non-core habitat. Do **not** clear underbrush for command posts, bivouac, or field dining areas.
- Always protect vegetation against fire. Do **not** start fires. Take necessary precautions to prevent fires, and promptly extinguish fires started accidentally.
- Outdoor fires are unauthorized except as approved by the Directorate of Public Works (DPW) Environmental Division and NRMB.
- Avoid unnecessary use of pyrotechnics and incendiary munitions.
- Report fires immediately to Range Control through frequency modulated (FM) 30:45. When FM radio is **not** available, use the most expedient means available to notify Range Control or the Fire Department.
- Use existing tactical emplacements to the extent possible. Digging or constructing new tactical emplacements within woodlands is unauthorized without an approved excavation and water use permit.
- Do **not** tamper or interfere with cowbird traps (large screen cages) or hog traps. Intentional damage to these traps is prohibited.
- If the military mission requirements conflict with the regulations, the designated S-3 will coordinate with DPW NRMB.

Bald Eagle Restricted Aviation Zone (1 October–31 March)

- Minimize disturbance from low-level helicopter flights and other aviation assets. Flight restrictions will be lifted when no bald eagles have been observed for a period of 2 weeks.

2.1.2.1.3 Plants and Animals

- Do **not** destroy plants and animals in violation of game and wildlife laws.
- Do **not** cut trees, whether alive or dead, without the approval of DPW NRMB. Native hardwood trees within the cantonment areas of the installation will be replaced at a ratio of 10 new trees for every 1 tree removed.
- Do **not** clear underbrush in command posts, bivouac, or field dining areas. Hunters and fishermen must consult local fish and game laws, and III Corps and Fort Hood Regulation 210-25 (*Hunting, Fishing, and Natural Resources Conservation*).

Fisheries impoundments off-limits to training are shown in Table 2-2 by name and grid coordinates.

Table 2-2	
Fish Impoundments Off-limits to Training	
Coordinate	Lakes and Ponds
PV293618	11A
PV245473	30A
PV296493	31C
PV106505	41A
PV102551	41C
PV113533	42G

PV058462	43C
PV064505	44C
PV078514	44G
PV065550	45B
PV170619	51E
PV102349	71A
PV238462	Airfield Lake
PV197467	Birdbath Lake
PV111441	Cantonment A
PV133440	Cantonment B
PV083418	Clear Creek Lake
PV093468	Copperas Cove #2
PV083462	Copperas Cove #3
PV123406	Crossville Lake
PV204467	East Lake
PV275478	Engineer Lake
PV326452	Heiner Lake
PV318479	Larned Lake
PV366448	Nolan Lake

2.1.2.2 Future Military Mission Impacts on Natural Resources

The INRMP is considered a “living” document that is based on several short-, medium-, and long-range planning goals. Short-range goals include activities that are planned to occur in 0 to 5 years, while medium-range goals include activities in a 6- to 10-year period. Long-range goals are usually scheduled beyond 10 years. Because an INRMP is a living document, goals may be revised over time to reflect evolving environmental conditions. In addition, medium- and long-range planning goals eventually become short-range activities that also require implementation.

The primary long-range planning goal at Fort Hood is to continue to train Soldiers while supporting environmental strategies and goals that are consistent with Army regulations and policies. With long-range planning goals in mind, Fort Hood has developed several short-range goals for the installation to support the current mission and meet future needs. To that end, this INRMP includes management measures that meet three short-range planning goals:

- 1) To implement a comprehensive environmental strategy that represents compliance, restoration, prevention, and conservation.
- 2) To improve the existing management approach to protecting natural resources on the installation.
- 3) To meet legal and policy requirements consistent with national natural resources management philosophies.

2.1.3 Facilities and Developed Areas

2.1.3.1 Installation Restoration Sites

The Department of Defense established the Installation Restoration Program (IRP) in 1975 to provide guidance and funding for the investigation and remediation of hazardous waste sites caused by historical disposal activities at military installations. The fundamental goal of the Fort Hood restoration program is to protect human health, safety, and the environment. The Army accomplishes this by eliminating or reducing to prescribed, safe levels any potential risks caused by the Army's past operations.

The IRP is carried out in accordance with all federal, state, and local laws. The primary federal laws are the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA). CERCLA, passed in 1980, requires the cleanup or remediation of hazardous waste sites created by historical disposal practices. Congress gave the U.S. Environmental Protection Agency (USEPA) responsibility for overseeing compliance with the law. The Resource Conservation and Recovery Act (RCRA) and the National Environmental Policy Act (NEPA) also guide the IRP's activities. Under the IRP, Fort Hood investigates and, if necessary, remediates former disposal and test areas.

Fort Hood has 65 IRP sites, all of which are solid waste management units (SWMUs) and most of which are old landfills (e.g., sanitary or burial pits) (Table 2-3). Thirty-five IRP sites were categorized "No Further Action" (NFA), and a Remedial Investigation/Feasibility Study was completed in 1995. Fort Hood monitors 54 closed SWMUs and 11 active SWMUs. Fort Hood's Installation Action Plan (IAP) sites are summarized below (Salmon, 2004).

Table 2-3
Fort Hood IRP/Solid Waste Management Units (SWMUs)

Site IAP Status	Number of Sites
No Further Action (NFA)	47
Closed	10
Active (listed below with SWMU ID No.)	8
Abandoned landfill, Main Cantonment (FH-006)	
BLORA wastewater treatment plant, (FH-036) – American Water has responsibility over this site	
Conforming storage 99209 (FH-045A)	
Conforming storage 99210 (FH-045B)	
Per Dudded Areas with impact area (FH-048)	
Washrack drainage discharge, Main Cantonment (FH-052)	
Sanitary sewerage network, Main Cantonment (FH-053)	
DPW classification unit (FH-060)	

Source: Fort Hood DPW, 2010.

2.1.4 Vegetation Management

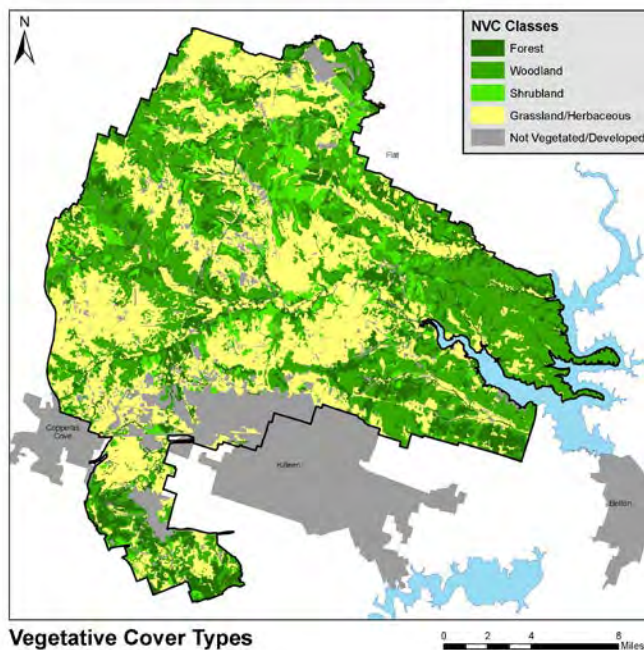
The two dominant types of vegetation at Fort Hood are Grasslands and Forest and Shrub Communities (Figure 2-1).

Grassland Communities are found throughout the installation but are most common in the live-fire zone/impact area and in the Western Maneuver Area. Wildfires and training activities in these areas likely reduce the woody vegetation and allow grasses to dominate. Grassland areas are composed primarily of perennial herbaceous species characteristic of mid-grass habitats. Common grass species include King Ranch bluestem (*Bothriochloa ischaemum*), little bluestem (*Schizachyrium scoparium*), hairy grama (*Bouteloua hirsuta*), and sideoats grama (*Bouteloua curtipendula*). Common forbs are broomweeds (*Amphiachyris* sp.), ragweed (*Ambrosia artemisiifolia*), and snow-on-the-prairie (*Euphorbia bicolor*). Remnant patches of tallgrass prairie vegetation are dominated by yellow Indiangrass (*Sorghastrum nutans*) and big bluestem (*Andropogon gerardii*) (USACE, 1999).

Forest and Shrub Communities are a major component of the installation. The majority of these habitats are found on the slopes and hillsides of mesas and on rolling lowlands and associated canyons; woodlands also occur along and adjacent to riparian zones. Over time, Forest and Shrub vegetation has naturally expanded into areas that were once grasslands because of a combination of factors, including fire suppression, training disturbance, and continuous grazing by livestock (USACE, 2003).

Based on the 2008 TNC vegetation map and supporting NRCS documentation, Fort Hood is 15% forest, 34% woodland, 8% shrubland, and 33% grassland, leaving 10% not vegetated (Figure 2-1).

Figure 2-1 Vegetative Cover types



Three distinct Forest and Shrub Communities have been classified: Coniferous Forest and Shrub, Deciduous Forest and Shrub, and Mixed Forest and Shrub. Coniferous Forest and Shrub Communities are found throughout the installation and are primarily composed of Ashe juniper (*Juniperus ashei*; commonly referred to as “cedar”), the only coniferous species in the area (USACE, 2003). Another relatively uncommon vegetation association throughout the installation is the Deciduous Forest and Shrub Community. This community is composed of broad-leaf trees and shrubs and is found near streams in lowlands and on protected slopes. Tree species representative of this community include plateau live oak (*Quercus fusiformis*), post oak (*Quercus stellata*), pecan (*Carya illinoensis*), and sycamore (*Platanus occidentalis*). The most common vegetation community on the installation is the Mixed Forest and Shrub Community. In some areas Ashe juniper dominates over either plateau live oak or Texas oak (*Quercus buckleyi*), and in others the oaks dominate over the Ashe juniper (USACE, 1999, 2000).

The land that makes up Fort Hood was purchased from the original landowners over a period of time. The former landowners have been allowed to graze the lands through outlease programs arranged first directly with the former owners and later through the Central Texas Cattlemen’s Association (CTCA). Since the inception of the original lease, grazing has been concurrent with military training activities on the installation (USACE, 2003). Military training has also led to disruption of the soil surface, as well as soil compaction, especially when the activities have occurred during wet periods (USDA-NRCS, 1998). Disruptions to the plant community after military training are further

exacerbated by livestock grazing during and after these training activities. The lack of grazing deferral after soil disturbance has subsequently led to a decline in the abundance of perennial grass species and has promoted the invasion of short-lived annual plants that have less extensive root systems, thus making the soil less resistant to erosion (USACE, 2003).

In addition, military activities in combination with livestock grazing have reduced the presence of the fine fuels required to carry range fires. Wildfires, which are a natural component of grasslands, were suppressed to prevent impacts on structures and to minimize the risk to human life. Lack of fire and overuse by livestock have been found to be primary factors leading to increases in Ashe juniper and other woody plants in the Edwards Plateau (Smeins et al., 1997).

The Natural Resources Conservation Service (NRCS) conducted a vegetative resource inventory in 1997 to determine the ecological health of training lands and to recommend livestock carrying capacities for Fort Hood's vegetation (USDA-NRCS, 1998). The findings of the vegetative resource inventory indicate that stocking rates were too high on most of the installation and that grazing and training deferments are necessary on all areas void of dense vegetative cover (USACE, 2003). There was also room for improvement in how livestock were distributed on ranges. Active restoration, such as grading eroded areas, ripping compacted soils, and planting perennial vegetation, are necessary for degraded areas to recover. One interesting finding was that rest from military activities and grazing did not necessarily improve site condition. Areas having a lack of military activity and a lack of grazing for 20 years had similarity indices of approximately 25 percent, nearly identical to the indices of areas currently grazed by cattle and used for training. This provides evidence that in the absence of restoration, permanent deferment from military training and livestock grazing is not a solution for improving ecological health (USACE, 2003).

In 2001, the NRCS conducted an inventory in the Western Maneuver Area, the Eastern Training Area, and West Fort Hood to estimate soil erosion and determine rangeland health and trend. Sampling was conducted at permanent vegetation monitoring points that had been established for the data gathered in 1997. Rangeland trend, a rating of the direction of change that might be occurring on a site, was also assessed. Trend defines whether the plant community and the associated components of the ecosystem are moving toward or away from the historic climax plant community or some other desired plant community or vegetation state (USDA, 1997). In the Western Maneuver Areas, both the short- and long-term rangeland trend was found to be declining on the majority of the sites. In the Eastern Training Area, approximately half of the sites showed a downward trend (USDA-NRCS, 2002). At West Fort Hood, most of the sites exhibited an upward trend.

The primary conclusion of the 2001 rangeland health inventory was that declining rangeland health and trend on portions of the installation were the result of increased military training, continuous grazing of livestock without deferment, and the effects of multiyear droughts. The NRCS recommended that livestock and training deferments were needed in much of the Western Maneuver Area and portions of the Eastern Training Area to allow perennial vegetation to increase root biomass and recover (USDA-NRCS, 2002).

In May 2002 the installation performed a vegetation resource inventory similar to the one conducted in 1997 (USACE, 2003). The primary objective of this inventory was to determine the amount of grazeable forage on the installation and to document the species composition and recommend stocking rates (USACE, 2003). Results of this inventory indicated that the amount of perennial forage that could be grazed by cattle was low (< 750 lb/ac) relative to site potential in the majority of the ecological sites in the Eastern Training Area and in the southern portion of the Western Maneuver Area. In the Eastern Training area, sites that had moderate to high productivity (1,000 to 3,000 lb/ac) were generally dominated by King Ranch bluestem (*Bothriochloa ischaemum*). In the North Fort Hood management unit, Texas wintergrass (*Stipa leucotricha*) and Virginia wildrye (*Elymus virginicus*), both native cool season species, constituted approximately 60 percent of the grazeable forage, making this area a candidate for seasonal (winter) grazing. In the West Fort Hood management units, the amount of grazeable forage was generally greater than that of other management units and the sites were dominated by little bluestem (*Schizachyrium scoparium*).

In 2004 Fort Hood carried out another vegetation survey to assess forage resources (Texas A&M, 2004). The 2004 study used the same methods as the 2002 inventory, and it collected vegetation data at 114 study points that had been established during the 2002 inventory. Several additional points were added in the Live Fire Area to collect additional data in areas underrepresented in the 2002 survey. The sampling technique identified plants within survey transects and categorized them according to forage suitability. These data were extrapolated to develop a prediction of the amount of consumable perennial vegetation in each of eight management units. The amount of consumable perennial vegetation was then used to calculate recommended grazing levels in animal units per year under four different management options. Recommended installation-wide grazing levels (in animal units) for management options based on a 25 percent harvest efficiency were 2 to 3 times higher than management options based on a 750- or 1000-pound-per-acre or greater threshold for residue that considered only grazeable acreage within training areas. Training-related reductions in forage availability were factored into the results. The survey also found that the reduction in training and grazing in the Western Maneuver Area appears to have resulted in increased biomass production and litter accumulation. Also, two good growing seasons in the previous 2 years had increased plant litter in all management areas.

Other forms of vegetation management, as it relates to training requirements, is also performed through the ITAM program. To accomplish its mission, the ITAM program relies on its five components and integrated management: Headquarters Department of the Army (HQDA), Army Command (ACOM), Army Service Component Command (ASCC), Direct Reporting Unit (DRU), and Installations. The five components are Training Requirements Integration (TRI); Land Rehabilitation and Maintenance (LRAM); Range and Training Land Assessment (RTLA); Geographic Information Systems (GIS) and Sustainable Range Awareness (SRA). These components combine to provide the means to understand how the Army's training requirements impact land management practices and what the impact of training is on the land, how to minimize and/or mitigate and repair the impacts, and communicate the ITAM message to Soldiers and the public. ITAM also includes a Land Sustainment Management Plan and a 5 Year Workplan, which can be found in Appendix A of this document.

2.1.5 Soil Conservation/Erosion Control Management

2.1.5.1 Geology and Soils Background

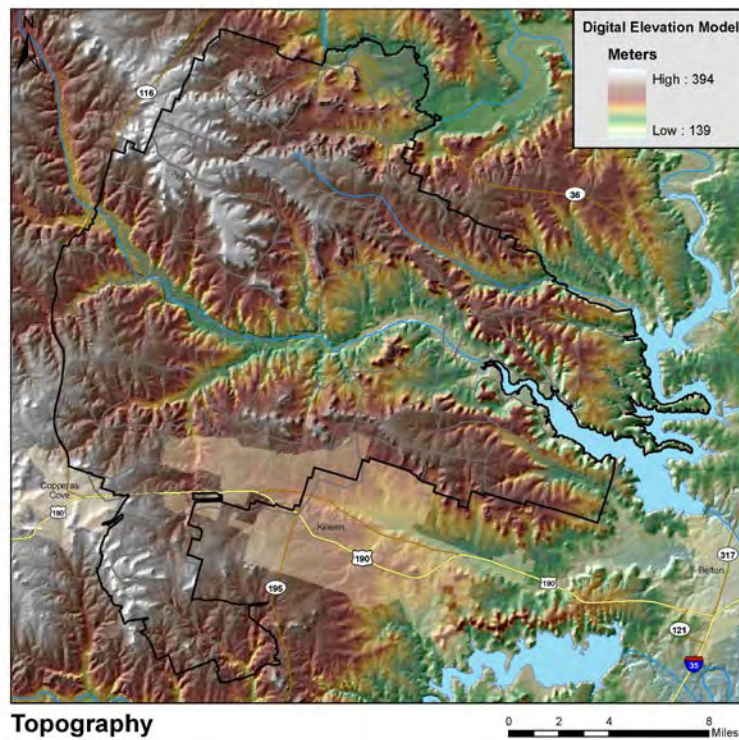
The topography of Fort Hood is defined by rolling hills and steep breaks, and it includes karst topographic features such as caves, sinkholes, rockshelters, and springs (Figure 2-2). The underlying geology of Fort Hood is predominantly composed of Cretaceous Age limestone and Quaternary deposits are present along major streams. Appendix D provides additional background information on the topography and geology of Fort Hood.

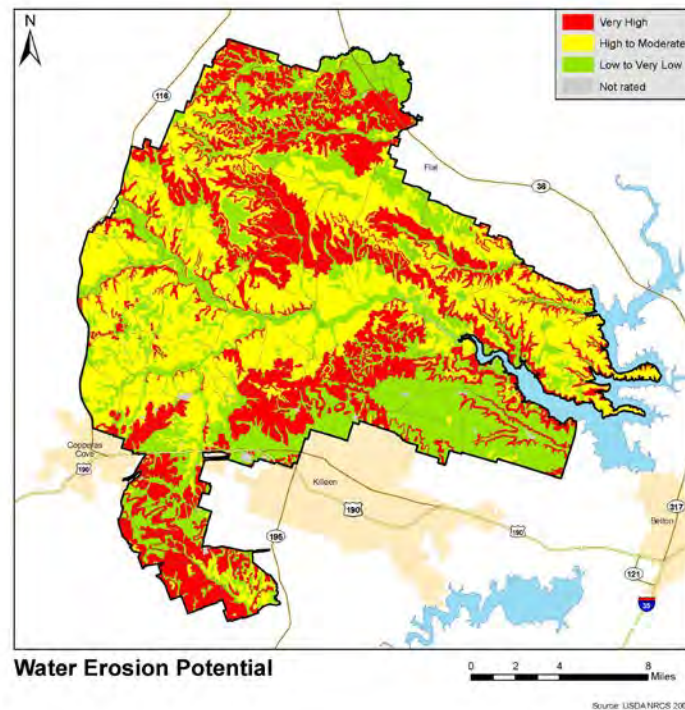
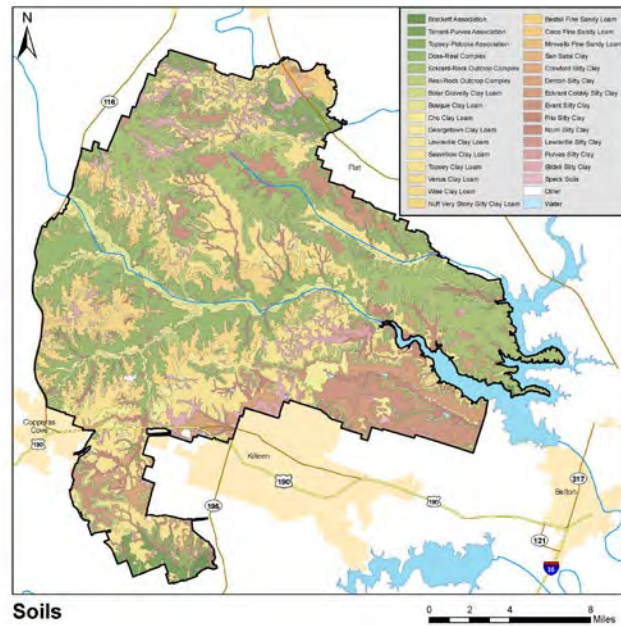
There are 40 unique soil series on Fort Hood (Figure 2-3). In general these soil series are well drained and moderately permeable, but they can vary widely in other characteristics such as depth, parent material, and slope. Five soils that occur on Fort Hood are considered to be partially hydric soils (USDA-NRCS, 2009). These soils cover approximately 5,482 acres, or 2.5% of the installation, and are generally located along the stream banks of Cowhouse Creek, Nolan Creek, and Leon Creek and their tributaries (USDA-NRCS, 2009). However, other soils can become hydric, exhibiting anaerobic conditions, as a result of periodic or permanent saturation or inundation. Seventeen soils that occur on Fort Hood are considered to be prime farmland soils. These soils cover approximately 41,297 acres, or 19% of the installation. The prime farmland soils are generally located near the main cantonment area, West Fort Hood (WFH), North Fort Hood (NFH), and on floodplains (USDA-NRCS, 2009).

Many of the soils on Fort Hood are naturally susceptible to water erosion (Figure 2-4). Five soils are categorized as having very high water erosion potential, covering approximately 68,128 acres, or 31% of the installation. Nine soils are categorized as having a high to moderate water erosion potential, covering approximately 82,504 acres, or 38% of

the installation. The remainder of the installation has a low to very low water erosion potential (USDA-NRCS, 2009). See Appendix D for additional background information on the soils of Fort Hood.

Figure 2-2 Topography





2.1.5.1.1 Soil Erosion on Fort Hood

Severe erosion areas are defined as areas with erosion rates exceeding tolerance limits established by the NRCS for each soil type according to its capability to maintain vegetative cover. Soil tolerance levels on Fort Hood range from 1 to 5 tons per acre (USACE, 2003). Soils with higher tolerance values are able to hold soil or withstand erosion better than those with lower values. Soil loss exceeding the tolerance results in sheet, rill, and gully erosion, eventually rendering lands unusable for military training maneuvers. Erosion in areas already bare from previous soil activities, lack of ground cover, or overgrazing is exacerbated by continued effects from military vehicle tracks or wheels. Several areas of the installation, particularly training areas, have extremely high soil erosion rates due to high use by tracked vehicles and cattle grazing, resulting in high sheet, rill, and gully erosion. Loss of perennial vegetative cover (herbaceous and woody vegetation) as a result of heavy training maneuvers has resulted in these high erosion rates and increased bare soil and annual plants in some areas.

Large gullies have developed to a degree that maneuver training cannot be conducted in these areas. The three primary maneuver lanes in the 67,000-acre western training areas of Fort Hood (Northwest and Southwest Regions) contain about 15,000 acres (or about 224 linear miles) of gullies about 3 to 6 feet deep. Much of the gully network is accumulative damage that has occurred over the past 60 years. The damage has accelerated during the past 20 years because the vehicles used for military training have become greater in number, heavier, and faster, causing increased damage to soils and extensive areas of bare soil. Decades of continuous training with no land repair efforts resulted in compacted soils in some areas that did not permit rainfall infiltration needed to sustain perennial vegetative growth. In addition, overutilization by cattle and inadequate land repair funding and Command emphasis have contributed to the erosion problem (Fort Hood, 2001a; Fort Hood, 2010a). The FY11 RTLA reports that the current erosion rate average is 4.5 tons per acre per year, and a total of over 4500 gully plugs have been placed across the western training areas.

Elevated rates of soil erosion appear to have historically affected several caves and sinks on Fort Hood, including 15 caves that were blocked by black topsoil and many additional sinks filled with sediment (Reddell and Veni, 2005).

2.1.5.2 Soil Erosion Monitoring Programs

Studies are ongoing to determine the contribution of the following activities to soil erosion on Fort Hood:

- Military Activities
- Woody Species Management

Inventories have been conducted for forage levels and soil erosion rates to identify priority areas for restoration, including the following (Fort Hood, 2001a):

- Fort Hood Erosion and Sedimentation Reduction Project (in cooperation with the NRCS), September 1993.
- Fort Hood Vegetative Resource Inventory (in cooperation with the NRCS), May 1998
- Fort Hood Vegetation Survey Project (in cooperation with the NRCS), May 2002 (USDA- NRCS, 2002)
- Annual ITAM RTLA report, ongoing

The NRCS conducted a soil erosion survey and rangeland health study as part of the Land Condition Trend Analysis (LCTA) Program in 2001-02 (USDA-NRCS, 2002). The amount of soil erosion (from sheet and rill erosion) was determined for the Western Maneuver Area, Eastern Training Area, and West Fort Hood. The results of the soil erosion inventory are shown in Table 2-4. The Western Maneuver Area was found to have the greatest amount of soil loss as a result of the high percentage of exposed bare ground and low amounts of vegetation residue on the soil surface. The average bare ground percentage for the western training area sites was 78 percent, and herbaceous

perennial production averaged 445 pounds per acre. This was determined to be a result of drought conditions, military training, and continuous grazing without deferment in this area. West Fort Hood was found to have the least soil erosion as a result of the high amount of herbaceous perennial production (2,325 pounds per acre on average) and lower amount of exposed bare ground (25 percent). These conditions were determined to be a result of grazing deferments and lack of tracked vehicle use in the area (USACE, 2003; USDA-NRCS, 2002).

Table 2-4
2002 Estimated Erosion Rates on Fort Hood

Area	Range of Soil Loss (tons/ac/year)	Average Soil Loss (tons/ac/year)	Percent of Sites With Bare Ground	Percent of Sites With Unacceptable Soil Loss
Western Maneuver Area	0.1–25.1	6	78	72
Eastern Training Area	0–7.8	2	N/A	42
West Fort Hood	0.1–3.0	0.7	25	0

Source: USDA-NRCS, 2002.

Another rangeland health study was conducted in 2004 (USDA-NRCS, 2004). The application of methods to deter soil erosion appeared to be yielding positive results. Biomass production in 2004 increased 85, 182, and 111 percent for southeast Fort Hood, the western training areas, and both areas combined, respectively, as compared with the 2002 study. Although there was virtually no change in the average percent bare ground for the sites sampled (39.8 percent in 2004 compared with 39.1 percent in 2002), the number of sites with greater than 75 percent bare ground reduced from 10 percent in 2002 to 2 percent in 2004. Bare ground in the western training area sites decreased from an average of 49 percent to 41 percent. The increase in biomass was attributed to favorable growing conditions, sufficient precipitation, and reduction in training usage (USDA-NRCS, 2004).

Additionally, the NRCS conducted a soil erosion survey and rangeland health study as part of the annual RTLA program in 2011. The amount of potential soil erosion (from sheet and rill erosion) was determined for the Western Maneuver Area based on several factors. The results of the soil erosion inventory are shown in Table 2-5. ITAM's "red-amber-green" scale provides a useful decision-making tool. Three factors (training, vegetation, and erosion) are presented as a matrix of severity and year (Table 2-5). Examining the mean total erosion by year gives an indication of the overall condition of Fort Hood for a given year or by metric (row) reveals the trend for that category through the last five years. As a result of this survey, it has been shown that potential for severe erosion has been reduced from 22% to 5% in 2011. In 2011, only 5% of the western maneuver area had the potential to erode greater than the allowable erosion rate compared to 22% in 2007.

Table 2-5

Metric		Percent of training area affected				
Training	Action level (criteria)	2007	2008	2009	2010	2011

Activity	Red (> 50% of plot affected)	16	4	0	10	1
	Amber (25-50% of plot affected)	48	17	4	12	1
	Green (< 25% of plot affected)	35	79	96	78	98
Disturbance	Red (> 50% of plot affected)	4	4	0	8	0
	Amber (25-50% of plot affected)	60	24	2	15	2
	Green (< 25% of plot affected)	33	70	98	77	98
Vegetation						
Bare ground (cover)	Red (> 50% of plot bare)	17	17	18	14	21
	Amber (25-50% of plot bare)	55	46	64	44	24
	Green (< 25% of plot bare)	28	37	18	42	55
Erosion						
Sheet and rill	Red (> 5 tons per acre)	10	16	4	11	19
	Amber (2-5 tons per acre)	10	16	7	13	9
	Green (< 2 tons per acre)	80	68	89	76	72
Concentrated	Red (> 5 tons per acre)	19	14	4	8	4
	Amber (2-5 tons per acre)	14	17	4	10	1
	Green (< 2 tons per acre)	67	69	92	82	95
Mean total erosion	>100% of T value	22	7	2	6	5
	50% -100% of T value	11	7	3	6	7
	<50% of T value	67	86	95	88	88

Between 1997 and 2001, the productivity of grazeable perennial species declined between 46 and 76 percent in the regions across Fort Hood. About 40 percent of the rangeland health sampling sites did not exhibit “stable” health characteristics (USACE, 2003).

As a result of this survey, the NRCS recommended the use of scheduled deferments from grazing and military activities in the Western Maneuver Area and recommended that structural improvements (i.e., revegetation and sediment catchments) be made. In the Eastern Training Area, the NRCS recommended rest-rotation grazing to allow plant vigor to increase, thus allowing increased soil protection. No new actions were recommended for West Fort Hood (USACE, 2003).

2.1.5.3 Current Erosion Control Management Programs

Optimal amounts of vegetation residue for mid-grass sites should range from 750 to 1,000 pounds per acre following grazing to maintain or improve rangeland health and reduce soil erosion. Year-long training and livestock deferments on selected areas occurred to allow vegetation recovery (USACE, 2003). The western training areas are a top priority because of heavy training use, high erosion rates, and gully formation. Other areas of the installation will be addressed on an as-needed basis or when erosion rates in the western areas are reduced to acceptable levels.

A soil erosion management plan has been developed for the western training areas (Fort Hood, 2001a). This plan includes the following:

- Improved training area access road (tank trail) system
- Construction of hardened stream crossings, hillside access points, staging areas, bivouac sites, and travel lanes

- Construction of diversion terraces and grassed waterways
- Construction of floodwater retention catchment basins
- Sediment retention includes the maintenance and restoration of catchment basins to reduce sediment loads
- Establishment of buffers along riparian zones
- Establishment of perennial vegetation on priority eroding areas
- Establishment of permanent excavation (dig) sites
- Establishment of rotation schedules for training

Fort Hood also employs various erosion mitigation practices (Fort Hood, 2010a), including the following:

- Maneuver Access Structures (MAS): Also known as “gully plugs”; Construction of series of rock check dams in gullies to reduce erosion, contain sediment, and provide maneuver access across gullies.
- Ripping: Ripping or fracturing compacted soil or bare ground to aerate the soil and allow growth of grass roots.
- Seeding: Seeding of areas where adequate vegetative cover is lacking.
- Maneuver Damage Program: Program under which training units file a maneuver damage report following training activities and repair damage incurred within their responsibility and capability.
- Sediment retention: Construction of more than 30 sediment catchment basins to reduce sediment loads into Belton Lake.
- Training Out Area Program: Closing of a training area for at least one or two growing seasons to allow the training area to recover naturally or with additional mitigation.

Fort Hood has an active Construction Site Storm Water Compliance Inspection Program that inspects construction sites for compliance with TCEQ Construction General Permit TXR150000. The areas of inspection include the main cantonment, North Fort Hood, West Fort Hood, and all training/live fire areas. A Memorandum of Instruction was signed on November 12, 2008 that established procedures for conducting inspections of construction sites at Fort Hood, to monitor compliance with storm water regulations, and for submitting and responding to inspection reports thru the use of Reply by Memorandums

Training area storm water management best management practices include the aforementioned MAS structures, silt fencing, ripping and seeding, check dams, and right of way clearing to ensure tracked vehicles remain in established ‘lanes’ (RTLA August 2010).

In addition, the 2010 RTLA report also cites gully erosion and the importance of the placement of maneuver access structures (MAS). The study showed positive effects associated with the MAS structures. Between 2007 and 2010, sediment deposition was measured. Deposition occurred at 49 of the 51 measured points and represented up to 55% deposition relative to original gully depth.

During 2010, Fort Hood Range Control personnel were alerted to 14 flood events. All gauged crossings were surveyed and level sensors placed ≤ 1 foot above the lowest point of each low water crossing. Solar powered automated warning lights were installed at tactical Crossing 10. Control of the lights at Crossing 11 has been transferred from the flood alert cellular unit to the Crossing 10 high water sensor. These changes and improvements are intended to improve Soldier and civilian safety at these water crossing locations. (RTLA, 2010).

2.1.6 Water Resources

The water resources of Fort Hood can be classified into two main categories—groundwater and surface water. Each of these water resources has its own physical and chemical characteristics, uses, and potential issues. Fort Hood's major uses of water resources primarily involve surface water and include municipal water supply, training, recreation, vehicle maintenance, and aquatic habitat.

2.1.6.1 Groundwater

The major aquifer that underlies Fort Hood is the Trinity Aquifer. Parts of both the outcrop and the downdip are deeply buried below Fort Hood. The Trinity Aquifer extends through parts of 55 counties of central Texas. The Glen Rose, Paluxy, Walnut Clay, Comanche Peak, Edwards Group, and Fort Worth Group limestones are the primary stratigraphic units that occur in the Fort Hood area. The Paluxy and Walnut Clay units are exposed on the rolling lowlands above major creeks and the Glen Rose unit is exposed in the benthic along major creeks (USACHPPM, 2001). The Comanche Peak, Edwards Group, and Fort Worth Group units are exposed on mesas.

The Travis Peak formation, which does not outcrop at the surface in Fort Hood, is the deepest and hydrologically the most important stratigraphic unit in the Fort Hood Region. No major groundwater resources outside the installation are affected by recharge from within Fort Hood, and recharge that occurs within the installation affects only the small, shallow groundwater supplies that remain on the installation (USACHPPM, 2001).

Potentially sensitive groundwater areas of the Fort Hood region are the outcrop areas of the Paluxy formation and recent alluvial materials within and adjacent to Cowhouse Creek, Henson Creek, and the Leon River, as well as the karst or cave systems found on mesas throughout the installation. The aquifers recharged by these areas are relatively shallow, and therefore they could be affected by hazardous material spills and seepage. However, these waters are rarely used (USACHPPM, 2001). Surface water, not groundwater, is the primary water supply for Fort Hood.

Groundwater studies have been conducted at Fort Hood, and the results do not show any critical issues directly attributed to the installation. A detailed discussion of these studies is provided in the Water Quality section of this chapter (Section 2.1.6.3).

2.1.6.2 Surface Water

Fort Hood is located in the Brazos River Basin. Surface water resources consist of numerous small to moderate sized streams, which generally flow in a southeasterly direction. Fort Hood has approximately 200 miles of named intermittent and perennial streams with numerous additional tributaries of those features. Fort Hood contains more than 200 water impoundments constituting approximately 692 surface-acres. Most of these are used for flood control, sediment retention, wildlife and livestock water, and fish habitat. Wetlands exist across the installation and range from small emergent wetlands associated with ephemeral streams to large, forested wetland complexes adjacent to perennial channels.

The installation is located directly upstream of two man-made reservoirs—Belton Lake (a sole source water supply for approximately 200,000 people in Fort Hood and surrounding communities) and Stillhouse Hollow Lake (a water supply for several surrounding communities). Both reservoirs function as fish and wildlife habitat and provide flood control and recreation opportunities for the public.

Fort Hood can be divided into portions of six large watersheds and several smaller subwatersheds (as shown in Figure 2-5). The six main watersheds are the Belton Lake watershed, Cowhouse Creek watershed, Lampasas River watershed, Leon River watershed, Nolan Creek watershed, and Owl Creek watershed. These watersheds can be further divided into minor subwatersheds, which include portions of the main stems and tributaries of the major water bodies listed above. The Leon River and Cowhouse Creek form the two arms of Belton Lake, while Owl Creek flows directly into

the Leon River arm. Reese Creek and its tributaries flow south toward the Lampasas River which feeds Stillhouse Hollow Lake. Various water quality studies have been conducted to monitor the condition of the water resources across the installation. Through these studies, water quality sampling has taken place at several locations throughout the Fort Hood area. These locations are shown in Figure 2-5, and the study results are discussed in Section 2.1.6.3. Specific drainage areas, surface water bodies, and water quality issues at Fort Hood are described in detail below according to the best available information. Unless specified otherwise, designated uses for each water body are presumed to be high aquatic life use and contact recreation.

Although precipitation varies from year to year at Fort Hood, most precipitation occurs during May through June and October. January is the driest month of the year. Installation-wide, flooding is usually of short duration, occurring only after heavy downpours. However, flooding can be a safety concern to Soldiers and equipment. Flood zone areas are shown in Figure 2-5.

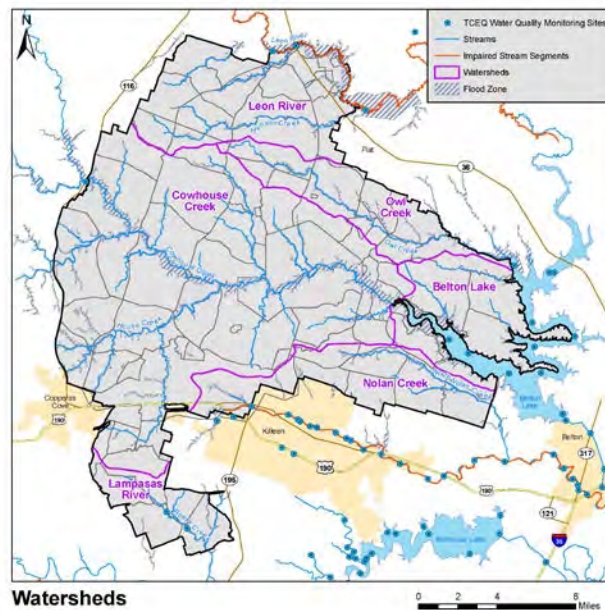
Most of the surface water features located on the installation are classified as waters of the United States as defined in Section 404 of the Clean Water Act (CWA). These features are currently being delineated IAW USACE standards. During the planning phase of construction projects, these delineations are utilized to assist in the avoidance and minimization of impacts to waters of the U.S, as required by Section 404 of the CWA. The delineations are also used to calculate the amount of unavoidable impacts, which is used to determine permitting requirements and appropriate compensatory mitigation. Approximately 30% of the installation has been delineated, primarily in areas associated with range and cantonment area construction projects.

2.1.6.2.1 BELTON LAKE WATERSHED

Belton Lake is a man-made reservoir that is owned and operated by the USACE for flood control, conservation, storage, and recreation. Most of Fort Hood drains to this water body and it is the primary water supply for Fort Hood and surrounding areas. The area classified as the Belton Lake watershed comprises the eastern portion of the installation, just below the point where the Leon River drains into Belton Lake. It includes those areas with shoreline along Belton Lake where all waters drain directly into the lake. This watershed includes tributaries such as Taylor Branch, Bear Creek, Bull Branch, and other unnamed tributaries. The Belton Lake Outdoor Recreation Area (BLORA) is in this watershed, just south of the lake.

Belton Lake was impounded in 1954 and has a surface area of 12,300 acres (Texas Parks and Wildlife). In addition to serving as a municipal water supply, the lake is a major site for recreation. It is estimated that nearly 3 million people visit the lake annually for recreational purposes. Designated uses for the lake include contact recreation, high aquatic life support, and use as a public water supply.

Figure 2-5 Map of Fort Hood Watersheds



2.1.6.2.2 COWHOUSE CREEK WATERSHED

The Cowhouse Creek subwatershed is the largest at Fort Hood, draining more than 50 percent of the surface runoff of the installation. The watershed is close to the center of Fort Hood and extends from the western to the eastern installation boundaries. Cowhouse Creek and its tributaries flow in an easterly direction and drain into Belton Lake. Tributaries to Cowhouse Creek include Beehouse Creek, Browns Creek, Bull Run, Buttermilk Creek, Clear Creek, Cottonwood Creek, House Creek, Oak Branch, Riggs Run, Ripstein Creek, Stampede Creek, Stephenson Creek, Table Rock Creek, Two Year Old Creek, Wolf Creek, and several other unnamed tributaries. Upstream portions of the Cowhouse Creek watershed extend far to the northwest outside Fort Hood's boundaries. Segment ID 1220A, Cowhouse Creek, was listed as impaired for bacteria on the approved 2008 state list of impaired waters required by Section 303(d) of the Clean Water Act (the 303(d) list). This area (1220A_03) is described as "from the confluence of Belton Lake in Bell County south of Gatesville in Coryell County to the upstream perennial portion of the stream north of Goldthwaite in Mills County". Additional data and information are to be collected before a Total Maximum Daily Load (TMDL) is scheduled.

The Cowhouse Creek watershed contains combat training areas where maneuver and live-fire operations occur. This area is heavily affected by these operations in terms of soil disturbance and destruction of vegetation, which results in surfaces prone to erosion and surface water runoff. In turn, sedimentation affects surrounding water resources. There is also a possibility of influence on water resources due to the receipt of surface water runoff that might contain residue from explosives and artillery use in high-explosive-impact areas in the Cowhouse Creek drainage basin.

Studies of the metals, explosives, and perchlorates in the groundwater, surface water, and sediment in this watershed have been conducted. Sedimentation studies have also been conducted in this drainage basin, as well as across the entire installation. In addition, storm water sampling has occurred at seven stations along Cowhouse Creek, House Creek, Table Rock Creek, and Clear Creek. These results are discussed further in the Water Quality section (Section 2.1.6.3) of this chapter.

2.1.6.2.3 LAMPASAS RIVER WATERSHED

A very small portion of the Lampasas River watershed lies within the southern arm of the Fort Hood installation. This watershed contains tributaries to the Lampasas River, including Reese Creek, North Reese Creek, and Clear Creek. These waters drain to Stillhouse Hollow Lake just outside Fort Hood. Segment ID 1217, Lampasas River (above Stillhouse Hollow Lake), was listed as impaired for bacteria on the approved 2008 Texas 303(d) list. This area is described as "from a point immediately upstream of the confluence of Rock Creek in Bell County to FM 2005 in Hamilton County". However, additional data and information are to be collected before a Total Maximum Daily Load (TMDL) is scheduled.

2.1.6.2.4 LEON RIVER WATERSHED

Portions of the Leon River watershed are in North Fort Hood. The tributaries in this watershed include Henson Creek, Shoal Creek, Turnover Creek, and Cottonwood Creek. At various points, the Leon River coincides with the boundaries of the installation. Several tributaries feed directly into the Leon River, which drains to Belton Lake. Segment ID 1221, Leon River (below Proctor Lake), was first listed as impaired for bacteria in 1996, and remains on the approved 2008 Texas 303(d) list. This area is described as "from a point 100 meters (110 yards) upstream of FM 236 in Coryell County to Proctor Dam in Comanche County". A TMDL was approved for this location, but is currently on hold while stakeholders (including Fort Hood) work on developing a Watershed Protection Plan. The Leon River watershed includes urban areas, as well as training areas where maneuver and live fire occur. The Leon River's designated uses include contact recreation, high aquatic life use support, and use as a public water supply.

2.1.6.2.5 NOLAN CREEK WATERSHED

Upstream portions of the Nolan Creek watershed lie in the southeastern portion of Fort Hood. Most of the headwaters of Nolan Creek originate within the installation and flow in a southeasterly direction into the creek. Eventually, Nolan Creek flows into the Leon River below Belton Lake. The portion of the Nolan Creek watershed that is within Fort Hood contains several tributaries, including North Nolan Creek, South Nolan Creek, Shaw Branch, Hay Branch, and several unnamed tributaries. In addition to training areas, this watershed contains most of the urban areas on Fort Hood.

2.1.6.2.6 OWL CREEK WATERSHED

The Owl Creek watershed is almost entirely within Fort Hood. The watershed is just south of North Fort Hood, and the creek drains directly into Belton Lake. The Owl Creek main stem, as well as numerous unnamed tributaries, flows through Fort Hood before its confluence with Preachers Creek and Belton Lake.

2.1.6.2.7 LAKES AND PONDS

As part of the "hill and lake" country of Central Texas, Fort Hood contains approximately 230 ponds, most of which are suitable for fishing (Fort Hood, n.d.), and 17 lakes, including numerous man-made impoundments across the installation. These are regularly maintained (Fort Hood, 2001a).

Pond Construction. Fort Hood has two ponds designed to the point of award by the Corps of Engineers. The sites for these are on Henson Creek tributaries; one is in TA 61 and the other is in TA 306. Construction of the ponds will not occur until adequate funding is available and coordination has been completed with other interested parties on Fort Hood.

Pond Maintenance. The fish habitats of several of the impoundments on Fort Hood were to be improved with submerged material to increase fish habitat and reproduction and, in turn, to improve fishing recreation. Several lakes were targeted for these improvements from 2000 through 2004. A nontoxic pond dye is used to control submerged aquatic weeds in the actively managed fisheries ponds during spring and early summer (Fort Hood, 2001a). The mechanical removal of emergent vegetation was used to improve angler access.

Fish kills, massive algal blooms and other pollution indicators were investigated to determine the cause, and corrective action to be initiated. In addition, periodic water analyses were conducted on major lakes and ponds as part of the fish management procedures and any suspected pollution problems were reported to EMD. NRMB monitored the programs to determine whether standards were being met.

2.1.6.2.8 WETLANDS

Wetlands in central Texas and at Fort Hood are most common on floodplains along rivers and streams (riparian wetlands), along the margins of lakes and ponds, and in other low-lying areas where the groundwater intercepts the soil (springs). There are numerous natural springs within the Fort Hood Military Reservation boundaries, but most of their locations have not been mapped.

Wetland features are currently being delineated IAW USACE standards in order to determine jurisdictional status under Section 404 of the Clean Water Act. It has been the practice of Fort Hood, IAW EO 11990, to avoid or minimize impacts to wetland areas from construction; however, these areas might be indirectly affected by ongoing installation activities such as military training activities, livestock grazing, hydrologic alterations, and urban and training area storm water runoff.

2.1.6.3 Water Quality

Water quality studies at Fort Hood include sedimentation and erosion studies, storm water data collection, TPDES permit monitoring, and studies of sediment, groundwater, and surface water in the Cowhouse Creek drainage basin. Each of these is discussed below, and summaries of the available data are presented. The Storm Water Management Plan for Fort Hood is also discussed, as well as issues regarding sewage and storm water. The relevant water quality standards and criteria are described first.

2.1.6.3.1 Storm Water Management

Currently, Fort Hood operates industrial, construction, and municipal storm water programs.

Specific industrial activities are managed under an industrial storm water permit (TPDES Permit No. TXR05P855) that comes from the general permit, TXR050000. These industrial activities include aircraft maintenance, airfield mobile fuelers and rapid refuel points, watercraft maintenance, DRMO, fill dirt mining, landfill, recycling, and the Transportation Motor Pool. These activities are inspected on at least a quarterly basis. Depending on the specific industrial activity, annual or semi-annual storm water sampling is also conducted.

Fort Hood also operates various sites under the TCEQ Construction General Permit TXR150000 for construction activities that occur on the installation. Such sites with land disturbance greater than 1 acre or within a Common Plan of Development that exceeds the 1 acre limit are required to obtain coverage under this permit. At some time in the future, the USEPA may require sites with greater than 20 acres of disturbance to monitor storm water discharges for turbidity. At a later date that size limit is expected to be decreased to 10 acres of disturbance.

The USEPA has published Phase II Storm Water permitting requirements that include Fort Hood as the owner and operator of a municipal separate storm sewer system. Fort Hood's Storm Water Management Program ensures the Installation complies with all federal, state, and local storm water regulations. Fort Hood is required to comply with the rules and regulations established in Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code. Fort Hood has been granted permission by the TCEQ to discharge storm water to surface waters in the state under the TPDES General Permit No. TXR040000 for small municipal separate storm sewer systems (MS4). Fort Hood developed a Storm Water Management Plan (SWMP) that outlines all requirements of the permit and summarizes the work plan that will be conducted over a 5 year period. Fort Hood has been approved with Texas Commission on Environmental Quality (TCEQ) for their Storm Water Management Plan (SWMP). The SWMP was approved by the TCEQ on January 30th 2009 and must be fully implemented by August 12th, 2012. US Army Garrison Fort Hood Directorate of Public Works is now in Year 5 of its SWMP. The SWMP will direct Fort Hood's compliance efforts for a period of up to 5 years following issuance and will include the following six minimum control measures:

- 1) Public education and outreach
- 2) Public involvement/participation
- 3) Illicit discharge detection and elimination
- 4) Construction site storm water runoff control
- 5) Post-construction storm water management in new development and redevelopment
- 6) Pollution prevention/good housekeeping for municipal operations

2.1.6.3.2 Sediment and Erosion

Sedimentation is the most prevalent water quality threat at Fort Hood. Training exercises and land practices (e.g., cattle grazing) have resulted in erosion and sediment deposition in water bodies across the installation. Construction and maintenance activities can also contribute to erosion and sedimentation. Storm water runoff transports eroded soils into nearby water bodies. Erosion and sedimentation have adversely affected the water quality of streams and lakes and reduced the capacity of lakes and ponds. Total suspended solids (TSS) data for streams has been collected at several stations during storm water events as an indicator of sediment input to streams. The physicochemical properties of water bodies, such as turbidity and TSS, can be affected by sedimentation. Across the installation, measurements of sedimentation have been collected in terms of TSS measurements and erosion inventories that were conducted in 1998 and 1999, all of which show that severe erosion is occurring. Most of the TSS values tend to increase with increasing stream level, indicating that high values might be due to storm runoff associated with precipitation.

The Blackland Research and Extension Center (BREC) Water Science Laboratory has been monitoring sediment losses at 13 sites on Fort Hood. (Although 14 stations were originally established, monitoring has been conducted at only 13.) In an effort to monitor restoration and sediment reduction efforts, monitoring included sites in the Shoal Creek watershed. The NRCS installed BMPs in the Shoal Creek watershed, which is in the Leon River drainage, to reduce erosion in this training area to acceptable levels and keep it open for training activities. A discussion of these monitoring efforts and results is included in the Storm Water Data section below.

2.1.6.3.3 Storm Water Data

The BREC conducted water quality and sediment monitoring at 4 Fort Hood sites. ITAM RTLA funds BREC to monitor ITAM BMPs for effectiveness. Further discussion of this study is included in the Soils section (Section 2.1.5) of this chapter. The water quality sampling results are discussed in this section.

In addition to storm water data, grab sample data (from the same period) are discussed on BREC's Fort Hood Water Quality Project Web site (<http://waterhome.brc.tamus.edu/projects/fhdata02.html>); however, these data were not available.

As part of the storm water study, 4 monitoring sites funded by ITAM RTLA were instrumented with rain gauges, stream level loggers, and programmable water sampling equipment. The sites are listed in Table 2-11. Samples were collected at the sites during storm water events, and results have been used to evaluate the effectiveness of the BMPs. Available storm water data were collected from 1997 to 2002. Note that no data were collected at station number 9 (near the mouth of Cowhouse Creek) because of its proximity to the heavily-duddled Artillery Impact Area (AIA). The data collected include nutrient (nitrate and phosphate) and TSS concentrations, as well as stream level and flow measurements.

Table 2-11
BREC Monitoring Station Locations

Monitoring Station Number	Monitoring Station Location
1	House Creek @ West Range Road
2	Cowhouse Creek @ West Range Road
3	Shoal Creek @ Bald Knob Road
4	Cowhouse Creek @ FM116

Data show that the TSS levels during storm events are 1 to 2 orders of magnitude above typical TSS levels in surface water (in the hundreds and thousands of milligrams per liter). These unusually high measurements could not be verified, although it has been noted in this and other studies that sediment runoff is extremely high during storm events. Analyses did not show any unusual patterns as far as concentration changes during storm events, although very high values of both nutrients and TSS were observed.

In addition, Fort Hood monitors 32 industrial sites covered in the Multi-Sector General Permit TXR05000. Sites are monitored annually and/or semi-annually. Typical pollutants sampled are heavy metals, TSS, and COD. Site specific pollutants are determined by the type of operation. Most sites meet regulatory requirements, however, the following sites have a history of exceeding permit benchmark parameters: Classification Unit (COD, Zinc), DRMO (COD, Zinc), Landfill (TSS) and Recycle Center (COD, TSS).

2.1.6.3.4 Cowhouse Creek Watershed Studies

The U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) has conducted studies to investigate the presence of explosive residues and metals in groundwater, surface water, and sediment in and around the AIA at Fort Hood (Geohydrologic Study No. 38-EH-1588-01). The Cowhouse Creek basin captures both runoff and shallow groundwater flow from the impact area and empties into Belton Lake.

Shallow groundwater discharges to Cowhouse Creek and flows in a general down-valley direction sub-parallel to Cowhouse Creek. Therefore, the activities within the AIA have the potential to affect the groundwater and surface water in this drainage basin, as well as Belton Lake.

Two sampling events—in April 2001 and March 2004—were conducted as part of the CHPPM studies. Surface water, groundwater, and sediment samples were collected from various sites in the Cowhouse Creek watershed in both studies. A site upstream of the impact area was also sampled to represent reference background conditions. Results from the downstream sites were compared with results from this upstream site, as well as numeric water quality criteria and benchmark values.

Results from the 2001 data show no consistent pattern in metals concentrations for both sediment and surface water samples in the impact area in relation to upstream samples. Explosives or degradates were all below detection limits in surface water and sediment samples. In addition, perchlorate was not detected in any surface water samples. It was determined that the quality of the surface water and sediment in Cowhouse Creek in the impact area, as well as at the mouth of the stream, is good. In the same 2001 study, groundwater monitoring was conducted at three monitoring wells along Cowhouse Creek. Samples were analyzed for metals, explosives, and perchlorate. Metals were present, and the results were higher in the upgradient monitoring well (upstream of the AIA), indicating a lack of effects from the impact area. No explosive compounds were detected in any of the groundwater samples. As with the surface water and sediment results, the groundwater results of this study do not show evidence of contamination. On the basis of these results, the AIA does not appear to have a negative impact on the water resources in the Cowhouse Creek watershed in terms of pollution from metals, explosives, and perchlorate.

The results from the March 2004 CHPPM sample collection are similar to the results from the 2001 monitoring. Three surface water samples were collected at each location. Comparisons were made between the 95 percent upper confidence levels (UCLs) of the MCOC concentrations, calculated from the three samples taken at each location, and the corresponding numeric standard for each detected compound. In the surface water samples, there were only a few detections of explosives, and those detections were very low. There were no exceedances of the criteria or benchmark values for metals in the surface water measurements. RDX, perchlorate, manganese, and vanadium had 95 percent UCL concentrations within an order of magnitude of the selected benchmarks at some sample points; however, no values actually exceeded the benchmarks. The RDX and perchlorate benchmarks are based on human health consumption concerns because the surface water from the range flows into Lake Belton, a drinking water reservoir.

At each well location, groundwater samples were analyzed for selected parameters, including the following: 15 explosive compounds (explosives and their degradation compounds), 16 total and dissolved metals, perchlorates, hardness, and total dissolved solids. No detectable levels of explosives or perchlorates were identified in analyzed groundwater samples. In addition, all results for metals were below respective primary maximum contaminant levels (MCLs) and, as with the results from 2001, the 2004 metals measurements were higher in samples from the upgradient monitoring well. These results do not demonstrate evidence of groundwater contamination from the AIA.

2.1.6.3.5 Sewage and Wastewater

The contract to privatize the Fort Hood drinking water and wastewater collection systems was awarded in September 2008 to American Water Works Company, Inc., who took over operational responsibilities from the government in January 2009. Sanitary sewer overflows have been noted as a potential source of contamination to water resources on Fort Hood. There are records of occasional sanitary sewer overflows across the cantonment, specifically near Clear Creek (near the golf course and along tributaries) and near Nolan Creek (Young, personal communication, 2005). There are also records of sanitary sewer overflows from the North Fort Hood waste water collection system. In the past several years, wastewater collection system improvement projects have been completed in the areas of both the golf course and North Fort Hood (Alexander, 2010).

Overflows occur periodically and pose somewhat of an issue regarding water resources. Upon each occurrence, procedures for reporting (to TCEQ) are followed; when fish kills occur, the Texas Parks and Wildlife Department (TPWD) becomes involved. In the past it was estimated that on average approximately 50,000 to 100,000 gallons of raw sewage flowed into water resources each year due to overflows. (Young, personal communication, 2005). In 2009 there were 32 recorded sanitary sewer overflows resulting in an estimated release of 571,400 gallons of raw sewage, a small percentage of which went directly into surface waters (ISR NI 2009). Records of sanitary sewer overflows are no longer kept by DPW-ENV.

Fats, oils, and grease (FOG) in the waste water collection system has also been identified as a potential issue. Grease interceptors, food preparation/grease disposal procedures, and on-going education on FOG are some of the measures that have been implemented to address this issue.

Other potential wastewater issues include those related to portable latrines, mobile kitchens and showers, and hand-washers used across the installation. It is unknown what impact, if any, these might have on the water resources of Fort Hood; however, procedures are followed to minimize pollution from these temporary units.

Fort Hood has a Texas Pollutant Discharge Elimination System (TPDES) wastewater permit, as shown in Table 2-8. This permit covers industrial wastewater discharges from various vehicle washing and maintenance activities located in the main cantonment. Permit limits are shown in Table 2- 9. Various best management practices (BMPs) and innovations are employed to limit the potential for pollutants to enter water resources. These include the use of wastewater and storm water detention ponds, and four tactical vehicle wash facilities which treat and re-circulate wash water so that no discharges occur. Water quality samples are collected weekly at TPDES permit outfall locations to ensure compliance with permit requirements. Water quality and flow data monitoring results are available for six different permit locations (1999 to present). Typically, flow and other constituents are measured weekly. A summary of the data collected is shown in Table 2-10. In June 2011 American Water obtained a TPDES wastewater permit for their outfall at BLORA which was previously covered by Fort Hood's wastewater permit.

Table 2-8
Fort Hood TPDES Permit Descriptions

Permit No.	Outfall	General Description	Specific Description	Receiving Water	Major Watershed
TX0002313	004		Discharge from East Lake	Bull Run Creek, a tributary of Cowhouse Creek	Cowhouse Creek
	005		Discharge from Birdbath Lake	Bull Run Creek, a tributary of Cowhouse Creek	Cowhouse Creek
	006		Discharge from Landfill Lake	Tributary of House Creek	Cowhouse Creek

Note: WWTP=Wastewater Treatment Plant

Table 2-9
Fort Hood TPDES Permit Limits

Effluent Characteristic	Daily Avg (lb/day) mg/L	7-day Avg mg/L	Daily Max mg/L	Single Grab mg/L	Min.	Max.
<i>TX0002313-004, -005, -006</i>						
Flow, MGD	--	--	--	--	--	--
Chemical Oxygen Demand	--	--	200	200	--	--
Total suspended solids	--	--	90	90	--	--
pH, s.u.	--	--	--	--	6.0	9.0

Oil and grease	--	--	15	15	--	--
TX0002313-010						
Flow, MGD	0.020	--	--	--	--	--
Biochemical	(5.0) 20	--	45	45	--	--
Oxygen						
Total	(5.0) 20	--	45	45	--	--
suspended						
solids						
pH, s.u.	--	--	--	--	6.0	9.0
Total residual	--	--	--	--	1.0	4.0
chlorine, mg/L						

^aLimitations are applicable to discharge from each individual treatment facility

^bTwo-hour average in gallons per minute (GPM).

Table 2-10
Permit Compliance Monitoring Data Summary

	Flow (GPM)	Flow (MGD)	pH (s.u.)	DO (mg/L)	TSS (mg/L)	TSS Load (lb/day)	Oil & Grease (mg/L)	COD (mg/L)	BOD (mg/L)	BOD Load (lb/day)	Total Residual Chlorine (mg/L)
TX0002313-004: 12/1/04–10/19/10											
Count	341	346	274	--	277	--	277	277	--	--	--
Minimum	0	0.000	6.84	--	1	--	4.68	30.0	--	--	--
Maximum	1000	1.008	8.92	--	103	--	32.1	159.0	--	--	--
Mean	241	0.321	8.02	--	14	--	5.33	32.69	--	--	--
Median	207	0.297	8.08	--	11	--	5.12	30.0	--	--	--
TX0002313-005: 12/1/04–10/19/10											
Count	319	319	100	--	99	--	100	100	--	--	--
Minimum	0	0.000	6.97	--	1	--	5.0	30.0	--	--	--
Maximum	18849	27.142	8.91	--	80	--	9.8	126.0	--	--	--
Mean	1034	1.490	8.26	--	10	--	5.23	32.8	--	--	--
Median	448	0.645	8.32	--	6	--	5.19	30.0	--	--	--
TX0002313-006: 12/1/04–10/19/10											
Count	348	348	343	--	346	--	345	346	--	--	--
Minimum	0	0.000	6.58	--	1	--	0.96	10.0	--	--	--
Maximum	3573	6.151	8.94	--	167	--	25.6	77.7	--	--	--
Mean	332	0.488	8.00	--	11	--	6.81	31.8	--	--	--
Median	236	0.340	8.12	--	6	--	5.17	30.0	--	--	--
TX0002313-010: 12/15/04–06/30/11											
Count	105	1133	428	--	214	214	--	--	212	213	917
Minimum	0.01	0.000	5.08	--	0	0.00	--	--	1.99	0.00	0.1
Maximum	77.01	0.043	8.41	--	78	2.67	--	--	19.2	1.90	8.8
Mean	15.51	0.007	7.51	--	7.0	0.50	--	--	3.22	0.23	1.9

Median	3.35	0.067	7.61	--	4.6	0.30	--	--	2.0	0.18	1.8
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Notes: TSS = total suspended solids, COD = chemical oxygen demand, BOD = biological oxygen demand.

The MDL for COD = 30.0 mg/L and the MDL for oil and grease = 5.0 mg/L. These values were used for non-detects in the calculations to summarize data.

2.1.6.3.6 Conclusions

Various activities at Fort Hood might contribute sediment and other nonpoint source pollutants to nearby water bodies and groundwater. Storm water runoff from training areas could carry sediments, vehicle fluids, and metals, as well as phosphorus and toxics contained within munitions. Surface water quality might also be affected by runoff from agricultural operations in the agriculture outlease areas of the installation. The runoff might contain nonpoint source pollution such as pesticides, sediment, fertilizers, animal waste, and oil and grease.

Comprehensive water quality assessments for the water bodies on the installation are lacking. These concerns are discussed further in Section 3.1.5. Additional water quality information is being sought from the BREC, the Brazos River Authority (BRA), and other sources to help provide a more comprehensive assessment of Fort Hood's water resources.

2.1.7 Fire Management/Prescribed Burning

Fire management in training areas is essential for ensuring safety and maintaining healthy natural systems. Wildfires in the past have caused substantial damage to the habitat of the golden-cheeked warbler, an endangered species, as well as damage to training facilities. However, fire can also have positive effects on natural resources. Prior to European settlement, wildfires were common and helped to maintain the ecological balance between grasslands and forest and shrub communities. Controlled prescribed fire can be a useful tool for maintaining healthy grasslands and controlling invasive shrubs like Ashe juniper. The NRMB plans to increase prescribed burning to improve the ecological condition of the training areas.

Prescribed fire is an appropriate management tool to use in grasslands to control undesirable shrubs and trees, burn dead debris, increase herbage yields, increase the availability of forage, and improve wildlife habitat. Prescribed burning is also used to manipulate habitat for the endangered black-capped vireo, improve open space for military training, and reduce fuel loads to prevent wildfires (Fort Hood, 2001a).

Prescribed burning is an annual management activity beginning in late fall and typically terminating at the end of February, though priority areas may be burned year-round when practical. Prescribed fire is also used on a limited basis during the growing season to reduce fuels in fire-prone zones of the live-fire area. Prescribed burning is controlled by the Directorate of Emergency Services (DES) and is conducted by qualified personnel. The number of acres treated each season depends on weather conditions and the availability of areas not occupied for training. Areas are usually treated on a 5- to 7-year burn cycle, depending on the success of each burn, although some areas might go for longer periods without treatment. Areas overgrazed by cattle and heavily used for training require a shorter cycle because of the reduced fuel load necessary to achieve positive results (Fort Hood, 2001a).

Prescribed fire was applied to 1,621 ha between October 1 2010 and 30 September 2011, including 244 ha of BCVI habitat. Prescribed fire in support of GCWA management is primarily for hazard reduction, and is conducted in areas adjacent to or near habitat.

Fort Hood personnel maintain and construct firebreaks in order to reduce the risk of catastrophic wildfire in GCWA habitat and facilitate wildfire suppression activities. Two kinds of firebreaks are used on Fort Hood: bladed breaks and grassland areas maintained free of Ashe juniper. During 2011, personnel maintained 24.5 km (15.2 miles) of bladed fire breaks. No new bladed firebreaks were constructed during that time. Juniper clippings were mulched on 235 ha (582 acres) of grassland areas for the purpose of firebreak maintenance. From 1 October 2010 until 1 September 2011, juniper removal was cited as an objective on 1,621 ha of prescribed burns during the reporting period.

Most wildfires begin in the Live-Fire Areas (Fort Hood, 2001a). Uncontrolled wildfires are not only detrimental to natural resources and to military training, but they can also threaten areas outside the installation if they cross the boundary. Wildfires occurring during dry periods seriously damage desirable herbaceous plant species and can have a major negative impact on small and large mammals and avian species.

Fort Hood uses a fire danger rating system to alert trainers when pyrotechnic operation should be limited or halted. The system is based on current (daily) weather and the estimated moisture content of vegetation and soil. Details of this rating system can be found in OPLAN 8-93, *Operation Brush Fire* and Fort Hood Regulation 350-40. The fire ratings are as follows:

- **Condition Green:** No restrictions on training. Troops may use pyrotechnics and incendiary munitions for training.
- **Condition Amber:** Caution must be taken in the use of pyrotechnics. Aerial flares are not to be used outside the impact area. Other pyrotechnics are to be used only in roadways, on tank trails, in areas clear of vegetation, or in containers.
- **Condition Red:** No pyrotechnics or incendiary munitions are authorized for training purposes.
- **Condition Red with Waiver:** Once a risk assessment is conducted by Range Control and the recommendation for training with waiver is approved by the Director, Range Control, specific restrictions are imposed on training units.

Under all fire condition ratings, fires are reported to Range Control by military units or installation personnel (Fort Hood, 2004b). If the fires are within range fans where live-fire training is being conducted, units must cease firing until a fire risk assessment is conducted or control measures are implemented. Range Control determines the location of the fire and risk to facilities, personnel, or sensitive resources such as endangered species habitat. If Range Control determines there is no risk to facilities or habitats, the fire is allowed to burn. Typical examples are fires occurring in the permanently duded impact area, where fires are extremely frequent and fuel loads are low. If a fire might pose a risk to endangered bird habitat, Range Control contacts NRMB for an assessment of the risk based on proximity to high-hazard areas, fuel load, topography, and other parameters. If the fire risk to habitats is obviously high, Range Control may immediately implement fire control actions concurrent with notification of the NRMB.

Prior to March 2005, fire control was implemented under all fire condition ratings if a determination was made that endangered species habitat was at risk from a fire. Within the Live-Fire Areas, the first response is usually made by a contracted helicopter on standby for fire control. Under condition Red, this helicopter is on 30-minute standby during 1100–1800 and 2-hour standby during the rest of the day/night period. Other installation fire-fighting assets are available for fire control as needed.

As part of the overall proposed revisions to the Fort Hood Endangered Species Management Plan (ESMP) (Appendix E), the NRMB proposed modifications to Fort Hood's fire management and protection policies (Fort Hood, 2004b). These modifications reduce requirements to conduct intensive fire suppression in Live-Fire Areas during conditions Green and Amber. Based on a March, 2005 Biological Opinion from USFWS, Fort Hood established a "let burn" policy for range fires that occur during periods when the Fire Danger Rating is Green or Amber. Under Green and Amber ratings, fires are allowed to burn in all habitat areas in the Live-Fire Areas unless there is an obvious threat

to personnel or facilities or until such time as changing environmental conditions warrant implementing increased fire control procedures. This “let burn” policy was carried over in the December 2010 biological opinion.

The purpose of this modification is to reduce interruption of ongoing live-fire training exercises (Fort Hood, 2004b). So far in FY 2011, live-fire training was interrupted 455 times to suppress fires caused by training activities, for a total downtime of nearly 339 hours. This amount of downtime results in a substantial operational constraint that adversely affects training effectiveness.

Under this modified procedure, Fort Hood will emphasize the use of annual preventive prescribed fire to maintain blacklines near habitat areas in the live fire area to enhance training capabilities. Fort Hood will employ firebreaks in association with endangered bird habitats to reduce fire risk.

2.1.9 Fish and Wildlife Management

There are approximately 196,356 acres of mission land suitable for fish and wildlife management. Fort Hood has approximately 200 miles of named intermittent and perennial streams with numerous additional tributaries of those features. Fort Hood contains more than 200 water impoundments constituting approximately 692 surface-acres and shares 43 miles of shoreline with Lake Belton. A list of native fish species is provided in Appendix F. Several projects are ongoing and planned to maintain or improve fish and wildlife habitat. Although not intended primarily for the benefit of wildlife, most of the planned elements being installed for other purposes will benefit fish and wildlife.

Current fish habitat management includes the construction of new lakes, lake renovation, dredging for silt removal, bottom contouring, shoreline improvement, aquatic weed management, and dam and spillway repair.

Fort Hood’s animal species include mostly animals indigenous to this part of Texas. Currently, two federally-listed endangered species have a significant presence on the installation. Other federally-listed species occur on the installation on a transient basis or winter on the installation, including the whooping crane (*Grus americana*). The Sprague’s pipit (*Anthus spragueii*), which winters in the Fort Hood grasslands, and smooth pimpleback mussel (*Quadrula houstonensis*) occur on the installation, and are candidates for federal listing. Bald eagles (*Haliaeetus leucocephalus*), which have been de-listed also occur on the installation near Belton lake.

In addition to federally-listed species, the state threatened Texas horned lizard (*Phrynosoma cornutum*) has also been documented to occur on the installation. For more detailed information, see the Federally Listed Species Managed section (Section 2.1.9.1).

The wildlife habitat management program at Fort Hood is targeted toward restoring the ecological health of the mission lands. The primary needs have been identified as the reduction of the sheet, rill, and gully erosion to acceptable limits; increased native food plants; the reduction of wildfires; and the creation of additional water supplies. A comprehensive list of birds known to occur on Fort Hood and their abundance is provided in Appendix G. A comprehensive list of plant species known to occur on Fort Hood and their abundance is provided in Appendix H.

2.1.9.1 Federally Listed Species Management

The endangered or threatened species observed at Fort Hood include the whooping crane, the golden-cheeked warbler and the black-capped vireo. Whooping cranes are known to pass over Fort Hood during migration, and have been known to stop over to rest and forage. The golden-cheeked warbler, which was federally listed as endangered in December 1990, nests on Fort Hood from March through July. The black-capped vireo was listed as endangered in November 1987, and it nests on Fort Hood from March through August each year. In addition, the Sprague’s pipit, a candidate for federal listing winters on the installation, primarily in the short grasslands of the Live Fire area. The

smooth pimpleback mussel, which is proposed for federal listing, has been documented in the Leon River in the northeastern portion of the installation.

The management and monitoring of Federally-listed endangered species on Fort Hood is a natural resource management obligation for the Army and Fort Hood. In accordance with the Endangered Species Act of 1973, the Army must assist in the recovery of all listed threatened and endangered species (TES) and their habitats under the installation's management authority. The installation ESMP should be used as a tool to achieve conservation objectives for populations of listed and proposed species while minimizing impacts on the training mission. The USFWS 1 December 2010 Biological Opinion for Fort Hood (see Appendix J) provides requirements and guidance for endangered species management on Fort Hood. The ESMP is written specifically for use by natural resource managers and leaders of training operations on Fort Hood to accomplish military training objectives while meeting conservation objectives for TES.

2.1.9.1.1 Existing TES Management

A key feature of the ESMP (FY 2001–2005) was the designation of core and non-core habitat areas (Figure 2-9), along with the modification of training restrictions and habitat protection measures based on these designations. Core habitat areas are primarily large, contiguous blocks of habitat where potential mission conflicts are below average and where habitat protection measures will be enhanced and active management will be performed. Non-core habitat areas also contain large tracts of high-quality habitat, however these habitat patches occur in areas where training activity is more intense. There are no restrictions on training in non-core habitat areas. Fire management policy has been enhanced by the Firebreak Construction Plan, along with prescribed burning to reduce fire hazards near habitat areas. Several mitigation studies were initiated following a major loss of habitat during a wildfire in 1996, including a study of dispersal patterns and patch utilization by warblers affected by the fire, extensive vegetation mapping and monitoring to document successional development of endangered species habitat following a disturbance, and a monitoring effort to track colonization patterns of black-capped vireos moving into new habitat created by the fire. Monitoring of the habitat affected by the 1996 fire will continue on a five-year basis for an indeterminate period of time. Available data to date show that much of the area that became suitable habitat for black-capped vireos after the fire is now becoming less suitable for the species due to changes in vegetative structure, composition, and height. Findings will be reported to USFWS and published in the scientific literature as data become available.

Cave-adapted or cave-dependent faunal communities of Texas are often represented by rare endemics due to the narrow ecological niche and natural isolation of the cave systems they inhabit. The Karst Management Plan protects and manages these species. Eighteen described, endemic cave invertebrate species, five karst dependent species requiring special concern, one undescribed karst dependent species, one bat species of concern, and one unique color morph of the slimy salamander (*Plethodon albagula*) occur on Fort Hood. Without pro-active monitoring and management, these species could be proposed for listing as endangered in the future. Rare or endemic cave-adapted species known to occur on Fort Hood are listed in Appendix I.

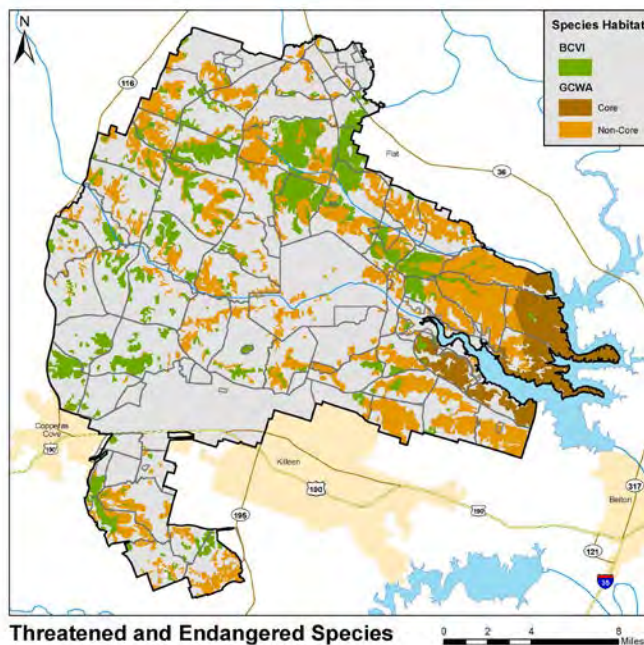
Ongoing karst (cave) research and monitoring will be furthered by the completion of surveys, mapping, microclimate monitoring, and biotic collections in known karst features. Fort Hood currently operates under its Karst Management Plan (Appendix K). No federally endangered or threatened plant species are known to occur on Fort Hood. The Alabama croton (*Croton alabamensis* var. *alabamensis*) is a species of concern that was formerly a category 2 candidate for federal listing. This species was formerly known from only two counties in Alabama and one county in Tennessee. In 1989, a variety of *C. alabamensis* was discovered on Fort Hood.

2.1.9.1.2 Proposed TES Management

Fort Hood is in the process of revising the installation's ESMP. The ESMP will be submitted to the USFWS for review. Management actions and minimization measures for endangered species are outlined in the December 2010 programmatic biological opinion (Appendix J). Most management and minimizations measures included in the December 2010 programmatic biological opinion were also included in the 2005 programmatic biological opinion.

Currently, construction and range improvement projects on Fort Hood, as well as habitat loss due to wildfire, have been authorized under the December 2010 programmatic biological opinion for a five-year period ending in 2015.

Figure 2-9 Core and Non-core Habitat Areas



2.1.9.2 Designated Critical Habitat

Currently, there is no habitat on Fort Hood designated as critical habitat by the USFWS.

2.1.9.3 Areas Restricted Because of Sensitive Habitat/Open Space

Areas that are restricted because of sensitive species habitat were discussed in Section 2.1.9.1.

2.1.9.4 Ecological Reserve Areas or Natural Resource Areas

In January 2001, two urban natural areas were designated on undeveloped tracts at Fort Hood. The purpose of designating these sites as urban natural areas is to promote the observation, appreciation, and study of nature by providing easily accessible sites that have been preserved and enhanced to support such activities. Enhancements were intended to be limited to those that support this purpose and may include development of a trail system, installation of interpretive signs or exhibits, and management of existing resources to promote the diversity of the area, such as development of a wildflower meadow or transplanting of native shrubs and trees. However, the need of a Child

Development Center near the location has encroached into the urban natural area on the corner of Tank Destroyer Boulevard and Clear Creek Road. There are no further plans for construction in the natural areas at this time.

Aside from this construction project, preservation and enhancement of these sites as urban natural areas benefits Fort Hood by:

- Enhancing the quality of life for Fort Hood's families
- Providing a buffer between the Comanche I housing area and any existing or future development
- Providing easily accessible field sites for the environmental education programs of on- and off-post schools
- Providing easily accessible sites for scout and other youth group field trips
- Increasing awareness and appreciation of Fort Hood's natural resources
- Preserving and enhancing wildlife habitat in the cantonment area
- Providing a corridor for movement of wildlife among parcels of open space
- Providing a refuge for wildlife displaced by construction of the railhead or by other habitat alterations
- Providing an opportunity to further Fort Hood's positive relationship with the surrounding communities (Fort Hood, 2001b)

The Fort Hood Natural and Cultural Area (NCA) is a 125-acre plot that offers residents and visitors the chance to observe and appreciate nature and the cultural heritage of Central Texas. The area is intended to highlight the diversity of native species of plants and animals, as well as the history of the region, by providing opportunities for viewing wildflowers, deer, a beaver pond, and a historic farmstead.

Walking and biking trails allow access to various points of interest in the area. The NCA is east of Clear Creek Road between Tank Destroyer Avenue and Battalion Avenue (Fort Hood, 2004f).

2.1.9.5 Historic Landmarks

There are no historic landmarks in the training areas at Fort Hood.

2.1.9.6 Migratory Birds

Several hundred species of non-game birds protected by the Migratory Bird Treaty Act (MBTA, 16 USC 703-712; 50 CFR Part 10) use Fort Hood (see Appendix G). These species use the Installation for breeding, overwintering, or migratory stopover. The MBTA states that, "Unless and except as permitted by regulations...it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill...any migratory bird, any part, nest, or eggs of any such bird...concluded November 19,1976."

In accordance with Executive Order 13186 and the associated Memorandum of Understanding between the DoD and the USFWS to Promote the Conservation of Migratory Birds, Fort Hood will, to the extent feasible and practical, conduct non-military readiness activities in a manner that will minimize or avoid their impacts on migratory birds, with special emphasis on migratory bird species of concern (SOC).

Further, Executive Order 13186 provides guidance to Federal Agencies with the purpose to, "minimize the potential adverse effects of migratory bird take, with the goal of striving to eliminate take, while implementing the mission."

In the 2003 National Defense Authorization Act (NDAA), Congress authorized the Secretary of the Interior to issue a regulation exempting the Armed Forces for the incidental take of migratory birds during Military Readiness Activities. The definition of a Military Readiness Activity in the 2003 NDAA, Public Law 107-314, §315(f), as incorporated into 50 CFR 21.3, includes all training and operations of the Armed Forces that relate to combat, and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat

use. It does not include (a) routine operation of installation operating support functions, such as: administrative offices; military exchanges; commissaries; water treatment facilities; storage facilities; schools; housing; motor pools; laundries; morale, welfare, and recreation activities; shops; and mess halls, (b) operation of industrial activities, or (c) construction or demolition of facilities listed above. Accordingly, the Armed Forces may now incidentally take migratory birds provided the take occurs as a result of a Military Readiness Activity and subject to the other provisions of the rule at 50 CFR 21.15.

In order to support Military Readiness Activities there are a number of essential non-military readiness activities that are required and are considered essential to the mission. Because of the absolute criticality of these activities in establishing the environmental conditions necessary to provide the realistic training needed to prepare or sustain the competencies of Soldiers for conflict, or maintaining the safety and security of the Installation, efforts to avoid impacts on migratory birds may not always be feasible.

2.1.9.6.1 MISSION ESSENTIAL TRAINING

At Fort Hood, soldiers are provided training in the use of light and heavy weaponry, tracked and wheeled vehicles, and individual and crew-served weapon systems. These systems involve target practice/maneuver areas/non-live fire battlefields which include individual, squad, platoon, company, battalion, brigade, combined teams, and full spectrum, (Infantry, Armor, Mechanized, and Stryker) brigade combat team (BCT) training to develop and/or sustain their skills to ensure battle readiness. Annually, Fort Hood trains the equivalent of four divisions (approximately 50,000 soldiers); and approximately 2000 tracked vehicles, 2000 Stryker vehicles, and 8000 wheeled vehicles train on Fort Hood lands and ranges semiannually. To meet the required “battle ready” standards, soldiers are scheduled to train on all Installation land and range facilities multiple times a year. Given the numbers of soldiers and vehicles that will be training at Fort Hood to meet the Army’s training standards, the Live Fire ranges/maneuver areas must remain open and in a ready condition to support Military Readiness Activities throughout the year.

To maintain and support realistic Military Readiness Activities training and live-fire areas, essential non-Military Readiness Activities are required to sustain the land’s training capabilities and environmental aspects. If essential non-Military Readiness Activities are not performed, training is degraded, and Soldiers are not trained to Army standards. Because Soldiers fight as they are train, improper training can lead to improper maneuver and execution of battlefield tactics resulting in increased casualties and deaths in combat.

Examples of essential non-Military Readiness Activities are: prescribed burning, mowing, encroaching woody species management, gully plugs, and other critical field management activities to support readiness training. These essential non-Military Readiness Activities are the Senior Mission Commander’s mandates that must occur when units are not actively using the training lands and are accomplished within the Federal funding cycles. As a result of this congressionally authorized and controlled funding cycle which begins the first of October each year, the availability Federal funds for contract award may vary throughout the fiscal year. As a result contracts cannot be awarded and executed until the Federal budget is approved and released to the Installation. Prior planning for these projects may position these projects for quick execution once funding is available. Under Continuing Resolution Authority, the funding authority that allows the Federal government to continue to operate until a formal Federal Budget is approved; there are no “new project” starts such as non-Military Readiness Activities projects. Thus, non-Military Readiness Activities projects may be executed year-round even during the migratory bird nesting season, periods when migratory birds are most active in the Fort Hood area. As such, and in spite of best efforts, migratory birds may be unintentionally taken, as a result of these essential non-Military Readiness Activities. Therefore, best management practices (BMPs) as defined in Section 3.8.2.3 have been put in place to avoid and minimize unintentional take during non-military readiness activities during migratory bird nesting season. No migratory birds will be intentionally taken except in those rare cases where a permit can be obtained from the United States Fish and Wildlife Service.

2.1.9.6.2 CONSTRUCTION PROJECTS

Range, Training Area and Cantonment Area construction, repair and maintenance projects are large scale, planning efforts on Fort Hood. During the planning phase, effects on migratory birds as well as on other natural resources (i.e. wetlands, endangered species, vegetation) are considered during the siting of potential projects. Construction projects are usually 12 to 18 months in duration. Therefore, once initiated, a construction project will affect at least one nesting season. . After awarded, the contractor must be able to work until the construction is finished. Any significant delays in the construction schedule would be costly to the Army/taxpayer, and possibly require contract/project termination, and congressional notification and approval. Section 3.8.2.3 describes BMPs that are taken to avoid and minimize the unintentional take as a result of ground clearing and other construction activities.

2.1.9.6.3 INSTALLATION SECURITY AND SAFETY ACTIVITIES

Fort Hood is required to maintain a secure Installation perimeter. One aspect of accomplishing this goal is by controlling vegetation within 300 feet of the existing Installation boundary. The Installation will remove trees or other vegetation that potentially could compromise security, present fire hazards or pose safety risks. Additionally, the removal of vegetation [dead tree(s)] in and around residential or administrative buildings is required when fire or safety hazards are present. Federal funding for these requirements is subject to the same congressional authorizations and controls as discussed previously, and as such, contract awards may occur throughout the fiscal year. Section 3.8.2.3 describes BMPs that will be taken to avoid and minimize the unintentional take as a result of Installation security and safety activities.

2.1.9.6.4 DETERMINATION OF EFFECTS

The effects of maintenance and other land management activities (such as vegetation removal) to migratory birds will vary according to the season in which the action takes place, habitat where the activity is taking place, and scope and intensity of the action. Activities such as vegetation removal over a large area during the nesting season would have much greater effects to migratory birds than the same action during the non-nesting season. The Installation will minimize the impacts to migratory birds by using established BMPs (Section 3.8.2.3) such as surveying for and marking active nests, and the early review of construction and maintenance projects. If land management activities must occur during any portion of the nesting season the Installation will, to the greatest extent possible, conduct these maintenance activities (i.e., mowing, disking, prescribed burning, vegetation clearing and removal) early enough in the nesting season in order to minimize the potential risk for an unintentional take. Areas to be maintained will be surveyed and nests will be identified and flagged or marked for avoidance. The Installation will implement these and additional BMPs (Section 3.8.2.3), as part of the project to further reduce the risk of an unintentional take.

2.1.9.6.5 CONSERVATION EFFORTS AND MANAGEMENT ACTIONS

The Installation performs both conservation efforts and management actions that lessen impacts and provide benefits to migratory birds. Although these actions are listed in detail throughout the INRMP, they are also listed below:

1. Brown-headed cowbird control. Cowbird control is conducted to minimize nest parasitism of GCWA and BCVI. However, this management activity may benefit some sensitive species that may be adversely affected by cowbird parasitism.

2. Erosion control and vegetation of watersheds. Controlling erosion minimizes damage to the landscape, thus serving to maintain and/or improve habitat for wildlife and migratory birds. Areas affected by excessive erosion may be re-vegetated with native species, wherever feasible to improve soil stability, allowing the landscape to recover.

3. Lake and pond management. Fort Hood conducts sediment removal from ponds and some shallow wetland areas as necessary ensuring they remain functional. Ponds and wetlands are used by a large number of migratory bird

species, both year round and during the peak of the migration season, and provide important foraging and resting habitat for many bird species.

4. Oak wilt management. Fort Hood conducts oak wilt management by trenching around infected trees and monitoring oak wilt centers. Reducing the spread of oak wilt is beneficial to migratory birds as native oaks are an important nesting habitat for many species and also provide forage for wildlife and bird species. In addition, native oaks are a very important component of different habitat types on the Installation, including GCWA habitat.

5. Prescribed burning. Prescribed burning is used to maintain grasslands and reduce the risk of wildfire to endangered species habitat and other resources. Conducting prescribed burns in and near the live-fire area reduces the risk of large, uncontrolled wildfires that may be started from range activities in this area. Minimizing the risk of large, destructive wildfires benefits all migratory birds on the Installation. Prescribed burning is also used in BCVI habitat to maintain the shrubby early seral stage vegetation preferred by this species. This management action also benefits the numerous other migratory bird species that prefer this type of habitat for nesting and foraging. The prescribed burning season for Fort Hood runs from October through February. In the event that there is a significant need to initiate a prescribed burn outside this standard burn season, a depredation permit will be obtained prior to any disturbance.

6. Grass lands Management. The maintenance of grassland habitat is very important for many species of migratory birds as anthropogenic activities (i.e., fire suppression, overgrazing by cattle, fragmentation, and development, etc) have resulted in substantial reductions in grassland habitat nationwide. Nationwide, grassland nesting migratory bird species are experiencing rapid population declines. Thus, maintaining habitat for these species is important on a local as well as regional and national scale. Removal of invasive and encroaching trees and shrubs restores and maintains prairie conditions in the western maneuver corridors. This restoration increases habitat for ground-nesting grassland birds.

7. Construction and maintenance of fire breaks. Constructing and maintaining fire breaks helps to minimize wildfire risk, thus reducing the loss of migratory bird habitat and the loss of active nests due to wildfire.

8. Protection of endangered species and habitat. Vegetation removal is prohibited during the nesting season in BCVI and GCWA habitat to reduce disturbance to these species and take of active nests. Other migratory bird species that utilize BCVI and GCWA habitat during the nesting season also benefit from this conservation measure.

2.1.10 Forest/Woodland Management

The Army forest management program is required to support and enhance the immediate and long-term military mission and to meet natural resource stewardship requirements set forth in federal laws (AR 200-1). Army policy further stipulates that forest resources must be managed for multiple uses, using an ecosystem management approach to optimize the benefits to the installation's natural resources. FORSCOM technical guidance indicates that installations should implement ecosystem management to support the military mission, while protecting endangered species and their habitat (FORSCOM, 1997). Ecosystem management provides a framework for holistic management of the resource rather than focusing emphasis on a single aspect or activity such as commercial timber production or game species management.

Fort Hood does not have a commercial timber harvest program. Juniper and Mesquite cutting is conducted to prevent encroachment into open training areas where unfettered growth could have negative impacts on training of mechanized units. Additionally, a Woody Species Management Program has been implemented by DPTMS to remove Juniper and Mesquite vegetation from the Western Maneuver Area. It includes the western maneuver corridor plan for heavy BCT training, dismount infantry plans for use on the east side, have been implemented to meet the senior commanders training missions on the training missionscape.

The primary focus of forest/woodland management activities at Fort Hood is the minimization of impacts to oaks from oak wilt, a disease caused by the fungus *Ceratocystis fagacearum*. The fungus is systemic, inhibiting the ability of the vascular system to move water and nutrients upward resulting in wilting of leaves, and ultimately causing the death of the tree (Fort Hood, 2004b).

Texas red oak and Plateau Live oak are the primary carriers of the disease, which is usually spread through the root system. Oak trees grow in colonies with their roots grafted together and provide the primary means of transportation for the disease. The disease normally moves at a rate of approximately 100 feet per year. Natural boundaries such as rock layers or open spaces between oak colonies can restrict wilt spread. If all above ground plant parts are removed the root system will continue to spread the disease. Usually about 90% of the trees in a wilt center will die.

A Texas red oak which dies in late summer or early fall may develop fungal mats, which consist of an orange, sticky, jell material, that attracts sap feeding insect vectors (primarily *Nitidulids* or very small picnic beetles) (Fort Hood, 2004b). The infestation of healthy trees can occur when these beetles travel from the fungal mats with fungi spores attached to their bodies (or in its digestive track) to a fresh wound on another Texas red oak or live oak. Infestation must occur within 72 hours or before a tree wound dries. Trees of the White Oak family are not as likely to be infected, but if they are, they may take several years to die. Normally, they have more tolerance to oak wilt. Approximately 99 percent of trees are infected through the root system and one percent is the result of insect vectors.

An aggressive oak wilt management program is needed on Fort Hood to control wilt effects, although it is unlikely that the disease will ever be eliminated from the ecosystem. Painting of wounds is a method recommended in urban landscapes to prevent insect infestation, however, this is not a practical treatment in the training areas. Another practice is *trenching*, which involves digging a 4 to 5 feet deep trench about 100 feet outside of infected areas. The objective of trenching is to sever the root masses, therefore the trench can be immediately refilled. This practice controls the spread of wilt to healthy trees. Because of the size of the training lands, implementing this management approach on a large scale is expensive and impractical.

In 2007 and 2008, TNC surveyed 923.4 ha in training area 32 and BLORA, and 200.2 ha in training area 115. In 2007, TNC identified 258 oaks as definitely having oak wilt, and of these, 76 were Texas red oaks, and the remaining 182 were Plateau live oaks. TNC identified 193 trees as possibly having oak wilt, 162 of which were Texas red oaks and 31 Plateau live oaks. Plateau live oaks infected with oak wilt show more obvious symptoms than Texas red oaks, which is the reason that they are more often diagnosed as definitely having oak wilt. In 2008, TNC identified 65 oaks as definitely having oak wilt. Of these, 18 were Texas red oaks, and the remaining 47 were Plateau live oaks. TNC diagnosed 21 trees as possibly having oak wilt, 10 of which were Texas red oaks and 11 Plateau live oaks.

TNC also re-surveyed the larger oak wilt centers from 2007, marking new infections and old death of oaks around the centers. Around these centers, TNC marked 546 old dead oaks, 3 possible oak wilt trees, and 68 new oak wilt infections, with only 6 of those being Texas red oaks. In 2008, TNC resurveyed the existing trenches (11,402 m) dug in oak wilt centers across the installation and found three verified outbreaks of oak wilt.

2.1.11 Agricultural Outlease

One of the most significant natural resource management issues at Fort Hood is the leasing of training land for livestock (cattle) grazing. The installation has one outlease for cattle grazing. When Fort Hood was established by condemning private lands, the federal government granted landowners fair market value for the land and a 5-year lease for grazing. The affected landowners formed the Central Texas Cattlemen's Association (CTCA), and the lease to the CTCA has been renewed continuously since its first issuance. Fort Hood allows grazing on approximately 190,000 acres (88 percent) of its 218,419 acres. Excluded from the leased acreage are the cantonment areas (North Fort Hood,

West Fort Hood, and main), the DOL area west of the main cantonment area, and training areas 20 and 30 near the main cantonment area (Fort Hood, 2001a). Figure 2-11 shows the locations of the grazing management areas. Table 2-12 lists the major grazing management areas, the training areas each management area comprises, and the number of acres in each management area.

The Corps of Engineers, Real Estate Division, Fort Worth District, is responsible for administration of the grazing outlease at Fort Hood (U.S. Army Audit Agency, 2001). Fort Hood's Natural Resources Management Branch, part of DPW's Environmental Division, initiates the lease process.

As part of the planning process for the INRMP, the NRCS conducted a detailed inventory and evaluation of the training areas (USDA-NRCS, 2002b). The purpose of the study was to determine the general ecological health of the training areas, as well as the stocking rates of individual training areas and management areas, and to recommend changes to protect and restore the ecological health of the training areas.

Table 2-12
Grazing Management Units by Training Areas and Acreage

Grazing Management Unit	Training Areas
Eastern Training Area – North	8 (partial), 10, 11, 12, 13, 20, 21, 22, 23, 115, BLORA
Eastern Training Area – South	8 (partial), 30, 31, 32, 33, 34, 35, 36
Live-Fire and Impact Area	80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94
North Fort Hood	300, 301, 302, 303, 304, 305, 306
West Fort Hood – North	200, 201, 202, 203
West Fort Hood – South	70, 71, 72, 73
Western Maneuver Area – North	50, 51, 52, 53, 60, 61, 62, 63, 64, 65, 66
Western Maneuver Area – South	40, 41, 42, 43, 44, 45, 46, 47, 48
TOTAL LEASED ACRES	188,183

Source: Fort Hood GIS

The stocking rate for each lease period is the number of animal units (AU) that are allowed to graze on a particular Grazing Management Unit (GMU). Animal unit equivalents were developed to standardize Aus among the various kinds and class of bovines. Table 2-13 presents the AU equivalents used by Fort Hood.

Table 2-13
Animal Unit Equivalents

Kinds/Classes of Bovine	Animal Unit Equivalent
Cow, dry	0.92
Cow, with calf	1.00
Bull, mature	1.35
Cattle, 1 year old	0.60
Cattle, 2 years old	0.80

Source: Fort Hood, 2005

Figure 2-11. Fort Hood Grazing Units.



Stocking rates are based on a stocking rate calculation methodology for each GMU based on the ecological health and trend of the unit, and the potential for soil erosion (Fort Hood, 2005). Forage will be made available for grazing to the extent practicable, while maintaining the ecological health and hydrological condition of the sites, and providing the flexibility to modify stocking rates should the ecological health, trend, or erosion at a GMU improve or decline. The stocking rate calculations methodologies are listed below (USACE, 2003; Fort Hood, 2005):

- **Conservation Threshold.** This approach sets a management objective of maintaining 1,000 lbs/acre of forage residue after grazing.
- **Maintenance Threshold.** This approach sets a management objective of maintaining 750 lbs/acre of forage residue after grazing.
- **25 Percent Harvest Efficiency.** This approach is based on the premise that 50 percent of the forage on a site should be left ungrazed to provide cover for the soils and keep the vegetation healthy. The other 50 percent is made available to the grazing animal, but only half of that (25 percent of the total) is actually consumed by the animal. The other 25 percent is lost during the act of grazing by the animal and is returned

to the soil as litter, trampled, or consumed by insects. Thus, only 25 percent of the forage will be consumed by livestock.

The lease area is inventoried each year in spring to determine the allowable stocking rate for the next year to keep grazing animals in balance with available forage. The forage inventory contractor reports estimated forage production in each GMU to Fort Hood (NRMB); NRMB incorporates land management requirements such as prescribed burning and the need for grazing deferments to support land rehabilitation efforts, and determines appropriate stocking rates by GMU. The current stocking rates listed in Table 2-14 are based on the 2005 forage inventory.

In 2010, a new 5-year lease agreement was recently signed and Fort Hood is currently in the process of conducting an Environmental Assessment (EA) to implement a grazing management plan which will allow for a sliding scale of the number of Aus based on yearly evaluations. Updated information on the new 5-year lease and subsequent documents and data will be available in the next INRMP.

2.1.11.1 Negative Aspects of Grazing

Large portions of the training areas are subject to excessive sheet and gully erosion (USDA, 1993, as cited in Fort Hood, 2001a). The resulting sediment is very detrimental to receiving streams. The poor ecological condition of training areas used for maneuver training by tracked vehicles and a historical low level of land maintenance are the primary causes of the erosion. However, an environmental assessment of the renewal of the grazing lease noted that ecological conditions at Fort Hood have worsened since the inception of the original grazing lease and that cattle grazing has the potential to contribute to poor ecological conditions. A supplemental environmental assessment (SEA) addresses these potential environmental impacts and evaluates several new alternative management actions. (Refer to the Grazing SEA for further information; USACE, 2003). A plan to address the erosion problem includes establishing a livestock rotation grazing program (Fort Hood, 2001a). An Environmental Assessment for the new 2010 grazing lease is currently being finalized.

Table 2-14
Stocking Rates and Calculations for each Fort Hood GMU

GMU	Stocking Rate Calculation Methodology (2004-2005)	Grazeable Acres	Animal Units
Eastern Training Area – North	25% Harvest Efficiency	27,091	207
Eastern Training Area – South	Maintenance Threshold	21,935	147
Live-Fire and Impact Area	Limited based on Live-Fire Training Intensity	58,150	750
North Fort Hood	25% Harvest Efficiency	3,793	Swing space
West Fort Hood – North	25% Harvest Efficiency	5,250	73
West Fort Hood – South	25% Harvest Efficiency	8,582	109
Western Maneuver Area – North	Maintenance Threshold	32,983	320
Western Maneuver Area – South	Maintenance Threshold	30,399	394
TOTAL		188,183	2,000

Source: Fort Hood, 2010a

The need for an active cowbird control program is directly related to cattle grazing on Fort Hood lands. From 1997 to 1999, the CTCA operated 27 cowbird traps around the boundaries of Fort Hood. This trapping program was intended to enhance Fort Hood's cowbird control program and mitigate the effects of continued grazing in endangered species habitat areas during the nesting season. To provide additional mitigation, TPWD adopted the Fort Hood trapping methodology and trap design, and Fort Hood personnel trained TPWD personnel. Since 1998, the State program has

rapidly expanded in the Fort Hood area to include about 60 traps currently in operation by private landowners within a 10-mile radius of FH.

So far in FY 2011 (1 January through 1 July), cattle have shut down training 125 times, and the total downtime on training ranges caused by cattle was approximately 38 hours. The amount of downtime is not considered to have a significant impact on the installation's ability to conduct its training mission (U.S. Army Audit Agency, 2001).

2.1.12 Outdoor Recreation

Fort Hood has a very active Outdoor Recreation Program, which has been recognized as the Army's best recreational program. The Belton Lake Outdoor Recreation Area (BLORA), the Sportsmen's Center, the Recreation Equipment Checkout (REC), and the West Fort Hood Travel Camp (WFHTC) are components of the program. The Outdoor Recreation Program provides basic recreation opportunities (e.g., hunting, recreation lodging, swimming, camping, boating, fishing, nature trails) and other opportunities that meet more specialized interests (e.g., skiing, scuba diving, excursions, horseback riding, mountain bike riding, archery, skeet shooting, paintball, kayaking, climbing and repelling).

Hunting and fishing are major recreational programs at Fort Hood. Deer and turkey hunting account for most of the hunting; quail, small game, duck, goose, dove, feral hog, and unprotected wildlife hunting are also available. Fishing opportunities abound in Belton Lake—a major recreational lake in the Central Texas area—and the small lakes, stock ponds, streams, and rivers on the installation. Live trapping is authorized on the installation, but participation is low. October is the archery season for deer, and firearms hunting occurs from November to early January. The turkey season lasts from early April to mid May.

All recreational activities are coordinated with the DPW's NRMB to ensure compliance with regulations.

The following installation regulations and instructions are related to the management of hunting and fishing programs on Fort Hood. They contain all information regarding hunting and fishing on the installation, including the types of weapons that can be used, information on guided and unguided hunting, and the type of game that can be hunted.

- III Corps & FH Reg 210-25 establishes the policy for hunting, fishing, and natural resources conservation on the Fort Hood military reservation. Proof of completion of a state-sponsored hunter education safety course is required in accordance with AR 350-19. A Fort Hood fishing permit is required to fish on Fort Hood and a Fort Hood hunting permit is required to hunt.
- III Corps & FH Cir 210-YY-22, the Installation's *Hunting and Fishing Bag Limits and Seasons* regulation, is issued each September and sets hunting and fishing bag limits, possession limits, size limitations, fishing and hunting seasons, and other restrictions for sport species at Fort Hood. It establishes equipment restrictions which comply with federal and state regulations; in some instances, they are more restrictive than the federal and state regulations.
- III Corps & FH Reg 210-3, Installation's *Recreational Use of Maneuver and Live-Fire Training Areas* regulation, covers access to and use of Fort Hood maneuver and live-fire training areas for recreational purposes. It establishes III Corps and Fort Hood policy, procedures, responsibilities, and user liability related to the recreational, nonmilitary use of all Fort Hood maneuver training areas and live-fire training areas. Personnel using Fort Hood's maneuver training areas and live-fire training areas for recreational purposes must have a personal liability release form on file at the Area Access Control Center (AACC). All entry into numbered training areas for any purpose other than official military training is controlled by

registering annually with the AACC and obtaining a valid FH Form 210-9 Area Access Card upon completion of the registration process.

- III Corps & FH Reg 200-1, *Facilities Engineering Environment and Natural Resources* regulation, prescribes policies, assigns responsibilities, and establishes procedures for protection of the environment, preservation of natural resources, and hazardous material/hazardous waste management.
- DFMWR *Annual Hunting, Fishing, and Area Access Guide* is a guidebook for hunters and anglers that contains basic information on hunting and fishing at Fort Hood and a list of prohibited activities. A map of Fort Hood is provided at time of permit purchase.

2.1.12.1 Fishing Program

A valid Fort Hood fishing permit and a valid state fishing license are required for all persons 17 through 64 years old when fishing on Fort Hood. Fort Hood fishing permits are available for purchase at the AACC. All Fort Hood permits are valid for one year from 1 September to 31 August.

Fish populations in installation lakes are monitored individually, and data indicate that there is considerable variation in game fish populations throughout the year. Funds generated by selling fishing permits are used to procure catfish (*Ictalurus punctatus*) to seasonally stock ponds and small lakes. A DFMWR activity fee, assessed at the time of permit sales, is used to offset the operational costs of the Sportsmen's Center, which conducts and promotes hunting and fishing programs on Fort Hood.

Fish are stocked seasonally (through the Put and Take Program) to provide quality fishing opportunities at lakes and ponds (Table 2-15). "Put and Take" refers to stocking (Put) legal size fish in installation waters that permitted fishers can immediately fish for and keep (Take) as a part of their creel. Largemouth bass (*Micropterus salmoides*) are stocked to maintain or establish balanced populations within a pond, particularly in newly built or renovated ponds. Supplemental stockings can be of any size, depending on the need identified, while new stockings are primarily fingerlings. Channel catfish are stocked annually in many of the installation ponds, and particularly in some of the more popular fishing lakes, to provide greater angler opportunities and to facilitate fish management by concentrating fishing pressure into specific areas. Forage fish, such as bluegill, redear sunfish, and fathead minnows, are stocked to supplement forage deficiencies in established ponds or to provide forage in newly constructed or renovated ponds. Stocking by sportsmen is prohibited.

**Table 2-15
Fish Stocking Report**

Lake	Date	Species	Length (inches)	Weight	Number	Total Pounds
Airfield Lake	27-Aug-08	CCF	20"	12 lbs	6	70
	27-Aug-08	CCF	13.5"	.85 lb	270	230
	23-Jul-09	CCF	13.5"	.82 lb	291	239
	3-Jun-10	CCF	13.7"	0.79	232	183
	20-Apr-11	CCF	14.9"	1.04 lb	201	210
Cantonment A	25-Jun-08	CCF	18"	9.5 lbs	11	105
	16-Jul-08	CCF	13.5"	.75 lb	216	162
	16-Jul-08	CCF	18"	9.5 lbs	9	85
	6-May-09	CCF	13"	.85 lb	285	250
	8-Jul-09	CCF	19"	9 lbs	14	
	12-Aug-09	CCF	19.5"	8.2 lbs	17	139
	26-May-10	CCF	15.2"	0.93 lb	354	330
	30-Jun-10	CCF	25"	4.7 lbs	45	215
	20-Jul-11	CCF	28.8"	7.22 lb	41	292
Cantonment B (Kid's Pond)	1-May-08	CCF	13"	.75 lb	570	380
	25-Jun-08	CCF	18"	9.5 lbs	11	105
	16-Sep-08	CCF	13.5"	.85 lbs	541	460
	16-Sep-08	CCF	20"	10 lbs	10	100
	6-May-09	CCF	13"	.85 lb	415	350
	8-Jul-09	CCF	19"	9 lbs	20	
	12-Aug-09	CCF	19.5"	8.2 lbs	38	311
	28-Apr-10	CCF	15.1"	1 lb	380	380
	3-Jun-10	CCF	13.7"	0.79	50	39
	30-Jun-10	CCF	25"	4.7 lbs	44	210
	14-Sep-10	CCF	18"	1.5	167	250
	6-Apr-11	CCF	13.9"	0.81 lbs	232	188
	14-Sep-11	CCF	TBD	TBD	TBD	TBD
Clear Creek Lake	5-Jun-08	CCF	13"	.75 lb	570	380
	25-Jun-08	CCF	18"	9.5 lbs	11	105
	16-Jun-09	CCF	15"	1 lb	335	335
	8-Jul-09	CCF	19"	9 lbs	12	
	12-May-10	CCF	15.3"	1 lb	174	180
	12-May-10	CCF	17"	4lb	5	20
	12-May-10	CCF	18"	5.6 lb	8	45
	30-Jun-10	CCF	25"	4.7 lbs	25	120
	18-May-11	CCF	15.3"	1.08 lb	324	350
	20-Jul-11	CCF	28.8"	7.22 lb	41	292
Engineer Lake	1-May-08	CCF	13"	.75 lb	570	380
	25-Jun-08	CCF	18"	9.5 lbs	11	105
	28-May-09	CCF	14.8	1 lb	350	350
	12-May-10	CCF	15.3"	1 lb	355	360
	12-May-10	CCF	17"	4lb	10	40
	12-May-10	CCF	18"	5.6 lb	17	95
	18-May-11	CCF	15.3"	1.08 lb	365	395
Heiner Lake	25-Jun-08	CCF	18"	9.5 lbs	13	125
	16-Jul-08	CCF	13.5"	.75 lb	217	163
	16-Jul-08	CCF	18"	9.5 lbs	10	95
	28-May-09	CCF	14.8	1 lb	325	325
	28-Apr-10	CCF	15.1"	1 lb	380	380

	14-Sep-10	CCF	16"	1.5	102	153
	6-Apr-11	CCF	13.9"	0.81 lbs	444	360
	29-Jun-11	CCF	28.8"	7.53 lb	51	384
Larned Lake	25-Jun-08	CCF	18"	9.5 lbs	11	105
	27-Aug-08	CCF	13.5"	.85 lb	352	300
	23-Jul-09	CCF	13.5"	.82 lb	487	400
	3-Jun-10	CCF	13.7"	0.79	278	220
	20-Apr-11	CCF	14.9"	1.04 lb	201	210
	29-Jun-11	CCF	28.8"	7.53 lb	51	384
Nolan Lake	5-Jun-08	CCF	13"	.75 lb	570	380
	16-Jun-09	CCF	15"	1 lb	537	537
	26-May-10	CCF	15.2"	0.93 lb	366	340
	20-Apr-11	CCF	14.9"	1.04 lb	312	325
30A	23-Apr-10	Redear	6"		20	
	23-Apr-10	Bluegill	6"		10	
	27-May-10	Bluegill	2" - 6"		60	
	27-May-10	Redear	2" - 6"		18	
	27-May-10	Longear	2"		2	
41A	8-Jul-09	CCF	19"	9 lbs	18	
	14-Sep-10	CCF	16"	1.5	65	97.5
43C	25-Sep-08	CCF	3"	.18 oz	1700	19.4
	8-Jul-09	CCF	19"	9 lbs	8	
	30-Jun-10	CCF	25"	4.7 lbs	25	120
44C	25-Sep-08	CCF	3"	.18 oz	2500	28.6
	25-Sep-08	Redear	2-10"		75	
	25-Sep-08	Bluegill	2-4"		25	
	25-Sep-08	Longear	6"		1	
	30-Sep-08	Redear	2-6"		30	
	30-Sep-08	Bluegill	1-8"		90	
	30-Sep-08	Longear	2-6"		30	
	27-May-09	Bluegill	1-8"		200	
	27-May-09	Redear	3-10"		100	
	18-Jun-09	Bluegill	1-8"		125	
	18-Jun-09	Redear	3-10"		50	
	8-Jul-09	CCF	0.5"	fry	6000	1.5
	27-May-10	LMB	6" - 10"		64	
44G	25-Sep-08	CCF	3"	.18 oz	1800	20.6
	15-Aug-11	FHC	37"		1	
44H	25-Sep-08	CCF	3"	.18 oz	1000	11.4
46C	18-Aug-11	FHC	25"		2	
51E	6-Apr-11	CCF	13.9"	0.81 lbs	187	152

2.1.12.2 Hunting and Trapping Programs

A valid Fort Hood hunting permit and a valid state hunting license are required when hunting or participating in a hunt (including the guided deer hunts) on Fort Hood. Fort Hood hunting permits are available for purchase at the Sportsmen's Center, building 1937. Fort Hood's hunting areas and their restrictions (e.g., guided, unguided, archery only) are provided in Figure 2-12.

Persons using Fort Hood's facilities are responsible for familiarity with the applicable statutes, regulations, and procedures for hunting safety, water safety, range entry, and proper conservation practices. Area clearances are not issued to anyone suspected of alcohol or drug consumption. The Sportsmen's Center conducts approximately 10 Texas Hunter Safety Education Classes annually, and approximately 400 hunters attend these classes each year. Per Texas law, any hunter whose birth date is on or after 2 September 1971 must attend a hunter safety course, and since September 1, 1999 per AR 210-21, any person hunting on a military installation must have attended an approved state hunting education class. Live-fire-area deer guides must attend a UXO (unexploded ordnance) Class. Participants in

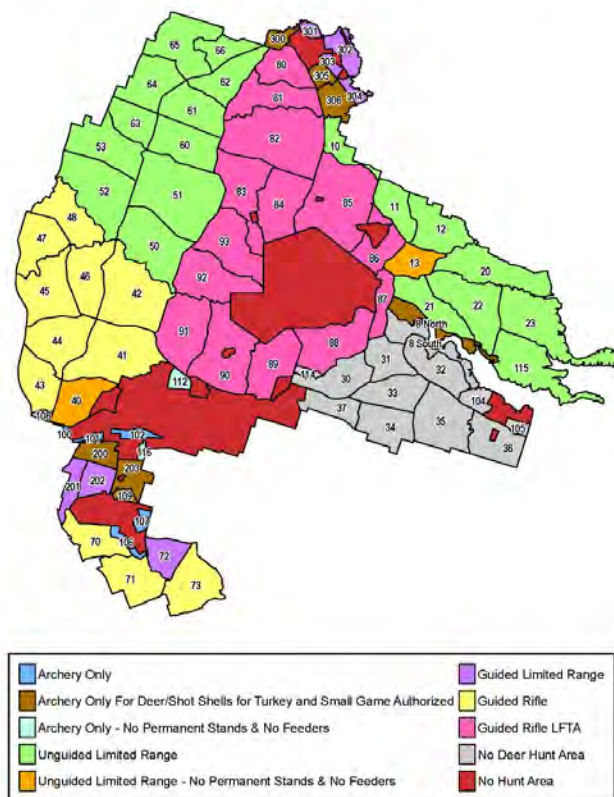
the fall guided rifle deer and turkey hunt programs must wear at least 400 square inches (total) of safety orange on the head and upper torso.

Categories of personnel authorized to hunt on Fort Hood are determined by rank. Category I hunters are active duty military personnel, E-5 and above, and their eligible family members. Category IA hunters are active duty military personnel, E-4 and below, and their eligible family members. Category II are retired DoD personnel, including retired military personnel (all ranks) and their eligible family members; active Department of the Army (DA) civilian personnel and their eligible family members; and appropriated- and nonappropriated-fund civilian personnel, including exchange service personnel regularly employed on Fort Hood for a minimum of 24 hours per week; and their eligible family members. This category does not include contract personnel unless they are retired military. Category III hunters are all other persons, including Fort Hood personnel working part-time (less than 24 hours per week), contractors, concessionaires, and their employees. This category includes DoD civilians not regularly employed on Fort Hood. Categories establish eligibility for the permit fee structure, not priorities.

Access into all training areas for hunting and fishing is accomplished through the automated TeleTrac system. Instructions for use of the TeleTrac system are provided in the DFMWR Annual Hunting, Fishing, and Area Access Guide. Individuals fishing in “No Check In/Out” fishing ponds and lakes are not required to check in using the TeleTrac system prior to fishing in those specific locations.

Figure 2-12 Hunting Areas

AREA DESIGNATIONS FOR THE 2011-2012 GENERAL HUNTING SEASON



2.1.12.2.1 CHECK-IN AND CHECK-OUT PROCEDURES

All persons, 17 years of age or older, desiring to conduct any recreational activity within the Fort Hood training areas must register with the Area Access Program. The AACC issues Area Access Cards that are valid from 1 September to 31 August. All recreational users must sign in daily using the automated TeleTrac system before entering any area for recreational purposes and must sign out after departing the area.

All large game (deer and turkey) hunting is conducted by the Sportemen's Center on a controlled basis. Hunters are issued a hunting clearance on unguided hunt programs; or they are placed in a deer stand by a volunteer deer guide for each hunt area on the guided hunt programs.

Major lakes on the installation are considered free access to anglers as long as they go directly to and from the lake and have a valid Area Access Card, Fort Hood fishing permit, and state fishing license in their possession. A list of these lakes can be obtained at the AACC. If the person or guests plan to conduct any activity other than fishing, the user must check in/out through the TeleTrac system.

Deer and turkey are the installation's primary game species. An annual deer census is conducted, using spotlight and incidental survey techniques IAW State protocols. The NRMB collaborates with TPWD to establish a sustainable harvest quota based on the survey data. Harvest quotas for Rio Grande turkeys are also established by NRMB. Seasons and bag limits for all game animals conform to state and federal laws and regulations and in some cases are more restrictive. All harvested game animals must be checked at the game check station. Deer and turkey harvest data are collected at the game check station and are forwarded to the TPWD.

2.1.12.2.2 POPULATION TRENDS

Deer. The deer population has remained stable in some regions on the installation but has declined in other regions. Increased military training requirements in the training areas might be a factor in the decline. Annual deer censuses and recommended annual harvest totals reflect a well-managed herd. Average deer harvest weight has continued to increase, and more mature bucks with quality racks are being harvested. The current doe-to-buck ratio is approximately 2 to 1. Hunter participation dropped in FY 1998 due to the closure of the west side training areas to conduct a 3-year study to determine whether hunting is a factor in the noted deer herd decline in those areas. Based on recent annual deer censuses and recommended harvest quotas, the deer population is expected to make small to moderate gains. Close coordination is maintained with DPTMS Range Control in maximizing utilization of available training areas to support hunt program requirements.

Turkey. Turkey harvests numbers continue to remain about the same and reflect a stable population of birds. By restricting the turkey harvest to one less bird than the State permitted bag limit for the county, NRMB is attempting to ensure that populations remain healthy. As new methods are developed for conducting a census on turkey, they will be utilized to more accurately assess the Fort Hood populations.

Other Species. Most of the training areas have feral hogs. Although their densities are not high, they are widespread and increasing, and they are becoming more problematic. Feral pigs are a serious ecological problem because they trample vegetation, disturb soils while rooting, degrade aquatic habitats by wallowing, and compete with and prey on native species. There is interest by hunters to pursue feral hogs and an increase in those that participate in hunting them outside the deer and turkey seasons. Recreational hunting pressure has been shown elsewhere to be very ineffective at controlling feral hog populations. Fort Hood's goal is to carry out intensive effort to eradicate and prevent re-establishment of current populations. As such, a trapping program has been implemented and will continue to expand in an effort to minimize the impacts of feral hogs to the installation's natural resources.

Opportunities to hunt waterfowl on Fort Hood are numerous. There are many small lakes, stock ponds, and rivers that offer ducks a temporary refuge during their migratory flight south during the winter season and provide exceptional duck hunting opportunities. Ponds are that were constructed to minimize erosion and collect runoff during heavy rains provide additional habitat for ducks.

Quail populations vary from year to year depending on environmental factors. Overutilization of bobwhite food sources and escape cover by cattle and fire ant predation play major roles in quail population dynamics.

With approximately 175,000 acres for small game hunting at Fort Hood, there is great potential for continued growth of small game hunting for squirrel, rabbit, and doves. Depending on yearly weather conditions and predator population size, small game populations can experience large fluctuations in population.

2.1.12.2.3 TRAPPING

Very few people participate in trapping on Fort Hood. Growth will depend on market pressures and user demands based on prices for common pelts. Only live traps are authorized and the traps must be marked with the name and address of the trapper. Traps must be checked every 36 hours, and hunters/trappers of furbearing animals must possess a valid Texas Trappers License and a Fort Hood Hunting Permit.

2.1.12.3 Off-Road Vehicle Use

A new all-terrain vehicle (ATV) course is located west of TA 112, north of Turkey Run Road. The course is open to the public. ATV riders wishing to use the course must register at the Sportsmen's Center prior to gaining access at the track.

2.1.12.4 Nonconsumptive Recreational Activities

2.1.12.4.1 Belton Lake Outdoor Recreation Area

BLORA is a 2,032-acre major recreational and leisure area that offers a wide variety of facilities and activities to military members and their eligible dependents. Recreational activities available include RV camping, primitive tent camping, swimming, boating, fishing, and sunbathing. BLORA is equipped with party pavilions, a paddleboat dock, a boat dock, a fishing marina, nature trails, horse riding trails, mountain bike trails, waterslides, paintball course and cottages. Unit parties, family picnics, and the like can be held there. Watercraft for rent include deck boats, ski boats, fishing boats, bass boats, party boats, and leisure boats. Most BLORA facilities are open to the public. Only facilities that require contracts, including watercraft rentals, camping sites, pavilion sites, and cottage rentals, are restricted to authorized users only.

There is a daily privately owned vehicle (POV) gate fee to enter BLORA for non ID card holders. All eligible MWR patrons (ID card holders) get in free. Additional family vehicle passes can also be purchased. BLORA honors Golden Age/Golden Access Passports by giving authorized patrons a 50 percent discount off park entrance fees (daily gate fee or annual vehicle pass fee) and a 25 percent discount off camping fees (RV pads, tent pads, or primitive camping). Persons sponsored by an authorized Golden Age/Golden Access cardholder do not receive any discounts given to the actual cardholder.

BLORA has three nature trails, totaling approximately 5 miles in length, for the nature lover. These trails are marked with signs to show the way, and rest areas are located along the paths. The trails wind through the beautiful rolling

terrain at BLORA. Deer, wild turkey, and other wildlife, including the endangered golden-cheeked warbler, are frequent sights.

BLORA Ranch. Horseback and pony riding opportunities are available at BLORA Ranch, and riding lessons are available upon request. Facilities are subject to inspection by the post veterinary services to ensure proper care of the animals and clean stables.

BLORA Trailblazers Mountain Bike Course. The BLORA Trailblazers Mountain Biking Program was implemented in 1998 as a Family and Morale, Welfare and Recreation (DFMWR) activity to promote mountain bike riding at Fort Hood. A trail system offers approximately 14 miles of riding trails and accommodates riders at all skill and endurance levels. Riding trails at BLORA are placed in close coordination with NRMB to ensure that environmental concerns and endangered species habitat areas are fully considered. A 5-year study was conducted by NRMB and USFWS to determine the effects of mountain bike riding in endangered species habitat areas, and it could affect future decisions regarding recreational activities in endangered species habitats.

BLORA Paintball Program. A BLORA Paintball Program was implemented in May 2000 as an MWR activity to provide a safe, controlled environment whereby participants can enjoy recreational paintball. Several playing fields have been designed and established to accommodate players of all skill levels.

2.1.12.4.2 Sportsmen's Center

The Sportsmen's Center is a program devoted to the conservation and preservation of wildlife, their habitats, and the environment. It supports hunting, fishing, and archery, as well as recreational gun use for skeet and trap. The facility is open to the public. All controlled deer and turkey hunt programs are administered by the Sportsmen's Center. A Fort Hood Hunting and Fishing Advisory Council has been established to provide the installation and Garrison Commander with an additional source of input on hunting and fishing issues, as well as to provide a forum for recreational users to suggest improvements in the use of Fort Hood's natural resources.

The Sportsmen's Center operates three skeet ranges and two trap ranges to promote skeet and trap shooting, and an archery range to promote archery and the annual archery deer and turkey hunt programs. These facilities are open to the public.

The Sportsmen's Center oversees the Hunt & Saddle Stables to board privately owned horses. The facilities are for authorized users only. A monthly stall fee is charged per horse.

2.1.12.4.3 West Fort Hood Travel Camp

The West Fort Hood Travel Camp (WFHTC) provides 80 temporary RV camping sites, 3 large group picnic areas, and dry boat storage facilities for incoming and outgoing patrons. This facility is open year-round for authorized users only.

2.1.12.4.4 Outdoor Recreation Equipment Checkout Center

The Recreation Equipment Checkout (REC) facility provides a wide variety of camping-related equipment to promote camping and sporting activities. Recreational items available include tents, campers, utility and travel trailers, boats and boat motors, vans, recreational games, sports equipment, camping equipment, and more. This facility is for authorized users only and is open year-round.

2.1.12.4.5 Other Recreational Activities

Boating is allowed on Fort Hood lakes and ponds, but gasoline-powered motors are prohibited. This restriction does not apply to Belton Lake, which borders the northeastern boundary of the reservation. DPTMS Range Division authorizes joint use of the Pilot Knob Rifle Zero (Sportsman's Firing Range) for rifle and pistol shooting. Military training requirements have priority on available shooting stations at the range on a daily basis. This is the only firing range at the installation that is open to the public for the personal use of firing privately owned weapons.

2.1.13 Law Enforcement Program

The Directorate of Emergency Services (DES) is responsible for the enforcement of the laws and regulations pertaining to natural resources on Fort Hood, including enforcement of hunting, fishing, archeological, and environmental statutes and regulations. The DES documents reports of endangered species habitat violations and works with DPW and NRMB to ensure compliance with wildlife harvest quotas, to dispose of dead wildlife resulting from motor vehicle operation, and to provide a portion of the training required for hunter safety certification. Game Wardens enforce the laws and regulations pertaining to natural resources on the installation, including those pertaining to threatened and endangered species, historical and archeological sites, fish and wildlife laws, and established harvest quotas. Game Wardens also enforce requirements related to access to the training lands and are available to provide briefings to new arrivals.

There are two jurisdictions on Fort Hood. The original purchase areas are exclusive federal jurisdiction, and the remaining areas are concurrent federal and state jurisdiction. Activities are coordinated with state natural resources management offices.

Game Wardens annually attend in-service training with federal and local agencies, and TPWD. Wardens receive at least 40 hours of refresher training annually. Newly hired enforcement officers attended a full law enforcement training academy (at least 11 weeks) or have obtained a Federal or State Law Enforcement Certification prior to performing duties. In addition, newly hired enforcement officers are required within one year to attend a Federal Law Enforcement Center approved Archeological Resource Protection Course (40 hrs), an approved Environmental Crimes Investigation Course (32 – 40 hrs), and obtain Endangered Species training relevant to this installation.

Game Wardens must qualify with personal sidearms twice annually, and familiarize themselves with shotguns and predator weapons annually.

2.1.14 Public Land Use and Access

Fort Hood is an open installation. The maneuver training areas are open to public recreation provided those activities do not conflict with the military mission. DPTMS Range Division controls recreational access to all training areas and may close training areas to public recreation at any time for safety or training purposes. The live-fire training area may be accessed only after a personal visit and when authorization is received from both Range Control and the AACC. Activities that are not allowed in the training areas are described in FH Reg 210-25.

With the exception of special situations, road entrance points at installation perimeters are unmanned. The public is responsible for adhering to all Fort Hood regulations and restrictions placed on range access by DPTMS Range Division and the Army. Joint use of training areas on a daily basis is authorized as long as it does not interfere with daily military training requirements.

In accordance with FH Reg 210-25, all persons desiring to conduct any recreational activity within the Fort Hood training areas must register with the Area Access Program; minors 16 years of age or younger are registered under a parent or guardian. Permits are valid from the date of purchase through 31 August. Persons must contact the AACC for recreational access to any training area. Registration requires a person to provide picture identification, vehicle registration, and other personal information, and all persons must sign FHT Form 210-9-1, which affirms that the applicant has received the AACC briefing, understands the policies, and assumes all responsibility while in the training areas.

Entry for recreational activities into contaminated impact areas, temporary or permanent, is strictly prohibited, without exception. CTCA provides a list of its members who use the Fort Hood training areas for their livestock to the AACC. The list is validated annually and revised as necessary.

2.1.15 Invasive Species Program

Invasive species are plants and animals that invade and quickly dominate natural habitats. Invasive species are most often those imported from outside North America, such as kudzu vine (*Pueraria lobata*) or gypsy moth (*Lymantria dispar*). Noxious weeds are plant species known to be detrimental to agricultural crops, and these weeds are regulated by state and federal government agencies. There are no known noxious weeds that occur on Fort Hood, but there are several invasive plants. Invasive species of primary concern are giant reed (*Arundo donax*), salt cedar (*Tamarix ramosissima*), Chinese tallow tree (*Sapium sebiferum*), and kudzu (*Pueraria montana* var. *lobata*).

Other species of plants not found on the state or federal invasive species list, but are noted as non-native invasive plants causing problems in Texas, are Mimosa (*Albizia julibrissin*), White mulberry (*Morus alba*), Chinese privet (*Ligustrum sinense*), Glossy privet (*Ligustrum lucidum*), Japanese honeysuckle (*Lonicera japonica*), King Ranch Bluestem (*Bothriochloa ischaemum*), Tree of Heaven (*Ailanthus altissima*), China-berry (*Melia azedarach*), Sacred-bamboo (*Nandina domestica*), Johnsongrass (*Sorghum halepense*), Chinese pistache (*Pistacia chinensis*), Red-tipped photinia (*Photinia serratifolia*), Jerusalem-thorn (*Parkinsonia aculeate*), Fire-thorn (*Pyracantha koidzumii*), Japanese rose (*Rosa multiflora*), Big-leaf periwinkle (*Vinca major*), Common chaste-tree (*Vitex agnus-castus*), Jujube (*Ziziphus zizyphus*), Field Brome (*Bromus arvensis*), Pampas grass (*Cortaderia selloana*), West India lantana (*Lantana camara*), and Dallisgrass (*Paspalum dilatatum*).

Other species not found on the invasive species list, but that are considered invasive in Texas, are Feral hogs (*Sus scrofa*), fire ants (*Solenopsis invicta*), and some other insect pests are also considered invasive species because of their foreign origin and damaging effects. Control measures for all nuisance animals and plants are covered in greater detail in the Fort Hood Pest Management Plan (Fort Hood, 2002).

The installation supports the National Strategy for Invasive Plant Management and its three goals— prevention, control, and restoration. In the event that any noxious weeds are found on the installation, a high priority for control will be established and control efforts will be maximized. A list of plants introduced to Texas is provided in Appendix D of the installation's Pest Management Plan (Fort Hood, 2002). Weeds on firing ranges, around targets, along fence lines, on road shoulders, on paved surfaces (including runways), and so forth require control using appropriate herbicides. Unwanted plants are controlled mechanically (mowing, string trimmers) or by the use of mulch materials around ornamental plants. Turf weeds such as dallisgrass (*Paspalum dilatatum*) and crabgrass (*Digitaria ciliaris*) might also require control in improved grounds. Aquatic vegetation control using herbicides is also occasionally necessary at managed fisheries ponds. Unwanted fish species are also removed from managed fisheries ponds by qualified personnel (Fort Hood, 2001a).

Besides invasives, there are Fort Hood species which require monitoring and management for Soldier safety. These plants can impact Soldiers by causing minor to major injuries and are capable of inflicting damage to wheeled vehicles

and military equipment. Examples known to be on Fort Hood include honey locust, mesquite, bois d' arc, prickly pear cactus, wooly buckthorn and catclaw.

Prescribed fire on training lands can be used to control Ashe juniper and young mesquite, as well as other undesirable plants. Mechanical and chemical controls are also used. Noxious plant control on most of the installation except the golf course is the responsibility of the Work Services Branch of DPW. Work requests for vegetation control in the cantonment area are handled by the DPW applicators or contracted applicators as needed. The DPW Housing Maintenance/Pest Control contractor does a small amount of vegetation control, and the DPW mowing contractor uses a herbicide in the mowing process for chemical edging and trimming. Vegetation control projects in areas outside the cantonment area may also be done by the Work Services Branch or through the EMD/NRMB per contractor.

2.1.16 Integrated Training Area Management (ITAM)

The ITAM program provides the range officer with the capabilities to manage and maintain training lands and support training mission readiness and METLs. ITAM integrates the mission requirements derived from RTLP, with environmental requirements and management practices, and establishes land policy and procedures by implementing uniform land management programs for the US Army Sustainable Range Program (SRP). The ITAM Program is a systemic framework for decision-making and management of Army training lands to avoid net loss of training land and to ensure that the lands remain viable to support future training and mission requirements.

ITAM has five components, which work in unison to accomplish the ITAM mission:

- Range and Training Land Analysis (RTLA)
- Land Rehabilitation and Maintenance (LRAM)
- Training Requirements Integration (TRI)
- Sustainable Range Awareness (SRA)
- Geographic Information Systems (GIS)

A detailed description of each component is discussed in the LSMP at Appendix A.

2.1.16.1 Range and Training Land Analysis (RTLA)

The RTLA Coordinator provides RTLA capabilities, recommendations and support to all ITAM Program components, including LRAM, GIS, TRI, and SRA, by developing and maintaining an RTLA Plan and the annual report of RTLA assessments results. This includes recommending and implementing assessment procedures and technologies; coordinating methodologies for gathering and analyzing data; assessing the condition of training land resources on the installation; making recommendations on the location and quantity of training; and incorporating all into the RTLA report.

The RTLA program is also responsible for monitoring trends of the training land condition, analyzing trend information, and making appropriate recommendations for management actions. The RTLA Coordinator assesses land quality, monitors land conditions, and recommends land rehabilitation options and provides support to all components of the ITLM program. The RTLA component will coordinate RTLA aspects with LRAM Coordinator to support mission requirements (i.e. erosion; vegetation loss and/or change). Furthermore, the RTLA Coordinator shall monitor the effectiveness of LRAM projects in order to validate LRAM techniques and procedures, assist the LRAM Coordinator in identifying LRAM work sites, designing LRAM projects, and develop suspense to implement practices to enhance ITAM work plans.

2.1.16.2 Land Rehabilitation and Management (LRAM)

The land and maintenance component is a key enabler for sustaining realistic training conditions and supporting the training missions of the unit using the installation. LRAM is a preventive and corrective land rehabilitation and maintenance procedure that reduces the long-term impacts of training and testing on an installation. Projects are identified by onsite observations, trainer feedback, G3 guidance, and Senior Commander (SC) goals. Identified projects are prioritized through consultation with G3, DPTMS, SC, and ITAM Program Manager during regular ITLM meetings as well as Garrison Commander (GC) briefings. Final prioritizing is accomplished through the Garrison Training Land Working Group by the GC. Projects are executed through DPW Projects & Plans, BREC, IRNR, or NRCS. LRAM oversees projects from start to completion by regular onsite visits, meetings with Contract Officer Representative (COR), and final inspections.

2.1.16.3 Training Requirements Integration (TRI)

The TRI component provides for decision support capability based on the integration of training requirements, land conditions, range facilities, and environmental management requirements. The primary focus of TRI is to ensure sustained accessibility to adequate training lands to support training to standards under realistic land conditions, and to provide military trainers and land managers with the necessary technical and analytical information to integrate doctrinally based training and testing with land capabilities.

TRI achieves the "training-environmental" balance and interface that is key to ITAM and requires continuous interaction and coordination between the operations/training staff and the natural resources management/environmental staff. This ensures wise land use planning and management decisions that meet regulatory compliance and training and testing activity requirements. TRI provides input for developing and updating the INRMP, in accordance with AR 350-19.

2.1.16.4 Sustainable Range Awareness (SRA)

The primary goals of SRA are to provide a proactive means to develop and distribute education and land stewardship materials to users of range and training lands to reduce the potential for inflicting avoidable impacts in training land assets, including the local natural and cultural resources.

2.1.16.5 Geographic Information Systems (GIS)

The GIS staff meets functional requirements of the SRP GIS Program on the installation. These are to support Soldier training, ITAM, Range Operations, and Range Modernization geospatial requirements. The Range GIS staff is an ITAM component.

2.1.16.6 ITAM Program and the Integrated Training Land Management (ITLM) Group

Fort Hood has been proactive in supporting the long-term sustainment of training lands by integrating the ITAM Program, which functions as the ITLM chair, with the natural resources management program since 2003 to support training requirements; land stewardship education; and training, environmental, cultural, and conservation management. The Fort Hood Land Sustainment Management Plan (LSMP) is the vehicle for the integration of natural, cultural, range master planning and infrastructure, and ITAM Program objectives outlined in the Installation Sustainment Program (ISP) (Fort Hood, 2004b).

The responsibilities for sustainment of the training lands and environmental compliance have been divided among DPTMS, Range Operations (ITAM Program); DPW, Environmental Division; and DPW Maintenance Division, Roads and Grounds Branch, DPW Master Planning, and Engineer Branch to work together to maintain, repair, and

reconfigure the training lands infrastructure to support readiness training. The Training Lands Committee has established a 25-year sustainment goal. The goals and management activities for the agencies involved have been divided into short-, mid- and long-range plans. The short-range plan involves the ITLM Program to repair and enhance land resources. The ITLM Program manages training land and supports training through the mid- and long-range components of the plan by repairing new maneuver land damage, minimizing erosion, reducing the backlog of training land repairs, and maintaining trail networks.

A description of future ITLM strategies and activities is provided in Section 3.17.

2.1.17 Cultural Resources

2.1.17.1 Fort Hood Cultural Resource Background

The final draft of the Integrated Cultural Resource Management Plan for Fort Hood, Texas (ICRMP) provides a description of the history of the III Corps and Fort Hood (Fort Hood, 2010). Also contained in the ICRMP is the Historic Property Component (HPC) of the Army Alternate Procedures established by 36 CFR 800. The HPC addresses compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA) and outlines the standard operating procedures and the best management practices for the Fort Hood Cultural Resource Management (FHCRM) program. Both documents (ICRMP and HPC) are incorporated by reference.

FHCRM has oversight responsibility for all of the historic properties within the boundaries of Fort Hood in addition to oversight responsibility for Installation activities outside of the Installation boundaries. Off-site activities can include training at other locations which are temporarily leased by Fort Hood. The list below is a breakout of Fort Hood acreage used for training:

- Real Property: 213,093 acres
- ACOE Property: 5,733 acres (per lease agreement)
- CRM Oversight: 218,826 acres.

Geographic Information System (GIS) Technology has been key in FHCRM's ability to keep pace with expanding military and civilian operations on Fort Hood and provides a method to accurately store locations of historic properties. Geographic and spatial data layers, including Installation boundaries, aerial photos, archeological site boundaries, and regional geomorphology, have been integrated into this system. The system is revised, as needed, based on information collected from field monitoring, surveys, and other projects

2.1.17.2 Status of Fort Hood Cultural Resource Management (FHCRM) program

The first intensive archaeological investigations at Fort Hood began in 1949 through the National Park Service River Basin Surveys and FHCRM began a proactive program to inventory archeological sites in 1978 (Fort Hood, 2010). Virtually all of the installation that surrounds the central live-fire impact area has been surveyed for archeological sites. The unsurveyed area in the Live Fire Area is approximately 17,710 acres. Approximately 43 percent of this unsurveyed area has not been included in systematic pedestrian cultural resource surveys due to its identity as a permanently duded or surface danger zone.

A total of 2,234 archaeological resources have been identified by archaeologists conducting pedestrian surveys. The inventory contains 1,125 historic and 1,109 prehistoric sites. Historic sites are those related to European settlement and usually have documentation associated with the land use. Prehistoric sites are those related to earlier Native American land use.

Table 2-16.
Archaeological Historic Properties at Fort Hood

	Total	Eligible	Eligibility to be assessed	Not Eligible
Prehistoric	1109	180	129	800
Historic	1125	27	34	1064
Totals	2234	207	163	1864

Since the early 1990s, FHCRM has implemented a rigorous assessment of these sites to identify those that are important to local and national heritage and are eligible for listing in the National Register of Historic Places. Prehistoric archeological resources assessment has followed a more traditional approach of shovel testing proceeding to a more formal National Register evaluation process. This program prioritizes testing of resources based on mission needs, particularly throughout the training maneuver areas. The majority of the Fort Hood Archeological Research Report publications address the survey and testing results of this program.

National Register of Historic Places eligibility assessment has been undertaken differently for the historic archeological resources. Assessment of historic resources has focused on a historic document review that was divided into two segments based on the two periods of property acquisition. The first segment focuses on the properties acquired in 1942-43 when Camp Hood was established by acquiring 104,000 acres in 1942. In 1943, 46,000 additional acres was acquired to meet Army training needs of the time. The second major land acquisition of 49,578 acres occurred between 1953 and 1955 after the re-designation of Camp Hood to permanent facility status, renamed Fort Hood. This is the second segment of the document review project. Belton Reservoir on the east side of Fort Hood was created during this same period. The products from this review include chain of title information for all properties associated with historic archaeological resources, an archaeological integrity assessment of all historic archaeological sites, a historic context for the 1942-43 acquisition project segment, oral history documentation, and two general reading history books. All publications are listed in Appendix G of the HPC.

Fort Hood has inventoried all structures on the installation and is currently in the process of identifying and assessing the buildings and landscapes that are important to local and national heritage and may be eligible for listing in the National Register of Historic Places. Fort Hood has recently identified seven historic landscapes within the cantonment areas and include: 1) the Capehart-Wherry Family Housing, 2) the Headquarters/Ceremonial, 3) the Hood Army Airfield, 4) the Killeen Base, 5) the Motorpool Corridor, 6) the Railroad and Transportation Corridors, and 7) the Unaccompanied Personnel Housing. The most important aspect of these landscapes is the historical and continued land use. The original post chapel (Building 53) is a significant contributing element of the Headquarters/Ceremonial Landscape. In addition to this building, the Reynolds House (Building 8640) is significant as an individual or stand-alone structure that is not associated with any of the historic landscapes.

At least 20 cemeteries have been documented within the installation boundaries at Fort Hood. In 1943 and 1953, several large cemeteries were disinterred and the human remains were relocated to both new and previously established cemeteries in local communities. Smaller cemeteries with less than 50 interments were allowed to remain. Fort Hood Regulation 210-190 describes the Army's role in the upkeep and conditions for interment of the remaining cemeteries.

There are 7 federally recognized Native American tribes affiliated with the lands of the present installation; these tribes are Apache Tribe of Oklahoma, Caddo Nation, Comanche Nation, Kiowa Tribe of Oklahoma, Mescalero Apache Tribe, Tonkawa Tribe of Oklahoma, Wichita and Affiliated Tribes (Keechi, Waco & Tawakonie).

2.1.17.3 Native American Resources

The National Register recognizes that properties of traditional religious and cultural importance (PTRCI) are eligible for listing. One property on Fort Hood, the Leon River Medicine Wheel, represents this resource type. The Medicine Wheel was discovered during an archeological survey in 1990 and has been used continuously for ceremonial activities since its identification. Access to the location is restricted to Native Americans for traditional observances. FHCRM personnel visit the resource for condition monitoring purposes and serve as a point of contact for Native American access. No formal assessment of Traditional Cultural Properties has been implemented for Fort Hood to date (Fort Hood 2010).

2.2 Regulatory and Jurisdictional Framework

The primary purpose of the Fort Hood INRMP is to conserve, maintain, and protect the natural resources to support the military mission. The NRMB must accomplish this task while ensuring compliance with all applicable environmental legislation, regulations, and guidelines.

2.2.1 Key Laws and Regulations

Pertinent Federal Laws. The preparation of this INRMP encompasses compliance with certain laws and executive orders. For an INRMP to be valid, it must comply not only with applicable natural resource laws, but also with Department of Defense directives and instructions and with Army policies.

As mentioned in Section 1.1, the preparation of this INRMP is in accordance with the provisions of the Natural Resource Management on Military Lands Act of 1960 (16 U.S.C. ' 670a *et seq.*), commonly known as the Sikes Act, as amended according to the Sikes Act Improvement Act of 1997. In addition, Section 3-11(b) of AR 200-1, *Environmental Sustainability and Stewardship* (2007) specifies Army policies and legal and other requirements, including statutes, laws, regulations, and other guidance applicable to the Army Natural Resources Management Program.

The list in Table 2-16, although not inclusive, includes most of the legal requirements with which an installation such as Fort Hood would be concerned.

Table 2-16
Federal Statutes, Laws, and Regulations Applicable to
Natural Resources Management on Army Lands

Applicable Authority	Summary
National Forest Management Act of 1974, 16 U.S.C. 472A, et seq.	Directs the preparation of plans for the National Forest System to provide for multiple use and sustained yield of the products and services and to include coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness; and to determine forest management systems, harvesting levels, and procedures in light of all of the preceding uses.
Archeological and Historical Preservation Act, 16 U.S.C. 469	Requires federal agencies to identify and recover data from archeological sites threatened by their actions.
Archeological Resources Protection Act, 16 U.S.C. 470aa–470ll	Requires permits and provides for civil and criminal penalties for persons damaging or looting archeological resources on federal and tribal land without a permit.

The Clean Water Act (33 U.S.C. 1344 <i>et seq</i>); also known as the Federal Water Pollution Control Act of 1972	Protects, restores, and enhances the quality of the nation's waters. Prohibits discharges without a permit for any actions affecting "waters of the United States," including wetlands. Established requirements that limits be determined for point sources that are consistent with state water quality standards, procedures for state issuance of water quality standards, development of guidelines to identify and evaluate the extent of nonpoint source pollution, and water quality inventory requirements, as well as development of toxic and pretreatment effluent standards. Section 404 of the amendments authorized the Corps of Engineers to issue permits for the discharge of dredged or fill material into navigable waters.
Clean Air Act, 42 U.S.C. 7401	Requires agencies to comply with state air quality standards set in State Implementation Plans.
Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9601–9675	Requires reporting of releases and cleanup of releases of hazardous substances; also assigns liability for cleanup.
Endangered Species Act, 16 U.S.C. 1531	Requires consultation with the U.S. Fish and Wildlife Service to ensure that actions do not jeopardize threatened or endangered species or their critical habitat.
Fish and Wildlife Coordination Act	Requires consultation with the U.S. Fish and Wildlife Service on actions affecting stream modifications.
Fish and Wildlife Conservation Act, 16 U.S.C. 2901	Encourages all federal departments and agencies to use their statutory and administrative authority, to the maximum extent practicable and consistent with each agency's statutory responsibilities, to conserve and promote conservation of nongame fish and wildlife and their habitats.
Farmlands Protection Policy Act, 7 U.S.C. 4201	Establishes criteria for identifying and considering the effects of federal actions on the conversion of farmland to nonagricultural uses.
Federal Facility Compliance Act, 42 U.S.C. 6901	Requires federal facilities to comply with state and local environmental laws, as well as federal environmental laws.
Federal Land Policy and Management Act of 1976, 43 U.S.C. 1701–1784	Provides for the management of public lands that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values that, where appropriate, will preserve and protect certain public lands in their natural condition.
Migratory Bird Treaty Act 16 U.S.C. 701–719c	Decreed that all migratory birds and their parts (including eggs, nests, and feathers) were fully protected.
The National Historic Preservation Act, 16 U.S.C. 470 <i>et seq</i> .	Requires agencies to identify historic properties subject to effect by their actions, and to consult with the State Historic Preservation Officer and others about alternatives and mitigation.
The National Environmental Policy Act, Public Law 91–190	Requires agencies to consider impacts on the human environment from proposed actions and to document environmental impacts during project planning.
Noise Control Act of 1972, Public Law 92–574	Requires the federal government to set and enforce uniform noise control standards for aircraft and airports, interstate motor carriers and railroads, workplace

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901–6992k	activities, medium- and heavy-duty trucks, motorcycles, portable air compressors, and federally assisted housing projects in noise-exposed areas. The control of environmental or community noise is left to state and local agencies.
EO 11988: Floodplain Management	Regulates collection, storage, transport, and disposal of hazardous and solid waste and regulates underground storage tanks.
EO 11990: Protection of Wetlands	Directs all federal agencies to avoid, if possible, development and other activities in the 100-year base floodplain. Where the base floodplain cannot be avoided, special considerations and studies for new facilities and structures are needed. Design and siting are to be based on scientific, engineering, and architectural studies; consideration of human life, natural processes, and cultural resources; and the planned lifespan of the project. Federal agencies are required to reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains in carrying out agency responsibility.
EO 12088: Federal Compliance with Pollution Control Standards	Directs all federal agencies to avoid, if possible, adverse effects on wetlands and to preserve and enhance the natural and beneficial values of wetlands. Each agency must avoid undertaking or assisting in wetland construction projects unless the head of the agency determines that there is no practicable alternative to such construction and that the proposed action includes measures to minimize harm.
EO 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Delegates responsibility to the head of each executive agency for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives EPA the authority to conduct reviews and inspections to monitor federal facility compliance with pollution control standards.
EO 13045: Protection of Children from Environmental Health Risks and Safety Risks	Requires each federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
EO 13175: Consultation and Coordination with Indian Tribal Governments	Requires each federal agency to make it a high priority to identify and assess environmental health risks and safety risks that might disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.
	In formulating or implementing policies that have tribal implications, requires agencies to consult with tribal officials regarding the need for federal standards and any alternatives that would limit the scope of federal standards or otherwise preserve the prerogatives and authority of Indian tribes.

SECTION 3.0: FUTURE MANAGEMENT

3.1 FUTURE MILITARY MISSION

In October 1999 the Secretary of the Army and the Chief of Staff of the Army articulated a vision about people, readiness, and transformation of the Army to meet challenges emerging in the 21st century and the need to be able to respond more rapidly to different types of operations requiring military action. The strategic significance of land forces continues to lie not only in their ability to fight and win the Nation's wars but also in their providing options to shape the global environment to the future benefit of the United States and its allies. Change is needed for the Army to become more strategically responsive and dominant at every point on the spectrum of operations (Fort Hood, 2004a).

3.1.1 Proposed Changes in Force Structure

Modularization of operational forces redistributed key corps and division resources to the brigade level, producing a more "brigade-centric" Army and, through standardization, has provided the Army greater flexibility in meeting operational requirements. To such ends, III Corps proposes to restructure forces at Fort Hood to create a modular Corps headquarters and to restructure forces in both the 3d CR and 1CD.

3ACR will convert from a HBCT to a Stryker Brigade, in the near future, and will have a different impact to the training lands due to their wheeled tactical vehicles. Strykers utilize trail and roads and will increase wear and tear, not only to tank trails, but to cross-country movements that will increase ruts, land compaction, and land disturbance.

Additionally, Fort Hood has gained 1st Army Division West at North Fort Hood.

3.2 DESCRIPTION OF DESIRED FUTURE CONDITION (DFC)

The U.S. Department of Agriculture's Forest Service first developed the concept of desired future condition (DFC) in the 1970s. The concept was used in the planning process for determining the maximum production of timber that could be taken from a particular area rather than what the ecosystem could sustainably produce (Leslie et al., 1996). Over the years, the concept has evolved to include all aspects of a future ecosystem, including human organizations and needs, such as the military mission.

The desired ecosystem condition is native vegetation cover, where practical. Ecosystem integrity has been defined as "the ability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitat of the region" (Angermeier and Karr, 1994, as cited in Leslie et al., 1996). Systems maintaining ecological integrity have the capacity for self-repair when perturbed, and minimal external support is needed for their management. Ecosystems consisting of native species are more easily maintained, resilient to perturbation, adaptable, and productive than ecosystems that have nonnative components. Although, the occasional use of NRMBA-approved annuals or other non-persistent species may be necessary for the rapid stabilization of bare areas, the most cost- and resource-efficient ecosystem to ensure long-term sustainability for both the natural resources and military mission requirements at Fort Hood is an ecosystem where native vegetation thrives.

Training Needs. As presented in Section 3.1.1, training needs by heavy mechanized units are expected to increase at Fort Hood. Past heavy use from training and other uses (e.g., cattle grazing) has left some of the installation's training lands severely compacted and void of perennial vegetation in many areas, causing the development of numerous

gullies (Fort Hood, 2004b). These gullies affect training by causing time delays in movement, restricting maneuver training lanes, and limiting access routes through lanes during training exercises. The gullies are safety hazards to Soldiers, increase the likelihood of equipment damage and repair costs, and divert resources (time and money) away from training. To address these needs, the Fort Hood Land Sustainment Management Program (LSMP) has identified the following objectives for improving the training landscape and creating the requisite conditions for the long-term sustainability of the training lands:

- Improving the training landscape
- Enhancing readiness training capabilities
- Reducing training obstacles in the primary heavy maneuver training lanes
- Reducing soil erosion rates
- Improving vegetative cover
- Providing an environment that will remain viable to support current and future maneuver and readiness training
- Improving water quality both on and off the installation

Inherent in ensuring the long-term sustainability of the training lands is compliance with all federal laws and regulations, particularly the Endangered Species Act. Fort Hood is required, and has agreed, to maintain the quantity and quality of habitat necessary to protect the breeding populations of black-capped vireos and golden-cheeked warblers. In addition to avian species, the Fort Hood NRMB manages karst habitats containing endemic cave-dwelling species. Continuing research efforts are resulting in the discovery and documentation of additional caves throughout the installation. The NRMB is implementing measures to ensure the protection of these caves and the rare species that inhabit them so as to preclude listing of the species as endangered.

The objectives of the Desired Future Conditions (DFC) of Fort Hood are to provide the conditions necessary to meet the expected increase in training, ensure the long-term sustainability of the training lands, and provide protection for sensitive and federally protected species. Maintaining the ecological integrity of the landscape is the most resource-efficient management approach to meet these objectives. The DFCs developed for Fort Hood are described below:

- Native vegetative cover sufficient to minimize erosion. In areas where grazing is allowed, maintain at least 1,500 lb/ac of consumable perennial forage residue, preferably perennial grasses, after grazing to avoid significant impacts from training, ensure the ecological health of the training areas, minimize erosion, and protect water resources.
- Maintain and conserve populations and habitats of federally-listed species and species of concern on Fort Hood while maintaining mission readiness in a manner consistent with Army and Federal environmental regulations.
- No net loss of populations of black-capped vireos and golden-cheeked warblers over time in the greater Fort Hood area.
- Vegetated riparian areas to buffer water resources from upland disturbances.
- An average of no greater than 5 percent of bare ground on all training grounds.
- Approximately 84,000 heavy training land acres of open area so as not to impede mechanized training and to provide sufficient open space to accommodate all necessary DZs, LZs and forward area refueling points (FARPs). Open space and woodland should be interspersed in a natural mosaic.
- Approximately 49,000 light training land acres of woody vegetation for infantry and dismounted training on hill terrains
- Maintenance of hydrologic regimes and erosion rates that approximate natural rates for this area minimize sediment transport from training lands into water bodies.
- High ecological integrity of terrestrial and aquatic habitat to support balanced and diverse populations of native fish and wildlife.

- Maintenance of species richness and evenness over time.
- Populations of indicator/keystone species, listed species, and species of concern that are viable, stable, and not declining.
- Maintenance of Belton Lake capacity adequate to meet future water quantity and quality needs, achieved by minimizing sediment transport and deposition to the lake.
- Compliance with all water quality criteria and standards for water bodies on the installation.
- Negligible effect on the ecosystem from the presence of invasive and exotic species.
- Outside-the-fence land uses compatible with the military mission and with the expansion of black-capped vireo and golden-cheeked warbler populations off-post.
- Fire return intervals between 2 and 5 years for native grassland vegetation and between 10 and 20 years for shrublands, which are managed for black-capped vireo habitat. Areas maintained as firebreaks are burned on a 1- to 2-year return interval.
- Rate of brown-headed cowbird annual parasitism of black-capped vireo nests maintained below 10 percent (averaged over 5-year periods) regardless of the cattle stocking rate.
- Reduction in the amount of pesticides being applied by validating all requests for pesticide treatments and providing education on alternative integrated pest management (IPM) procedures using biological methods, products low in toxicity, or nontoxic means of control on targeted pests.

3.3 FACILITIES AND DEVELOPED AREAS

Developed areas on Fort Hood are managed in accordance with various plans and regulations. III Corps and Fort Hood Regulation 200-1, *Environment and Natural Resources*, addresses hazardous waste management, solid waste management, air pollution control, pesticide management, spill prevention and control, and pollution prevention. Fort Hood has prepared individual management plans to address specific resource or program management activities such as hazardous waste management, pest management, spill control and cleanup, and recycling. Cantonment areas are developed in accordance with the Fort Hood Master Plan and DoD programs such as the Residential Communities Initiative, Privatization of Army Lodging, and Utilities Privatization.

3.3.1 Installation Restoration Sites

Active Installation Restoration Program (IRP) sites must continue to be managed in accordance with applicable regulations, and closed or “No Further Action” sites must be monitored where necessary to ensure that they remain innocuous. Because sites may be reentered into the IRP Environmental Restoration Program if future conditions or new information suggests it is necessary, Fort Hood should ensure that all information collected during remedial response and stored in site files is properly maintained and safeguarded. Actions regarding the site may occur years after the data has been gathered. Records should be sufficiently detailed and protected to provide a complete and accurate history of the remedial response in support of any future legal action and to aid the installation or MACOM in answering inquiries from Congress or requests from the public under the Freedom of Information Act.

3.3.2 Goals and Objectives

General goals and objectives for the facilities and developed areas at Fort Hood are listed in Table 3-1 and discussed below.

Table 3-1
Goals and Objectives for Facilities and Developed Areas

Goals	Objectives
Manage all existing and potential sources of environmental contamination to prevent releases of contamination.	Comply with all laws, regulations, and policies applicable to sources of environmental contaminants.
Prevent environmental contamination from occurring	Thoroughly train all employees (and ensure that all hired contractors are thoroughly trained) in the laws, regulations, policies, and procedures of handling potential environmental contaminants and preventing pollution. Follow all protocols in relevant Fort Hood management programs to minimize the possibility of environmental contamination. Report all activities with the potential to create environmental contamination immediately upon their occurrence Initiate appropriate response actions as soon as possible after a potential contamination occurrence. Monitor closed and NFA IRP sites where the potential for migration of environmental contaminants exists to ensure that any release of contamination from such sites is contained and corrected as quickly as possible. Maintain thorough records of all staff training and compliance activities. Maintain all data related to IRP sites and cleanup activities to remain up-to-date. Store at least one copy of the most up-to-date environmental program compliance data, including IRP data, in a location remote from where original records are stored.
Ensure the integrity of information related to environmental response actions	

3.4 VEGETATION MANAGEMENT

Army Regulation (AR) 200-1 requires that Army habitat management efforts be accomplished in a manner that conserves and enhances existing flora and fauna consistent with the Army's goal to conserve, protect, and sustain biological diversity while supporting the accomplishment of the military mission. To meet this requirement, activities will be directed toward the maintenance of healthy ecosystems and restoration of degraded ecosystems. AR 200-1 also requires that primary consideration be given to the management of indigenous listed, proposed, and candidate species' habitats, as well as to other environmentally sensitive areas and areas of special concern.

3.4.1 Goals and Objectives

The primary goals of vegetation management at Fort Hood are to restore and maintain native plant communities, to the extent practical, through the use of integrated ecosystem management principles while accommodating military training needs.

Table 3-2
Goals and Objectives for Vegetation Management

Goals	Objectives
To the extent practical, restore and maintain native plant communities through the use of integrated ecosystem management principles while accommodating military training needs.	Increase growth and density of vegetation, particularly in open-area habitats to enhance training.
Control damage to vegetation from overuse by cattle.	<p>Eliminate nonnative species to the extent practical and feasible. Consider the occasional use of NRMB-approved annuals or other non-persistent species for rapid stabilization of bare areas. Improve habitat quality for native species to the extent practical and feasible.</p> <p>Manage cattle grazing on training lands.</p> <p>Implement cattle grazing deferments on a rotational basis to allow revegetation of degraded training areas and riparian buffer zones, and to minimize future erosion.</p> <p>Maintain grazing deferment for a time period sufficient to allow revegetation of deep-rooted species and improve long-term sustainability of training lands.</p> <p>Monitor and evaluate plant responses to maneuver training.</p>
Reduce damage to vegetation from training	<p>Install an improved training area access road (tank trail) system.</p> <p>The access road/trail system will consist of 520 miles of improved access roads, thereby allowing military units access to training lands in a manner that reduces erosion and is less damaging to military equipment and to natural resources.</p> <p>Harden 13 HATs to enable safe access to hilltops and reduce soil erosion gullies. Use existing roads and openings to the maximum extent possible.</p> <p>Establish authorized and improved stream crossings so existing riparian corridors will be maintained, improved and allowed to naturally re-establish and develop. These constructed crossing direct vehicular traffic to appropriate sites and deter the establishment of volunteer crossings, which cause significant damage to riparian areas.</p>
Establish and maintain perennial vegetation on critical and potentially eroding areas.	<p>Continue to limit all excavation within 50 meters of riparian areas through the Dig Permit process.</p> <p>Conduct annual survey to identify eroded areas on training lands</p> <p>Identify areas of severe sheet, rill, and gully erosion that require measures other than normal seedbed preparation to establish perennial vegetation. These areas will be defined as “critical areas.” It is estimated that in excess of 5,000 acres could be defined as “critical areas.”</p> <p>Identify other areas having near-term potential for becoming severely eroded if a cover of perennial grass is not established. These areas will be defined as “potential critical areas.” It is estimated that in excess of 20,000 acres could be identified in this category.</p> <p>Repair 1,000 acres of critical areas and 4,000 acres of</p>

Work with universities, state agencies, federal agencies, and non-governmental organizations to gather basic data on natural resources; develop planning and evaluation tools.

potential critical areas per year. Measures normally include grading, filling, and shaping prior to seedbed preparation, followed by seeding, grazing deferment, and training deferment.

Continue to provide aerial support for vegetation surveys.

Continue to coordinate with universities and state, federal, and non-governmental agencies on ongoing and new research projects to broaden informational database of natural resources on Fort Hood.

Update existing floristic inventory document as additional plant species are found.

Develop geographic information system (GIS) database to facilitate planning, implementation, and post-implementation evaluation of projects.

ITAM conducts annual RTLAs in cooperation with Natural Resources Conservation Service (NRCS).

Continue to require the use of native landscaping plants around housing and buildings in cantonment areas, per MOI, *Landscaping on Fort Hood* (10 May 2004)

Develop an installation-wide wetlands delineation, increase wetlands management activities and use GIS to track wetlands and other environmentally sensitive areas.

3.4.2 Monitoring

Annual forage inventories should be conducted to ensure that overuse of the training lands does not occur. In addition, the Grazing Management Plan currently under development should include monitoring measures for rangeland vegetation. The ITAM RTLA program will continue to monitor training land conditions.

3.4.3 Other Management Alternatives Considered

A higher-intensity approach to vegetation management, in which management techniques similar to those described above would be implemented on a larger scale, was considered. Under this alternative, the acreage of training lands defined as critical areas and potential critical areas would be increased and more of these areas would be repaired and revegetated annually. Moreover, additional training lands would be included in the Training Out Area Program and tighter restrictions on cattle grazing would be implemented. However, such an increase in the intensity of vegetation management would have an adverse effect on the area of land available for training, and deferment of grazing activities is not possible due to a lack of fencing in the TAs. This adverse effect would become increasingly evident with the increase of troops stationed at Fort Hood and the subsequent increase in OPTEMPO and the demands on training lands. As a result of the adverse effects on training, this alternative was eliminated from further consideration.

Under a lower-intensity management approach, fewer steps would be taken to manage vegetation. For example, the area of land in the Training Out Area Program would be decreased or the program would be eliminated completely. The effort and resources expended to identify and repair degraded lands would be decreased. This alternative would quickly result in the degradation of the training lands, proving detrimental to the military mission. In addition, increased erosion and sedimentation would adversely affect water resources, aquatic habitat and biological communities, overall biodiversity, and karst habitats and the sensitive species that inhabit them.

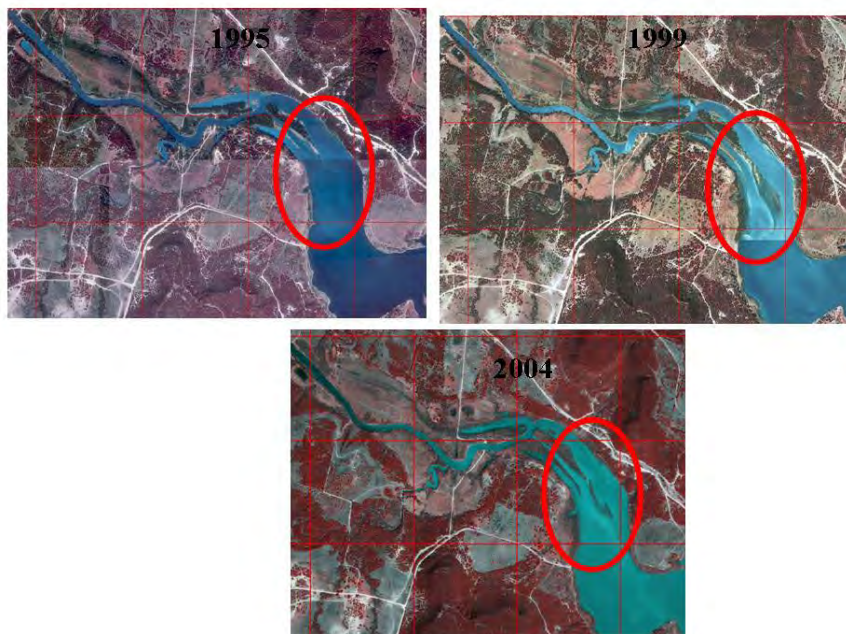
A lower intensity of management would also subvert Fort Hood's goal of environmental sustainability of its training lands. Thus, lower-intensity vegetation management was eliminated from further consideration.

3.5 SOIL CONSERVATION/EROSION CONTROL

Soil erosion is a major problem at Fort Hood and has resulted in impaired training and degradation of the water resources. It also represents a threat to the long-term sustainability of the training lands. Impacts from training and overuse of the training lands by cattle have reduced, and in some cases eliminated, the vegetative cover, and an expansive network of gullies has developed across the installation but primarily in the western maneuver area. Observations indicate that detrimental impacts on water quality and on aquatic habitat and biota are also occurring. An example is the significant sedimentation that has occurred in Cowhouse Creek (Figure 3-1).

Additionally, in 2007, USACHPPM conducted a study to look at munitions constituents of concern (MCOC) on Fort Hood. MCOC concentrations measured in surface soils within the Fort Hood PD94 Area and Firing Point Training Area 12B were not present at concentrations statistically greater than measured within background soils and/or at concentrations above their respective EPA Region 9 Industrial risk-based screening criteria. Arsenic was the only metal that exceeded the screening criteria, but the concentrations were naturally occurring in the region. Six explosives-related compounds (Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX); Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX); 2,4,6-Trinitrotoluene (TNT); Nitroglycerin (NG); 2-Amino-4,6-dinitrotoluene (2A46DNT); and 4-Amino-2,6-dinitrotoluene (4A26DNT) were detected at concentrations much lower than the screening criteria within areas containing a high density of impact craters. Perchlorate was not detected in any samples.

Figure 3-1. Sedimentation of Cowhouse Creek. (Source: Eckrich, 2005.)



3.5.1 Goals and Objectives

The primary goals of soil conservation and erosion control management on Fort Hood are to identify eroded soils, protect soil resources, and prevent soil erosion and its potential impacts on water quality, habitat, and mission.

objectives. Approximately 87 percent of the soil series that occur on the installation are considered highly or potentially highly erodible. Most of the problems associated with soil erosion on the installation occur in areas where vegetation has been removed or disturbed on steep slopes or on long, moderately steep slopes.

The objective of soil conservation and management on Fort Hood is to avoid disturbance of soils that are considered moderately or severely susceptible to erosion. Where these areas are disturbed, as a result of anthropogenic activities or natural causes, they will be stabilized and repaired in a timely manner to avoid the development of excessively eroded sites. Installation sources of erosion and sedimentation, runoff, and dust will also be controlled to prevent damage to land, water resources, equipment, and facilities on the installation and adjacent properties.

Specific goals and objectives to protect soil resources are listed in Table 3-3 and discussed below.

Table 3-3
Goals and Objectives for Soil Conservation/Erosion Control

Goals	Objectives
Protect soil resources and prevent soil erosion and its potential impacts on water quality, habitat, and the military mission.	Minimize erosion, reduce the sediment load to streams and other water bodies, protect fertile soils, and revegetate bare ground.
Continue reduction of sheet, rill, and gully erosion to acceptable limits.	Continue use of the Revised Universal Soil Loss Equation (RUSLE) model or other Army-approved erosion model to estimate soil erosion and use of soil tolerance levels and other factors to determine acceptable limits.
	Continue to develop a standardized, coordinated system for recording and mapping significant erosion damage and gully sites.
	Investigate the use of pavers to reduce runoff in improved areas, such as parking lots, staging areas, firing points and range travel lanes, and other areas subject to heavy traffic.
	Continue to provide aerial support for erosion surveys. Maximize vehicle flow traffic on established trails.
Continue to minimize, where possible, impacts from vehicle training maneuvers that increase soil erosion.	Limit cross-country non-tactical traffic.
	Conduct maintenance activities following training exercises to the maximum extent possible.
	Harden high-use staging areas.
	Design criteria and specifications for wet- and low-maintenance conditions.
	Repair trails with significant erosion problems.
Conduct erosion and sedimentation inventory and monitoring.	Continue ITAM RTLA monitoring and forage inventory being conducted by NRMB to estimate soil erosion rates.

Minimize erosion and degradation of training lands resulting from overuse by cattle

Maintain, and where possible, increase vegetative cover on training lands to reduce soil erosion and facilitate maintenance, restoration, and revegetation in training areas.

Continue to implement designation Free excavation site and restrictions for military training.

Develop and implement a comprehensive plan on the management of borrow sites.

Continue to implement existing best management practices, assess their effectiveness, and continue to search for new BMPS applicable to Fort Hood.

Evaluate and prioritize a list of active erosion sites.

Manage cattle grazing on training lands.

Reduce stocking rates as recommended by vegetation inventories

Increase growth and density of vegetation, particularly in open-area habitats, to enhance training. Consider the occasional use of NRMB-approved annuals or other nonpersistent species for rapid stabilization of bare areas.

Supply organic matter and nutrients through the addition of mulch or other organic biodegradable material to enhance soil quality and promote vegetative growth to reduce soil erosion where practical and in keeping with overall NRMB land management goals.

Encourage the use of installation-generated organic matter (e.g., grass clippings, landscape trimmings, leaves, mulch, wood chips) for application to training lands to enhance soil quality and promote vegetative growth.

Continue forage inventory monitoring at transects and RTLA site monitoring to estimate changes in biomass, ground cover, and erosion rates.

Continue prescribed burning to help restore and maintain the ecological health of the soils.

Continue to establish permanent excavation sites as needed.

Continue to restrict excavation sites within 50 meters of trails and streams, and within 10 meters of trees.

Prohibit the use of non-permitted and unregulated borrow sites, and develop a program for rehabilitating / reclaiming borrow areas.

Encourage the reuse of construction “spoil” material.

Eliminate illegal dumping sites to include construction/deconstruction materials.

Continue to implement the following BMPs to minimize erosion, conserve soil resources and protect vegetation.

- Critical Area Planting (NRCS Code 342)
- Early Successional Habitat Development/Management (NRCS Code 647)
- Fences (NRCS Code 382)

- Grazing Land Mechanical Treatment (NRCS Code 548)
- Heavy Use Area Protection (NRCS Code 561)
- Land Reconstruction, Currently Mined Land (NRCS Code 544)
- Mulching (NRCS Code 484)
- Prescribed Burning (NRCS Code 338)
- Prescribed Grazing (NRCS Code 528 and 528A)
- Prescribed Grazing (Appendix 1): Acceptable Grazing Use on Rangeland, Native Pasture, Grazed Forestland, Grazed Wildlifeland and Pastureland (NRCS Code 528)
- Prescribed Grazing (Appendix 2): Resting or Deferring Grazing Land for a Prescribed Period (NRCS Code 528)
- Restoration and Management of Declining Habitats (NRCS Code 643)
- Rock Barriers (NRCS Code 555)
- Sediment Basins (NRCS Code 350)
- Stream Crossings (NRCS Code 578)
- Use Exclusion (NRCS Code 472)
- Water and Sediment Control Basins (NRCS Code 638)
- Wetland Wildlife Habitat Management (NRCS Code 644)
- Wetland Wildlife Habitat Management, Texas Supplement (NRCS Code 644)
- Gully Plugs

Assess effectiveness of rangeland ripping and seeding.

Monitor effectiveness of hardened stream crossings, and continue to construct new ones as appropriate.

Monitor effectiveness of diversion terraces and grassed waterways, and continue to construct new ones as necessary.

Monitor effectiveness of hardened hillside access points, and continue to construct new ones as appropriate. Use existing roads and openings to the maximum extent possible.

Continue to establish rotation schedules for training and closing training areas for recovery in the Training Out Area Program.

3.5.2 Monitoring

Most of the current or planned projects detailed in the Land Sustainment Management Plan (LSMP) are designed to address problems resulting from erosion on training areas. The LSMP is an integrated land management and sustainment plan to guide the use, conservation, repair, protection, and long-term sustainment of Fort Hood training resources (Appendix A). Because of the potential for erosion of disturbed areas on Fort Hood, it is necessary that a comprehensive soil resource management approach be followed. The current policy of addressing problem erosion

areas as they occur through the LSMP program will be continued. In addition, a management approach designed to avoid the disturbance of potential problem erosion areas will be implemented, when possible, in a manner consistent with mission objectives.

A comprehensive monitoring program involving both the NRMB and the ITAM program has been incorporated into the objectives to ensure the effectiveness of the soil conservation and erosion control measures that will be implemented as part of this INRMP.

3.5.3 Other Management Alternatives Considered

Intensive management measures are proposed for the soil resources on Fort Hood. Other soil management alternatives that represented a program consisting of fewer, and less intensive, management measures were considered but rejected. The other management alternatives considered represented the minimum approach to achieving a soil resource management program that could comply with the guidelines established in AR 200-1. The management alternatives in the minimum approach were aimed at controlling or reacting to the level of erosion, soil loss, and disturbance that could occur, rather than taking the proactive steps necessary to prevent, to the maximum extent practicable, the likelihood of such events occurring.

Given that nearly 87 percent of the soils on Fort Hood are vulnerable to erosion, this minimal approach to soil management has been rejected. The intensive use of tracked and wheeled vehicles requires continuous vegetative cover, and the ability to sustain this cover over the long term could be jeopardized by a minimal management approach and unexpected climatological events (e.g., heavy rains). The effort and resources necessary to implement the proposed approach are a prudent investment toward ensuring the long-term sustainability of the soil resources.

3.6 WATER RESOURCES MANAGEMENT

The ecological and human health importance of maintaining healthy water bodies at Fort Hood is reinforced by several federal and state laws and regulations. In addition, AR 200-1 (*Environmental Protection and Enhancement*) promotes the importance of maintaining healthy water resource systems on the installation.

Protecting and improving the water quality in the streams, wetlands, lakes, and ponds is especially important because there are two large reservoirs—Belton Lake and Stillhouse Hollow Lake—directly downstream of the installation. Both reservoirs are used for municipal water supply for Fort Hood and surrounding communities, in addition to other uses. The water that drains from the installation has the potential to affect water quality at both of these locations, and it is important to maintain high quality so this water is potable. In addition, maintaining high water quality is important to preserve the ecological integrity of the water resources in and around Fort Hood. Water of a quality unable to support a diverse and healthy population of aquatic life would have an adverse effect on all local species.

Another water quality issue involves the streams flowing out of the impact areas, specifically in the Cowhouse Creek drainage basin. The water bodies exiting the impact areas have been tested for metals and explosives, but studies are limited.

In 2007, USACHPPM conducted a limited focus investigation of the potential overall impact of munitions constituents resulting from live fire training operations that occurred at select ranges on the installation. It was not meant to be a hot spot analysis of every impact crater or low order detonation. This investigation consisted of sampling the soils, surface water systems, ground water and small mammal sperm, and evaluating the results against various criteria. Five munitions constituents of concern (MCOC) (barium, chromium, nickel, lead, and vanadium) were detected in all 216 surface soil samples collected for this study. None of these metals were found to be statistically greater than background. Mercury was detected in five soil samples, collected from different strata, at concentrations well below

the risk-based screening criteria. In surface water, none of the surface water MCOC exceeded the applicable State of Texas surface water standards or the benchmarks. In the sediments, arsenic and manganese exceeded the sediment benchmarks at the sample point located downstream of the most heavily used section of the PD94 Area. The study concluded that periodic monitoring, every 5 years, is recommended to ensure that the elevated MCOC concentrations do not affect aquatic ecosystem health over time.

3.6.1 Goals and Objectives

The primary goal of water resources management at Fort Hood is to identify and restore degraded aquatic habitats, protect aquatic and riparian habitats, and prevent degradation of water quality. Fort Hood's goals and objectives for surface water and groundwater are presented in Table 3-4 and described below.

Table 3-4
Goals and Objectives for Water Resource

Goals	Objectives
<i>SURFACE WATER</i>	
Identify and restore degraded aquatic habitats, protect aquatic and riparian habitats, and prevent degradation of water quality.	Design and implement a comprehensive sampling and assessment plan. Expand the current water quality monitoring program to include regular monitoring of surface water and groundwater across the installation. Identify areas of high erosion and sediment input through stream and watershed assessments. Develop a database to assess status and trends in water quality and habitat suitability.
Reduce erosion and sedimentation in water resources.	Repair and maintain aquatic resource infrastructure such as dams and spillways to maintain safety and established aquatic habitat. Continue evaluation of effectiveness of existing BMPs to reduce sedimentation and erosion of streams and assess possibilities of new ones. Establish and maintain sufficient vegetative buffers (stream bank and shoreline vegetation) around water bodies to minimize the flow of nonpoint source pollution, particularly sediment, into the streams. Limit activities within the buffer zone to those causing little or no impact on water quality and aquatic habitats.
Protect, maintain, and enhance waters of the U.S., and ensure no net loss of wetland habitats.	Continue revegetation of disturbed lands. Identify, delineate, and characterize the waters of the U.S. on Fort Hood IAW USACE standards. Evaluate potential impacts of current mission activities on waters of the US, and determine need for permits. Establish a database to monitor habitat quality and ecological integrity. Develop a GIS data layer with available attributes.

Continue environmental awareness and outreach programs.

GROUNDWATER

Protect groundwater resources and prevent degradation of water quality.

Pursue water quality management procedures that protect waters of the U.S. from excessive nonpoint source runoff.

Assess the need for a wetland management plan. Prepare and implement a wetland management plan if deemed necessary
Develop Sustainable Range Awareness (SRA) materials to disseminate information to Soldiers and commanders.

Develop an inventory and characterization of karst conditions and groundwater hydrologic flow characteristics on Fort Hood.

Establish and maintain vegetated buffers around sinkholes and other karst features that provide direct access to the groundwater aquifers on Fort Hood.

Limit application of pesticides, fertilizers, or other chemicals in or near sinkholes or other karst features.

Locate refueling activities and other training activities with the potential for generating pollutants away from sinkholes or other karst features.

Continue to develop and disseminate information on proper spill prevention and control techniques to be implemented in karst areas.

Develop adequate understanding of hydrologic environment sufficient to determine wells or springs to be quarantined if spills occur in karst areas.

3.6.2 Monitoring

To gain a thorough understanding of the current state of water resources at Fort Hood and identify water quality issues, it is necessary to have a comprehensive water monitoring program. Ideally, the program should include routine water and sediment sampling across the installation, in addition to assessments of the stream habitat and biological communities. Information and data from such a program would help to characterize the condition of Fort Hood streams and the associated aquatic life, and to identify water quality issues.

Given the types and quantity of ordnance deposited in the impact area over the past several decades, continued monitoring is needed to provide additional information on potential water quality, drinking water, and other environmental concerns. This is of particular importance given that these streams drain into local municipal water sources.

The management objectives described above are designed to characterize existing conditions, determine whether there are significant water quality issues, and provide a foundational database from which to evaluate and monitor the status and trends of water quality conditions at Fort Hood.

It will be necessary to monitor the integrity of waters of the U.S., including wetlands, following their identification, delineation, and characterization. The development of a database to monitor their status and trends not only will enable NRMB staff to determine future management efforts but also will facilitate the

decision making process on future training and range actions. Activities occurring in or adjacent to wetlands that would result in negative impacts on the habitats will be avoided, when possible, in a manner consistent with mission objectives. Where impacts on waters of the U.S. are not avoidable, mitigation of the impacts will be implemented.

3.6.3 Other Management Alternatives Considered

A less intensive approach to water resource management was considered but rejected. The Clean Water Act has severe regulatory implications for noncompliance that could adversely affect the ability of Fort Hood to support its mission. In addition, potential liability is associated with not knowing the conditions of water from which people catch and eat fish, and drink. These conditions warrant implementing the intensive water monitoring program described in this INRMP to characterize the water resources.

3.7 FIRE MANAGEMENT/PREScribed BURNING

Wildfire prevention and suppression is a matter of concern for military training and natural resources management at Fort Hood. Wildfires have several undesirable aspects: they interfere with ongoing training activities, they can make training areas unsuitable for training over the short term, and they have direct and indirect impacts on habitats and species. From an ecological standpoint, there are positive aspects to wildfire provided the fuel loads are not excessive, such as returning nutrients to the soil, releasing the seeds of fire-dependent plant species, increasing diversity, and causing an overall revitalization of habitat. For many years, Army guidance has focused strictly on the suppression of wildfires. Wildfire prevention and suppression involve minimizing fire occurrence by educating personnel and residents of Fort Hood on fire prevention techniques, reducing natural fire fuels, restricting the types of ammunition and pyrotechnics that can be used based on the level of fire danger, being well prepared for fires, and, when necessary, rapidly suppressing and containing the spread of wildfires that do occur.

3.7.1 Goals and Objectives

The goals and objectives (Table 3-6) reflect the change to a let-burn policy designed to reduce fuel loads and minimize interruptions of live-fire training exercises, while preserving endangered species habitat and protecting human health and facilities on and off the installation.

3.7.2 Monitoring

To minimize the potential impacts of fires on endangered species habitat, and in accordance with provisions listed in the 1 December 2010 Biological Opinion issued by USFWS Fort Hood will assess the effects of fire on endangered species habitat and will report habitat loss due to wildfire to the USFWS. Fort Hood will also implement minimization measures as outlined in the December 2010 biological opinion which will reduce the potential incidence and effect of wildfires to federally-listed species and their habitat.

3.7.3 Other Management Alternatives Considered

The fire management and prescribed burning measures proposed for Fort Hood are those minimally required for effective fire management and protection of endangered species habitat. Other management alternatives that require more or less aggressive fire management were considered but rejected. Because accidental fires result from the use of pyrotechnics and some types of ammunition during training, a more conservative alternative would involve increasing the restrictions on the use of pyrotechnics and ammunition or eliminating their use altogether. This management

strategy would place an unacceptable level of restriction on training activities and the military mission, and therefore it was rejected. This conservative approach would also attempt to extinguish all wildfires outside the impact area regardless of whether they posed a direct threat to endangered species habitat, human health, or facilities. This approach could allow fuel loads to build to levels that would make it difficult to quickly and safely extinguish future fires. The fires of 1996 occurred during a time when fuel loads were very high and resulted in extremely hot fires that could not be contained and were difficult to extinguish. These extreme fires adversely affected training and destroyed a significant amount of endangered species habitat. The let-burn policy will assist in maintaining fuel loads at more manageable levels that should not result in extreme and difficult-to-control fires.

Table 3-7
Goals and Objectives for Fire Management/Prescribed Burning

Goals	Objectives
Protect human life and suppress or prevent damage to land and natural resources caused by fire.	<p>Continue the let-burn policy to minimize fuel loads. However, prevent unacceptable damage to natural resources and interference with training, and protect health and safety of personnel.</p> <p>Purchase fire suppression equipment and train personnel, on an as-needed basis.</p> <p>Continue to provide aerial firefighting support.</p> <p>Support DES in suppressing wildfires that threaten endangered species habitat and installation facilities.</p>
Maintain firebreaks and construct new ones as needed to contain fires originating in the live-fire area and reduce the risk of fire damage to critical facilities, training activities, and endangered species habitat.	<p>Maintain the road network in the live-fire area to provide some fire containment function.</p> <p>Maintain a 25-foot-wide bladed earth firebreak around the Fort Hood boundary, within constraints of erosion control BMP's.</p> <p>Minimize erosion on firebreaks.</p> <p>Maintain a firebreak around critical facilities such as fuel storage areas by controlling the vegetation by mechanical means and herbicides where necessary.</p> <p>Use soil sterilants for certain vegetation control needs. Mechanical control includes mowing, blading, or flaming.</p> <p>Construct and maintain firebreaks inside of and adjacent to endangered species habitat as required by the ESMP.</p>
Implement prescribed burning activities to control undesirable shrubs and trees, increase availability of forage and improve wildlife habitat, manipulate habitat for the endangered black-capped vireo, improve open space for military training, and reduce fuel loads to reduce the risk of wildfire.	<p>Continue to provide aerial support for firebreak surveys.</p> <p>Conduct prescribed burning to reduce fire hazards near black-capped vireo and golden-cheeked warbler habitat areas.</p> <p>Conduct prescribed burning year-round to minimize potential harm to endangered species habitat from training-related fires. The number of acres burned each season will depend on weather conditions and training schedules.</p> <p>Conduct cool season fires in black-capped vireo habitat to maintain patchy habitat structure and to limit the encroachment of juniper</p>

and other large trees.

Investigate the use of prescribed fires in ecotone boundaries to protect golden-cheeked warbler habitat from catastrophic fires.

Conduct prescribed fires to treat grasslands on a 5- to 7-year cycle, depending on conditions, burning approximately one fifth of appropriate grasslands on the installation per year. Burning the grasslands will limit woody encroachment on endangered species habitat.

Train personnel with S-130 and S-190 basic fire suppression classes, as well as in intermediate and advanced fire-fighting techniques as necessary to maintain a prescribed fire crew with the diverse skills and training needed to ensure safety and effectiveness.

All personnel serving on the prescribed fire crew must maintain fitness conditions appropriate to their assigned roles, up to and including Red Card certification, and be tested at least annually.

3.8 FISH AND WILDLIFE MANAGEMENT

3.8.1 Fisheries Management

Per AR 200-1, the fisheries management program on Army installations must provide for the management of fish populations and their habitats consistent with accepted scientific principles, in compliance with the ESA and other applicable laws and regulations. The program is to emphasize maintaining and restoring habitat favorable to the production of indigenous fish, particularly federally listed species protected under the ESA. In addition, fisheries stocks are to be managed to conserve both game and nongame species.

Habitat protection and the availability of suitable habitat are essential for productive fisheries and the successful management of the fisheries (USEPA, 1993). The condition of the surrounding watershed plays a significant role in determining the quality of the water and the physical habitat. The implementation of watershed management practices improves and protects the quality of the water resource and therefore must be incorporated into the fisheries management program.

Fort Hood's approach to fisheries management places a higher priority on habitat restoration aimed at creating ecosystems capable of producing self-sustainable populations of fish than on stocking. Long-term increases in fishing quality at relatively low costs are achieved more effectively by implementing habitat improvement and protection measures. Costs for enhancing or rehabilitating fish stocks are controlled by implementing self-sustaining habitat and water quality protection measures.

3.8.1.1 Goals and Objectives

The goal of fisheries management at Fort Hood is to provide quality recreational fishing opportunities while maintaining a balanced and diverse aquatic ecosystem. The best long-term approach, as well as the most efficient use

of resources for achieving this goal, is to establish and maintain the biological integrity of the water bodies. The inability of water bodies to provide sustainable populations is often the result of habitat degradation, poor water quality, introduction of undesirable species, and overfishing. Table 3-7 lists the goals and objectives for fisheries management.

3.8.1.2 Monitoring

The monitoring methods used to manage the fisheries on Fort Hood will be consistent among water body types (i.e., lakes/ponds and streams) and from year to year. Such consistency allows the comparison of data between water bodies of a similar type, as well as the evaluation of temporal status and trends occurring for each water body. Management measures that produce the desired results will be continued for as long as they successfully meet their objectives.

Table 3-8
Goals and Objectives for Fisheries Management

Goals	Objectives
Provide quality recreational fishing opportunities while maintaining a balanced and diverse aquatic ecosystem.	Evaluate current fisheries, develop a database to evaluate the future condition of fish populations, and enhance fishing opportunities on Fort Hood.
	Assess the need for electrofishing, sampling, and monitoring of fish populations, and implement as needed.
Protect, restore, and enhance aquatic ecosystems to protect water quality and support an adequate fisheries resource.	Continue to develop and expand recreational fishing opportunities. Assess aquatic habitat and develop a database from which to determine status and trends of physical habitat conditions and overall ecological integrity. Use the database as baseline information to assess future conditions. Protect the biological integrity of streams.
Maintain, protect, and enhance riparian areas to protect water quality, aquatic habitat, and fisheries and to enhance native biodiversity.	Control/eradicate exotic and undesirable species in lakes and ponds. Maintain riparian buffer zones along streams, lakes, and ponds.
Enhance fish habitat.	Where necessary, conduct silt removal, bottom contouring, shoreline diversification, dam and spillway renovation, and riparian habitat management.
Manage fish harvests to maintain fish populations within the capacity of available habitat.	Monitor aquatic weeds and implement necessary control measures. Continue to obtain adequate data to support the development of sustainable fish harvests.
Continue the reduction of sheet, rill, and gully erosion to acceptable limits.	Evaluate and prioritize a list of active erosion sites.
Assess existing best management practices.	Continue to improve the program through research and implementation of new management practices.

3.8.1.3 Other Management Alternatives Considered

Restricting access to the riparian and aquatic areas at Fort Hood was considered, but it was rejected because training restrictions in those areas would impede training under realistic conditions. Improving water crossings for all the streams at Fort Hood to protect the integrity of the aquatic habitats was also considered. However, the more prudent allocation of resources involves prioritizing stabilization projects on the basis of need. In addition, ground-disturbing activities associated with such projects could contribute additional sediment loads and disturb aquatic habitats during the stabilization process. It is possible to protect, conserve, and enhance the aquatic habitats at Fort Hood to ensure long-term ecological integrity, support healthy fish populations, and provide recreational opportunities without placing undue restrictions on the military mission. Therefore, implementation of these other management alternatives is not necessary.

A more intensive (and traditional) approach to fisheries management, in which management techniques focus on more intensive manipulation of the food chain, gamefish stocks, and increased levels of stocking, was considered. This intensive or traditional approach to fisheries management is more costly and less effective in the long term than the approach presented above. Habitat improvement and protection measures are far more effective than intensive stock manipulation and stocking, and they have a higher probability of producing long-term improvements in the quality of recreational fishing at relatively low costs.

3.8.2 Wildlife Management

3.8.2.1 Goals and Objectives

The goals of the wildlife management program (Table 3-8) are to sustain indigenous wildlife populations through the use of integrated ecosystem management principles while accommodating military training needs. Furthermore, wildlife resources and habitats for consumptive and nonconsumptive uses are to be managed in compliance with federal and state laws (Sikes Act, ESA, Clean Water Act [CWA], state laws), and U.S. Army regulations (e.g., AR 200-1) and guidance.

3.8.2.2 Monitoring

The management objectives described above are designed to characterize existing conditions, determine management measures, and provide a database from which to evaluate and monitor the status and trends of wildlife resources at Fort Hood. The monitoring methods used to evaluate wildlife resources on Fort Hood will be consistent among habitat types and from year to year. This consistency allows the comparison of data between areas of a similar habitat type, as well as the evaluation of temporal status and trends. Management measures that produce the desired results will be continued for as long as they successfully meet their objectives. The inventory and monitoring data will be evaluated at regular intervals to ensure the continued successful management of wildlife resources at the ecosystem level. Management measures that do not produce the desired objective will be reevaluated to determine the corrective action needed to ensure success.

3.8.2.3 Migratory Bird Treaty Act

Several hundred species of non-game birds are protected by the Migratory Bird Treaty Act (MBTA, 16 USC 703-712; 50 CFR Part 10) on Fort Hood (see Appendix G). These species use the Installation for breeding, overwintering, or migratory stopover. The MBTA states that, “Unless and except as permitted by regulations...it shall be unlawful at any

time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill...any migratory bird, any part, nest, or eggs of any such bird...concluded November 19,1976.” Further, Executive Order 13186 provides guidance to Federal Agencies with the purpose to, “minimize the potential adverse effects of migratory bird take, with the goal of striving to eliminate take, while implementing the mission.”

In February 2007 the USFWS promulgated a rule exempting the Armed Forces for the incidental take of migratory birds as a result of Military Readiness Activities. The rule is codified at 50 CFR 21.15. Under the provisions of that rule (NEPA and ESA considerations), Fort Hood units, civilians, and contractors conducting a Military Readiness Activity may unintentionally take migratory birds. The rule does not apply to activities that do not meet the definition of a Military Readiness Activity. The Natural Resources Management Branch is the review authority for migratory bird consideration in NEPA analyses and has developed BMPs for avoidance and minimization of potential incidental take of migratory birds. These BMPs ensure the Installation is meeting its compliance obligations under the MBTA for both Military Readiness Activities and non-Military Readiness Activities.

The Natural Resources Branch relies on guidance issued by Army Environmental Command on 28 July 2008. According to the guidance, “No authorization or permitting process currently exists for the unintentional take of migratory birds during lawful activities that are not considered MRAs [Military Readiness Activities]”. These include routine Installation operations, maintenance, and construction. Further, “An Installation’s Integrated Natural Resources Management Plan (INRMP) is required to address migratory bird management and conservation. In the case of military non-MRAs [Military Readiness Activities], an INRMP should include management practices to avoid or minimize adverse impacts on migratory birds to the greatest extent practicable.”

The greatest risk of unintentional take occurs during the migratory bird nesting season, which at Fort Hood is 15 March to 15 August. Given the intense and dynamic training requirements and construction, and security activities at Fort Hood and the need to sometimes conduct these activities during the nesting season, the Installation has developed comprehensive BMPs to minimize impacts to migratory birds as a result of activities necessary to support ongoing military readiness operations. With proper project planning and coordination, Fort Hood should be able to avoid and minimize the risks to migratory birds. For projects that occur during nesting season, the following BMPs and measures will be implemented to minimize risks and potential for adverse effects:

- **NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) REQUIREMENTS:** NEPA analyses will be performed on a programmatic level in order to address the potential comprehensive and cumulative impacts associated with all Military Readiness and non-Military Readiness Activities on Fort Hood. These NEPA analyses will be completed, and then coordinated with all stakeholders before a decision document is signed by the appropriate Army leadership. Additional tiered NEPA analyses will be completed prior to project implementation. The level of these analyses (i.e., Record of Environmental Consideration [REC], Environmental Assessment [EA], or Environmental Impact Statement [EIS]) will be dependent on the scope of the effort and the potential for environmental impacts as a result of the proposed action and alternatives. All environmental media will be evaluated in the analysis, including migratory birds as well as threatened and endangered species.
- **DISTURBANCE:** Birds and/or bird nests protected under the MBTA will not be removed from building exteriors and interiors without coordinating with the Natural Resources Management Branch. Any nests found in inactive vehicles or equipment will be assessed to determine if a depredation permit is required prior to disturbance. If the nest is determined to be active, a depredation permit will be obtained from USFWS prior to any activities that could result in a take.
- **CONTRACTS:** All contracting documents associated with the training, construction, and security activities will include the comprehensive BMPs and measures for protection of Migratory Bird populations for each project.

- **BRIEFINGS:** Prior to commencement of work activities, appropriate stakeholders (i.e., contractors and contract inspectors) working on a project site will receive a DPW-NR MBTA briefing. The brief will discuss the MBTA, federal agencies responsibility under the MBTA, Fort Hood's BMPs and methods of minimizing the effects of project implementation to migratory birds. The presentation will include color handouts for field referencing of examples and pictures of the different types of nests that are likely to be encountered, and will discuss behavioral clues that may indicate a nearby nest (i.e., flushing, scolding). This interactive discussion will also include the procedures to be taken in the event a nest is located. The briefing will occur prior to onset of each project implementation. A list of MBTA briefing attendees will be provided to the contracting officer (COR) or DPW Natural Resources office, as appropriate.
- **FUNDING:** Although subject to Federal funding cycles and congressional approvals, projects will be scheduled to occur outside MBTA nesting season wherever feasible and practical.
- **SURVEYING:** Vegetation including trees, shrubs and grassland areas in the entire project area will be surveyed and assessed by qualified biologists with experience in surveying and locating bird nests. The systematic surveying will occur within 48 hours prior to commencement of work activities in the immediate project area. For large parcels, the biologist will survey the smaller parcels where the work will begin first and phase the surveying to immediately precede (within 48 hours) project disturbance. The biologists will mark the nesting areas with flags at a safe distance to avoid the potential take of the birds. GPS coordinate data will be taken at all nests locations. Prior to removing a tree or shrub, crews (staff or Contractor) will also be instructed to inspect the tree/shrub as thoroughly as possible to determine if a nest is present.
- **IDENTIFYING AND MARKING:** A progressive distance-buffer system has been developed to minimize and/or eliminate potential impacts to nesting birds on Fort Hood. If a nest is discovered within the work site at ground level (0 to 10 feet above grade), the site containing the nest will be flagged or marked, a 60-foot radius buffer around the site delineated, and the area avoided. If a nest is discovered at low tree height (10 to 20 feet above grade), it will be marked and a 30-foot radius buffer will be established around the area of nest, and the area avoided. In the event that 2 or more nests are observed at one site location, the buffer will increase to 100-foot radius buffer for ground and 60-foot radius for low tree height nesting locations. In the event that 3 or more nests are observed at one site location, the buffer will be a 100-foot radius for both ground and low-tree nesting sites.
- **NOTIFICATION:** Project survey biologists will notify all appropriate stakeholders (i.e., DPW Natural Resources staff, all of the active field crews, and DPTMS/Range staff) that the pre-project survey has been completed and provide details on number and location of nests found. All marked nests will be treated as active, unless DPW Natural Resources staff determines a nest to be inactive. DPW-NR will inform stakeholders of nests that they determine to be inactive within one week of notification of nest location.
- **TRACKING AND DATA COLLECTION:** DPW Natural Resources will maintain records on nest data and locations for the duration of the nesting season. All nests located during nesting season will be tracked through GIS so that nesting habits, populations, and even species can be observed and monitored during the nesting season in which it is discovered, as well as tracked over time for better understanding of population trends. Fort Hood Natural Resources staff has already implemented a robust monitoring, data collection, and tracking system. Data collected from the MBTA program will be managed with this established data management program.
- **ASSESSMENT AND DETERMINATION:** The DPTMS/Range Project Manager will assess the vegetation conditions (i.e., type and density) and limitations (i.e., nest density and locations) and determine the best removal methods that pose the least risk to the surrounding environment.
- **PROJECT EXECUTION AND VERIFICATION:** Once the assessment of conditions and determination is made, the Project Manager will remove the targeted vegetation only. DPW Natural Resources staff will

confirm and verify the evaluation, assessment, and project execution process. Any project delays require Garrison Commander approvals.

By following the above BMPs, the Fort Hood Team believes that the unintentional take of individual migratory birds will be minimized and avoided, and there will be no significant impact to migratory bird populations.

3.8.2.4 Other Management Alternatives Considered

A lower-intensity approach to wildlife management, in which management techniques would be minimized and implemented on a smaller scale, was considered. Under a lower-intensity management approach, fewer steps would be taken to manage terrestrial habitat resources and management would more closely resemble the status quo, or less. For example, Ashe juniper would not be cleared using mechanical means. Although the effect of such a course of action would be gradual and not immediately apparent, the long-term impacts could be very detrimental to the military mission and to biodiversity. For example, further reduction in open areas over the next decade and increased stands of dense Ashe juniper would likely result in areas where training was no longer possible. Ultimately, the ability of the installation to support the mission would be impaired due to a reduction in open training areas, particularly those suitable for maneuvers. Furthermore, it is conceivable that with a lower-intensity management scheme additional species might become federally listed, resulting in additional training restrictions. Thus, lower-intensity management of terrestrial habitats was eliminated from further consideration.

Table 3-8.1
Goals and Objectives of Wildlife Management

Goals	Objectives
Sustain wildlife resources and habitats for consumptive and nonconsumptive uses that are managed in compliance with federal and state laws (Sikes Act, ESA, CWA, state laws) and U.S. Army regulations (e.g., AR 200-1) and guidance.	<p>Improve habitat quality for wildlife species and ensure healthy wildlife populations in a manner consistent with land use and training objectives.</p> <p>Manage native vegetation to promote optimal community succession.</p> <p>Maintain existing drinking water availability.</p> <p>Enhance the value of ecosystems by eradicating exotic animal and plant species, promoting native plant communities, preventing the introduction of new weeds, and restoring areas disturbed by training.</p>
Develop a standardized, coordinated system for recording and mapping resource observations (e.g., plants, wildlife, erosion, damage).	<p>Ensure that scientifically sound and commonly accepted data collection methods and sampling techniques are used to update natural resource inventories.</p> <p>Continue to monitor and protect medium-large carnivore distribution and composition.</p> <p>Continue to educate the public about the benefits of</p>

	carnivore communities to ecosystems.
	Evaluate and research factors influencing deer populations.
	Continue RTLA monitoring as a component of ecosystem management.
Manage wildlife harvests to maintain game populations within the capacity of available habitat.	Continue to obtain adequate data to support the development of sustainable wildlife harvests.
	Continue to provide aerial support for wildlife surveys.
Continue environmental awareness and outreach programs.	Continue support and development of the Fort Hood Outdoor Recreation Program.
Continue to survey, monitor, protect, and manage forest and cave bat species, their habitat, and their roosts	
Continue to educate the public about the importance of bat communities to ecosystems	
Continue to survey birds covered under the Migratory Bird Treaty Act	
Survey, manage, and protect Texas horned lizard populations	

3.9 RARE, THREATENED, AND ENDANGERED SPECIES MANAGEMENT

3.9.1 *Federally Listed Species*

The ESA requires all federal agencies to conserve listed species. Conservation, as defined by the ESA, means the use of all methods and procedures necessary to bring any listed species to the point where protections pursuant to the ESA are no longer necessary. The act specifically requires agencies not to “take” or “jeopardize” the continued existence of any endangered or threatened species, or to destroy or adversely modify habitat critical to any endangered or threatened species. Under Section 9 of the act, *take* means to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect”; under Section 7, *jeopardize* means to engage in any action that would be expected to “reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.”

On 28 September 1994 the Acting Assistant Secretary of the Army (Civil Works) signed a multi-agency Memorandum of Understanding (MOU) on implementing the ESA. The purpose of the MOU was to establish a general framework for greater cooperation and participation among the agencies exercising their responsibilities under the ESA. The MOU states that the departments will work together to achieve the common goals of (1) conserving listed species, (2) using existing federal authorities and programs to further the purposes of the ESA, and (3) improving the efficiency

and effectiveness of interagency consultations conducted pursuant to Section 7(a) of the ESA. Each signatory agreed to (1) use its authorities to further the purposes of the ESA by carrying out programs for the conservation of federally listed species, including implementing appropriate recovery actions that are identified in recovery plans; (2) identify opportunities to conserve federally listed species and the ecosystems on which they depend within existing programs and authorities; (3) determine whether its respective planning processes effectively help conserve threatened or endangered species; and (4) use existing programs, or establish a program, to evaluate and reward the performance of personnel who are responsible for planning or implementing programs to conserve or recover listed species or the ecosystems on which they depend.

Army policy on listed species includes the following elements: balancing mission requirements with endangered species protection, cooperating with regulatory agencies, and conserving biological diversity within the context of the military mission. As required by AR 200-1, the Army must ensure that it carries out mission requirements in harmony with the requirements of the ESA. All Army land uses, including military training and testing, recreation, and grazing, are subject to ESA requirements for the protection of listed species and critical habitat. In fulfilling its conservation responsibilities, the Army is required to work closely and cooperatively with the USFWS and National Marine Fisheries Service (NMFS), the two federal agencies responsible for enforcing the act. Installations are encouraged to engage in informal consultation with the USFWS and NMFS during the planning of projects or activities to ensure ESA compliance. In conserving biological diversity, installation commanders and Army natural resource managers are required to develop and implement policies and strategies to maintain viable populations of native plants and animals, maintain natural genetic variability within and among populations, maintain functioning representations of the full spectrum of ecosystems and biological communities, and integrate human activities with the conservation of biological diversity.

The Army requires installations to prepare ESMPs for each listed species and species proposed for listing and the critical habitat present on the installation, including areas used by tenant organizations. Installations that require more than one ESMP (i.e., more than one listed or proposed species is present) are permitted to prepare a combined ESMP. Installation ESMPs must prescribe area-specific measures necessary to meet the installation's conservation goals for the subject species and critical habitats (HQDA, 1995b).

3.9.1.1 Goals and Objectives

The management goals for rare, threatened, and endangered species on Fort Hood are to preserve these species on the installation in accordance with the Endangered Species Act, Endangered Species Recovery Plans, U.S. Army regulations and guidance, approved ESMPs, and BOs. Table 3-9 lists the goals and objectives for the management of rare, threatened, and endangered species.

Table 3-9
Goals and Objectives for Rare, Threatened, and Endangered Species Management

Goals	Objectives
Manage all identified rare, threatened, and endangered species in accordance with the ESA, U.S. Army regulations and guidance, state wildlife regulations/laws, and approved site-specific management plans (e.g., ESMP).	<p>Continued ongoing monitoring of intensive study areas to assess critical demographic parameters of golden-cheeked warblers and black-capped vireos. Provide approval and oversight for research conducted by universities, graduate students, and other researchers.</p> <p>Actively manage black-capped vireo habitat in accordance with the provisions of the ESMP.</p> <p>Continue to document occurrence of Sprague's pipit on the installation and support additional research on this species.</p>

	Continue to evaluate potential mussel habitat
	Continue to survey for mussel species
Protect and enhance the habitat and populations of those plant and animal species listed as rare, threatened, and endangered or those with the potential to be listed in the future.	As long as funding is available, continue support for the MAPS station and evaluate additional survey needs.
	Continue to monitor for the presence of Species of Conservation Concern and collaborate with researchers who are studying declining species.
Continue cowbird control through an active trapping and shooting program throughout the post and enhance control in core habitat areas.	Continue to provide aerial support to monitor land use impacts in endangered species habitat. Maintain parasitism levels in black-capped vireo nests below 10%.
Continue support and encouragement of research programs that assess the effects of military training activities on endangered bird populations.	Continued monitoring to determine population trends, demographic parameters, and effectiveness of management initiatives.
Continue support for range-wide population and habitat conservation and protection measures.	Assess the feasibility and desirability of participating in regional surveys of selected species and habitat types to contribute to the understanding of the ecology of the black-capped vireo and golden-cheeked warbler, or other sensitive species.
Ensure that scientifically sound and commonly accepted data collection methods and sampling techniques are used.	Continue to collaborate and cooperate with agencies and organizations conducting monitoring and conservation of listed species on the wintering grounds, including collaborative training and data-sharing. Continue to develop and assess new and innovative survey techniques for endangered species. Provide recommendations that might improve or enhance research projects conducted by universities, graduate students, or other researchers and provide oversight for the implementation of these projects.

3.9.1.2 Monitoring

The ESMP and 1 December 2010 BO include provisions for monitoring. The reasonable and prudent measures outlined in the BO (Appendix J) includes (1) continuing to implement monitoring and research programs for the golden-cheeked warbler and black-capped vireo; (2) managing vegetation-clearing projects to minimize fire hazard from slash and to avoid impacts on residual stands; (3) emphasizing the use of prescribed burning to support protection and maintenance of endangered species habitat and to support ecosystem management principles; (4) evaluating the effects of predation on endangered species productivity and investigating management options to reduce nest losses; (5) monitoring the quality and quantity of available endangered species habitat; (6) incorporating preventive measures to avoid future uncontrolled burns similar to the February 1996 fires; (7) implementing training restrictions in golden-cheeked warbler core habitat; (8) monitoring the distribution and spread of oak wilt and using appropriate measures to limit effects on endangered species habitat; and (9) restricting recreational use in endangered species habitat. In addition, the BO recommends the following conservation practices:

- Continue to investigate, monitor, and manage karst ecosystems occurring on the installation. Fort Hood should continue the mapping and study of karst features with an emphasis on protecting these sensitive areas. This would include developing and implementing a management plan and providing adequate protection for these ecosystems.
- Fort Hood should work cooperatively with state and federal agencies managing the substantial populations of black-capped vireos and golden-cheeked warblers to exchange ideas and further recovery implementation within their authorities. Such agencies would include, but not be limited to, Texas Parks and Wildlife, Balcones Canyonlands National Wildlife Refuge, Fort Sill, and Wichita Mountains Wildlife Refuge.
- Fort Hood should implement a program to control red imported fire ants in endangered species habitat and near important karst features. Fire ant control should use non-toxic methods (e.g., boiling water) to avoid unintended effects.

3.9.1.3 Other Management Alternatives Considered

Because protection of federally listed species is mandated by federal law and protection of state-listed and rare species is required by Army regulation, other management alternatives that would have afforded less protection to these species were not considered. A lower-intensity management approach to threatened and endangered species would include reducing or easing management for these species altogether. That management approach was rejected because it would not comply with the spirit of AR 200-1 or comply with the agreed-upon provisions of the Fort Hood ESMP and the 1 December 2010 biological opinion.

3.9.2 Karst Management

Fort Hood covers several karst fauna regions. Karst landscape identifies the caves, sinks, and the network of dendritic fissures and cracks that supply nutrients to and from the cave. The regions, as described earlier in this report, are defined on the basis of geologic and hydrologic continuity and the distribution of karst adapted and dependent species. Subregions are zones within karst fauna regions that have different faunal assemblages.

Karst fauna regions and subregions can be further divided into “karst fauna areas.” USFWS (1994) described the karst fauna area as “known to support one or more locations of the listed species [species of concern at Fort Hood] and is distinct in that it acts as a system that is separated from other karst fauna areas by geologic and hydrologic features and/or processes that create barriers to the movement of water, contaminants, and troglobitic fauna.” The purpose of the karst fauna areas in managing the species of concern is to establish areas such that if a catastrophic event that might kill species or destroy habitat occurs in one area, it will not affect species or habitat in other areas.

There are several threats to the species of concern on Fort Hood. Vegetation removal around and within 50 m of karst entrances and cave footprints are a threat to the integrity of the ecosystem because important microclimate variables are altered. Additionally, disturbances related to vegetation removal promote the colonization of red imported fire ants, an important predator of cavernicoles and cave crickets. Military vehicle maneuvers and bivouacs around entrances and over footprints promote soil disturbances around karst features. Loose soil, which is easily washed into karst features and plugs passages, alters critical hydrologic recharge and nutrient exchange between the karst feature and the surface. Anthropogenic disturbances such as vandalism, trash dumping, and unauthorized visits degrades and destroys karst ecosystems and the ecosystem processes. Most threats to cavernicole species are related to urban growth into the karst regions and the subsequent loss of habitat, as well as direct impact on the species. Generally, these threats or their potential is present to a lesser degree at Fort Hood than in urbanizing areas.

Fort Hood has prepared a Karst Management Plan designed to eliminate, mitigate, and prevent harm to the species of concern. By proposing a plan for all species of concern, not just those proposed for endangered listing, Fort Hood can take a broader and more effective ecosystem-based approach to species management, similar to habitat conservation plans. SOPs have been developed between Cultural Resources and Natural Resources Divisions to coordinate research at karst features.

3.9.2.1 Goals and Objectives

The goals and objectives established by Fort Hood to protect the karst habitats and the associated species of concern are provided in Table 3-10. Tasks listed in the table, along with continued implementation of the Karst Management Plan (KMP), constitutes a proactive role that could preclude listing of the species as threatened and/or endangered. Should listing occur, Fort Hood's proactive role will no doubt result in less intense restrictions (*i.e.* should not increase above current protection and management levels found in KMP). Additionally, most of Fort Hood's karst areas co-occur with endangered songbird habitat. As a result, many karst features receive "umbrella" protection and management via songbird habitat management, protection, and threshold reviews.

Table 3-10
Goals and Objectives for Karst Management

Goals	Objectives
Conserve rare and endemic invertebrates and salamanders and their habitat throughout the karst landscape of Fort Hood.	<p>Continue to identify, survey, study, and protect karst features with significant faunal assemblages</p> <p>Continue to monitor and protect the Rocket River Cave System in live fire</p> <p>Continue to assess, investigate, and excavate sinkholes for their potential to become caves and/or significant locations for cavernicoles</p> <p>Continue to monitor salamander cave and spring habitats for degradation and/or human and non-invasive species damage</p> <p>Continue to manage, update, and the limit the distribution of karst location and species composition databases and shapefiles.</p> <p>Continue to determine the appropriate size and shape of karst fauna areas targeted for management.</p>
Provide protection to targeted karst fauna areas. Specific protective measures include installing rock (physical) barriers, protecting the areas from vegetation clearing, implementing erosion control practices , and protecting cave watersheds.	<p>Identify training effects on karst areas and disseminate educational information to Soldiers and trainers to raise awareness, when appropriate.</p> <p>Limit use of chemicals at and near karst preserve locations.</p>

Control localized juniper growth and manage existing juniper as appropriate in karst fauna areas, as determined by NRMB staff.

Implement conservation measures and management of targeted karst fauna areas.

Continue ongoing research and conduct additional research about the life history of rare and endemic invertebrates and salamanders, as well as karst hydrology and geology.

Continue to survey, map, and sample the biota in known and newly discovered karst features in conjunction with the Karst Management Plan.

Protect the karst surface and subsurface watershed. The subsurface watershed is the dendritic network of cracks and fissure around a feature that direct nutrients and water underground.

Protect surface area and vegetation as appropriate to conserve cave cricket populations

Continue to study and monitor the cave microclimate of selected karst features

Continue to limit human visitation to researchers with appropriate karst competency skills

Continue to collaborate with Cultural Resources Management Branch (CRMB) staff to ensure conservation and protection of cultural sites and Traditional cultural properties, along with researcher access to such sites

Continue to coordinate with CRMB for excavation activities at karst sites

Continue bat cave conservation activities.

Continue to monitor and protect the maternal colony of cave myotis (*Myotis velifer*) on the western maneuver area.

Continue to monitor and manage bat caves in the live-fire area.

Continue to study cave bat use at rockshelters and other non-cave habitats.

	Continue consultation and collaboration with governmental and non-governmental cave and cave biota management organizations.
Control or eradicate fire ants near karst systems.	As funding permits, evaluate and prioritize a list of karst systems that require nonpesticidal (e.g., hot water or steam) fire ant control.
	Research and develop a monitoring plan for assessing the impact of fire ants on karst systems.

3.9.2.2 Monitoring

All karst fauna areas targeted for conservation should be monitored to determine the success or failure of the management actions implemented and to guard against irreversible declines in the species' status. The status of the species of concern, their karst fauna areas both above and below ground, and existing or potential threats to either should be monitored on a basis recommended by the USFWS. Monitoring criteria that are as quantitative as possible should be developed to minimize sampling or interpretational bias and to facilitate comparison between monitoring periods and other observations. The results of the monitoring should be assessed periodically to determine whether changes, additions, or deletions to the conservation program are needed.

Any monitoring program should take care not to adversely affect cave fauna. It is both impractical and probably harmful to do intensive, regular detailed monitoring of many of the small caves. Larger caves, where only selected areas are monitored, can be safely monitored two to four times a year.. Any cave in a potentially affected karst fauna area should be studied immediately after the event. Additional surveys should be conducted if there is evidence of an adverse impact on the karst ecosystem or, especially in the event of a spill of hazardous materials, several surveys should be conducted to determine whether pollution is occurring later. Caves should also be monitored if heavily affected by flooding or fires.

The Karst Management Plan provides detailed descriptions of the actions necessary to monitor the karst features of Fort Hood (Appendix K). The monitoring efforts identified in the Karst Management Plan include the following:

- Identifying karst fauna areas that meet the Karst Management Plan criteria
- Determining the appropriate size and shape of the karst fauna areas targeted for management
- Providing long-term protection to targeted karst fauna areas
- Implementing conservation measures and managing targeted karst fauna areas
- Conducting additional research
- Developing educational materials and programs
- Continuing monitoring

In addition to these monitoring efforts, the Karst Management Plan identifies monitoring efforts for karst features that contain species of concern (Appendix K). The complete details of these monitoring efforts are provided in the Karst Management Plan. The monitoring efforts for karst features with species of concern may include the following:

- Preserving the general ecology and water quality and quantity
- Protecting surface area for cave crickets
- Controlling or eradicating fire ants

- Installing cave gates to protect species of concern
- Limiting the use of chemicals at nearby locations
- Controlling new growth of juniper in karst fauna areas, as determined by NRMB
- Identifying species of concern present

3.9.2.3 Other Management Alternatives Considered

Species that are candidates for federal listing or are state-listed as threatened, endangered, or of special concern are not protected under the ESA. However, because candidate species might be listed in the future, installations are required to avoid taking actions that result in the need to list candidates as threatened or endangered and are encouraged to participate in conservation agreements with the USFWS. For state-listed species, installations are encouraged to cooperate with state authorities in efforts to conserve these species.

Because Army regulations require protection of state-listed and rare species, other management alternatives that would have afforded less protection to these species were not considered. A lower-intensity management approach to karst management would include reducing or ceasing management for these species and their habitat altogether. That management approach was rejected because it would not comply with the spirit proactive management to preclude listing.

3.10 FOREST/WOODLAND MANAGEMENT

Ecosystem management provides a framework for holistic management of the resource rather than focusing emphasis on a single aspect or activity, such as timber production or game species management. The forest/woodland management program at Fort Hood is aimed at sustaining the ecological integrity of the habitat. Fort Hood has no timber harvest program, and none is anticipated for the future. Using an ecosystem management approach, NRMB can provide for the following:

- Biodiversity of species and habitat
- Natural beauty
- Outdoor recreation opportunities
- Wildlife habitat, particularly endangered species habitat
- Soil conservation, erosion control, and watershed protection
- Air and water quality
- Sustained viability and diversity of military training lands

In 2009, Fort Hood's ITAM implemented a Woody Species Management (WSM) Program and a dismount thinning plan. WSM consists of removing Ashe Juniper, Mesquite, and selected hardwoods and dead vegetation. The areas for WSM are part of the western maneuver corridor and dismount infantry plans required to thin and remove selected woody species to enable heavy and infantry maneuver and open the land to provide realistic TADSS training. Areas are reseeded with a grassy mix, where needed, and when approved by DPW-NRMB. Work is normally done through the Training Out Area program

3.10.1 Goals and Objectives

The goal and objective for forest/woodland management at Fort Hood are provided in Table 3-11.

Table 3-11
Goals and Objectives for Forest/Woodland Management

Goals	Objectives
Protect and enhance forest/woodland composition and structure to support endangered species and other wildlife.	Evaluate potential negative impacts of oak wilt on woodlands. Implement control measures where and when necessary.

3.10.2 Monitoring

Forest and woodland management efforts are directed at protecting wildlife and endangered species habitat from *Ceratocystis fagacearum*, the fungus that causes oak wilt. The provisions prescribed by the 16 March 2005 BO (Appendix J) include monitoring the distribution and spread of oak wilt centers and using appropriate measures to limit effects on endangered species. Future control measures implemented to control oak wilt will be monitored to evaluate their efficacy in minimizing the impacts on surrounding trees, as well as the cost-effectiveness of implementing these measures installation-wide.

3.10.3 Other Management Alternatives Considered

More intensive management efforts were considered but rejected. Intensive forest management efforts are not necessary to promote conditions to maintain ecosystem integrity or to support or enhance training. More efforts to manage the forests and woodlands at Fort Hood would direct limited funds and resources away from programs requiring more intensive management.

3.11 AGRICULTURAL OUTLEASING (GRAZING)

The original landowners of what is now Fort Hood have been allowed to graze cattle through the outlease program. The Central Texas Cattlemen’s Association (CTCA) administers the leasing of the land by the cattlemen, and the leases run for a period of 5 years. Prior to the renewal of a lease, Fort Hood evaluates the conditions of the training lands to determine the level of grazing that can occur without degrading the training lands, impeding the military mission, and endangering the long-term sustainability of Fort Hood’s resources.

On 8 April 2005 the Department of the Army executed a new lease agreement with the CTCA for the purposes of grazing cattle on the training lands at Fort Hood. As part of the lease agreement, the cattlemen must abide by the provisions in the Land Use Regulations (LUR), included as Exhibit B in the Lease Agreement. The purpose of the LUR is to ensure that all grazing activities are conducted in a manner consistent with national policy intended to do the following:

- Provide for multiple uses of the premises (Fort Hood) for military purposes, wildlife habitat, public recreation, water conservation, and domestic livestock grazing
- Preserve, sustain, and enhance the natural resources of the premises (Fort Hood)

In 2010, a new 5-year lease agreement was recently signed in order to implement a grazing management plan which will allow for a sliding scale of the number of Aus based on yearly evaluations. Updated information on the new 5-year lease and subsequent documents and data will be available in the next INRMP.

3.11.1 Goals and Objectives

The primary goal of the grazing program at Fort Hood is to permit cattle grazing while ensuring the long-term sustainability of the training lands and unimpeded military training. The goals and objectives of the program are provided in Table 3-12.

Table 3-12
Goals and Objectives for Agricultural Outleasing (Grazing)

Goals	Objectives
Allow cattle grazing to the extent that impacts on training, training lands, and natural resources can be maintained at acceptable levels.	Implement the stocking rate formulas defined in the Supplemental Grazing Environmental Assessment and the approved grazing management plan.
Develop a long-term plan for grazing management.	Develop and implement a Grazing Management Plan. A copy of the GMP will be included as an appendix (Appendix L) to the INRMP upon completion.
Evaluate new methodologies for calculating cattle stocking rates	A predictive forage response model is currently in development by Texas A&M University's Ranching Systems Group that shows promise to assess and predict forage response and fire risk to emerging conditions. Use of this model, if validated and approved by the Department of the Army, is proposed by Texas A&M to be integrated with a multiple model system for assessing and predicting Fire behavior, erosion and forage to assist Fort Hood with land management decisions where cattle grazing coincides with the military training mission. While the model(s) shows merit, a key component of its validated accuracy will be the system's capability to assess and predict forage loss throughout the year due to Fort Hood's military training mission and fluctuating military traffic intensity.
Monitor lessee performance	Develop a lease surveillance plan to monitor the lessee's performance of work requirements. Design and implement enforceable provisions to ensure that the lessees comply with the stocking rates authorized by the lease.

3.11.2 Monitoring

Fort Hood is finalizing a Grazing Management Plan (GMP; to be included as Appendix L) that will integrate the management of cattle grazing with Fort Hood's mission and environmental stewardship responsibilities. Monitoring measures are being built into the GMP to ensure that grazing at current levels is not jeopardizing the long-term sustainability of the training lands, resulting in irreparable harm to the natural resources, including increased erosion rates, sedimentation in the water bodies, and changes in the character of the rangeland vegetation.

Previous monitoring efforts to evaluate compliance with lease provisions have had limited success. Containment of cattle to designated grazing/training areas is naturally difficult without fencing. A more robust monitoring program must be implemented to ensure compliance and to avoid degradation of the training lands. A lease surveillance plan detailing compliance and monitoring measures could be developed for incorporation into future lease agreements and land use regulations. The lease surveillance plan would identify the lease provisions to be monitored and the manner in which compliance or noncompliance will be determined, documented, and reported.

Measures that could be incorporated into the lease surveillance plan could include the following:

- Identification, counting, and reporting of cattle that interfere with or interrupt training exercises.
- Penalties for repeat offenders should be implemented and enforced.
- Random aerial surveys to monitor cattle locations and numbers. Surveys would be conducted concurrent with other aerial support operations.

The implementation of compliance monitoring could ensure the protection of Fort Hood's natural resources, minimize environmental damage and degradation, and protect endangered species habitat. Monitoring and compliance provisions could be incorporated into future grazing leases and land use regulations. Penalties for noncompliance could be established and incorporated into the LUR.

3.11.3 Other Management Alternatives Considered

Less intensive management alternatives were considered but rejected. Overuse by cattle in the past has resulted in degraded rangeland vegetative cover, severely eroded training lands, and numerous interruptions of training exercises. Applying a more liberal use of training lands for grazing could adversely affect the long-term sustainability of training lands and increase interruptions of training. Measures to protect the golden-cheeked warbler and black-capped vireo must be implemented to ensure compliance with the ESA and BO.

More intensive management alternatives were also considered but rejected. Fort Hood has had a long standing relationship with the local cattlemen and is committed to providing multiple uses of its resources. More conservation management alternatives are not necessary provided that overuse does not adversely affect the long-term sustainability of the training lands and that sediment loads to the water resources serving the surrounding communities do not degrade water quality, aquatic habitat, and water supply capacity.

3.12 Invasive Species Management

Executive Order 13112, *Invasive Species*, was signed in February 1999 to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts from such species. Invasive species are defined by EO 13112 as alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Per EO 13112, each federal agency whose actions might affect the status of invasive species must, to the extent practicable and permitted by law, use relevant programs and authorities to

- Prevent the introduction of invasive species
- Detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner
- Monitor invasive species populations accurately and reliably
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded
- Conduct research on invasive species and develop technologies to prevent their introduction and to provide for their environmentally sound control
- Promote public education on invasive species and the means to address them

The control of invasive species is a priority for the pest management staff, as well as the fish and wildlife biologists in the NRMB. Management actions for the pest management program, which includes invasive species, are provided in the 2002 Pest Management Plan.

3.12.1 Goals and Objectives

The goals and objectives for the prevention of new infestations and the control of existing infestations of

invasive species are provided in Table 3-13.

Table 3-13
Goals and Objectives for Invasive Species Management

Goals	Objectives
Prevent new infestations of invasive species.	Report new infestations of invasive weed species to natural resources personnel.
Prevent the introduction of invasive species.	Prohibit the planting of invasive species in ornamental landscaping, in wildlife supplemental food plots, and in revegetation projects per MOI, <i>Landscaping on Fort Hood</i> (10 May 2004).
Control invasive plant, insect, and mammal species to prevent degradation of training areas with respect to safety, training, and wildlife management.	Control invasive species on improved grounds using mechanical and biological control methods and approved chemical control methods when necessary.
	Control unwanted aquatic plants in managed fisheries ponds with mechanical (shoreline shaping), physical (water level fluctuations), and biological and chemical methods.
	To the extent deemed necessary by NRMB staff to protect other resources, control Ashe juniper by prescribed burning and mechanical methods.
	Use all practical means to control and prevent spread of feral hogs on the installation.
	Conduct research to evaluate new ways to control feral hog species.
	Continue to provide aerial support for feral hog control.
	Continue to document and map occurrences of key exotic/invasive species that are observed during survey efforts or incidentally encountered; use this information to schedule and prioritize management actions for such species.
Conduct restoration activities after invasive species control to repair areas vulnerable to erosion, and also to prevent other invasive plants from invading disturbed soil.	Reseed native grasses in bare soil resulting from mechanical control of invasive plants.

3.12.2 Monitoring

Monitoring for invasive species is integrated into the monitoring programs for other resources, such as terrestrial, aquatic, karst, and endangered species habitat; fish; and wildlife, as well as pest management.

3.12.3 Other Management Alternatives Considered

Two other management alternatives for invasive species management were considered: (1) lower- intensity management and (2) higher-intensity management. The invasive species management measures in use at Fort Hood are high intensity, primarily due to the aggressive management of woody species in the maneuver and live fire training

areas. Intensive invasive species management measures have resulted in increased usage of pesticides and herbicides, as well as hunting and trapping of feral animals. More aggressive efforts to eliminate exotic and invasive species might further reduce their populations in targeted areas, but the benefit would not offset the significant implementation costs. Therefore, higher-intensity management approaches were also dropped from further consideration.

3.13 PEST MANAGEMENT

Per AR 200-1, Environmental Protection and Enhancement, 13 December 2007, DODI 4150.07, DoD Pest Management Program, 29 May 2008., Fort Hood's Integrated Pest Management Plan (IPMP) defines and describes essential elements of the pest management program, such as health and environmental safety; pest identification; and pesticide storage, transportation, use, and disposal. The plan is used as a tool to reduce reliance on pesticides, to enhance environmental protection, and to maximize the use of Integrated Pest Management techniques. In addition, the plan provides guidance for the judicious use of both chemical and nonchemical control techniques to achieve effective pest management with minimal environmental contamination. Adherence to the plan ensures effective, economical, and environmentally acceptable pest management and compliance with pertinent laws and regulations.

3.13.1 Goals and Objectives

The goal of the pest management program is to protect human health and suppress or prevent damage to real estate and natural resources caused by pests. The objective of the pest management program is to use integrated pest management techniques to eliminate, suppress, or control pests using the judicious use of both chemical and nonchemical control techniques. Table 3-14 provides a list of the goals and objectives.

Table 3-14
Goals and Objectives for Pest Management

Goals	Objectives
Protect human health and suppress or prevent damage to real estate and natural resources caused by pests. Provide oversight of installation pest management IAW AR-200-1 and DODI 4150.07	Use integrated pest management techniques to eliminate, suppress, or control pests with the judicious use of both chemical and nonchemical control techniques. Assure compliance with federal and state laws and the IPMP.
Implement Integrated Pest Management practices.	Continue to provide pest monitoring. Provide outreach education in nonchemical and reduced chemical control methods. Encourage the creation of favorable yard habitats in Fort Hood family housing for beneficial insects and other wildlife. Provide education and implement control practices in outdoor areas near buildings that protect beneficial insects and other animals.
Reduce the quantity of toxic pesticide used on the installation and promote more effective pest control practices.	Evaluate the effectiveness of control programs. Implement new pesticide reduction methodologies and equipment initiatives. Investigate the safety and practicality of providing alternative housing for bats displaced from buildings by bat exclusion projects. Implement the placement of bat houses in locations coordinated with

	CRDAMC Environmental Health.
Implement pest preventive building construction and maintenance requirements.	Insure plans for building and renovation procedures contain pest preventive requirements.
Implement effective control and management procedures for urban wildlife that pose a risk to public health or damage to property.	Perform new construction and renovation projects inspections for pest preventive requirements. Provide trapping and removal of vertebrate animals that are inside or under buildings or in close proximity to the public in environmentally sensitive locations. Provide education for tolerance of and safety associated vertebrate animals that in locals close to the public. Assess the need for installation-wide surveys and mapping of Pest or invasive species.

3.13.2 Monitoring

The monitoring program for the pest management program is detailed in the Fort Hood IPMP.

3.13.3 Other Management Alternatives Considered

Two other management alternatives for pest management were considered: (1) lower- intensity management and (2) higher-intensity management. The pest management measures in use at Fort Hood, as described in the IPMP, are relatively low in intensity. Lowering that intensity further would not provide sufficient control of invasive species and nuisance animals, which would create a potential for those species to adversely affect Fort Hood and increase human health risks. More intensive pest management measures would result in increased usage of pesticides. This would be counterproductive and counter-directive to the Army's goal of reducing pesticide usage. More aggressive efforts to eliminate pests such exotic and invasive species might further reduce their populations in targeted areas, but the small incremental benefit would not offset the significant implementation costs. Therefore, higher-intensity management approaches were also dropped from further consideration.

3.14 OUTDOOR RECREATION

The Fort Hood Directorate of Morale, Welfare and Recreation (MWR) supports the largest active duty armored post in the United States, enhancing the quality of life by providing numerous recreation opportunities and services. As described in Section 2.1.12, Fort Hood offers a wide variety of outdoor recreational opportunities from horseback riding, swimming, camping, and mountain biking at BLORA to hunting, fishing, and trapping out in the training lands.

The Sportsmen's Center encourages interest in hunting, fishing, and other outdoor recreation activities and is devoted to the conservation and presentation of wildlife, their habitats, and the environment; the sports of hunting, fishing, and archery; and the recreational use of guns for skeet, trap, or other target shooting.

Fort Hood's NRMB provides support to the outdoor recreational program by protecting and enhancing the natural resources on which these recreational activities rely.

3.14.1 Goals and Objectives

NRMB's primary goal for supporting recreational opportunities is to ensure that the natural resources maintain their ecological integrity and that the recreational pursuits do not adversely affect endangered species (Table 3-15).

Table 3-15
Goals and Objectives for Outdoor Recreation

Goals	Objectives
Provide quality consumptive and non-consumptive recreational opportunities while avoiding impacts on training and maintaining a balanced and diverse ecosystem.	

3.14.2 Monitoring

Most of the monitoring done to support recreational opportunities like hunting, fishing, and trapping is discussed under Sections 3.9.1, *Fisheries Management*, and 3.9.2, *Wildlife Management*. Fort Hood conducted a 5-year study to evaluate the potential impacts of recreational mountain biking in BLORA on golden-cheeked warbler populations in the area (Pekins, 2002). The study concluded that mountain biking at current intensity levels did not have an apparent adverse impact on the species. Fort Hood will continue to monitor recreational activities in BLORA to ensure that these populations continue to remain unaffected.

3.14.3 Other Management Alternatives Considered

A higher-intensity management alternative that included more intensive measures to enhance recreational opportunities was considered but rejected. Most of these activities have been discussed in Sections 3.9.1.2 and 3.9.2.2, and they include more intensive measures to enhance fisheries and wildlife populations. As previously discussed, the most resource-efficient management approach is (1) to focus on maintaining and improving the ecological integrity of terrestrial and aquatic habitat and (2) to ensure that incremental increases in the intensity of management activities to enhance populations will not result in proportional incremental increases in recreational opportunities. Therefore, a higher-intensity management alternative would not be a prudent use of resources.

3.15 LAW ENFORCEMENT PROGRAM

Effective enforcement of laws and regulations applicable to natural resources enhances the overall natural resources program, protects the natural and cultural resources, and provides public safety by enforcing off-limit areas and providing protection from criminal destruction of natural resources (i.e., activities such as trespassing and poaching).

3.15.1 Goals and Objectives

The primary goal of law enforcement at Fort Hood is the enforcement of natural resources laws and regulations. The objectives that will be implemented to ensure that goal is achieved are presented in Table 3-16.

Table 3-16

Goals and Objectives for Law Enforcement

Goals	Objectives
Protect the natural resources of Fort Hood by enforcing laws and regulations.	<p>Ensure that all laws and regulations pertaining to natural resources at Fort Hood are in accord with the laws and regulations of the United States and the state of Texas.</p> <p>Adopt additional laws and regulations that adequately protect the natural resources of Fort Hood.</p> <p>Maintain staffing levels of trained and capable natural resource law enforcement personnel sufficient to effectively monitor and enforce all natural resource laws and regulations. Ensure that all natural resources law enforcement personnel meet the requirements for training and weapons qualification according to their experience and rank, and receive appropriate continuing education to enhance understanding of natural resources and ecosystem management.</p> <p>Enforce the natural resource laws and regulations of Fort Hood; conduct patrols adequate to cover the installation and prioritize them to ensure protection of sensitive resources; educate military personnel and the public about natural resource protection and how to report violations; file reports for all known violations and law enforcement actions.</p>

3.15.2 Monitoring

Federal and state natural resource laws should be reviewed regularly, and pertinent or applicable changes should be considered for incorporation into Fort Hood's regulations. In addition, incident reports should be reviewed to ensure that adequate actions have been taken in each instance and enforcement activities should be evaluated to determine their adequacy in protecting Fort Hood's natural resources.

All law enforcement personnel should have their training and qualifications periodically reviewed (e.g., annually or semiannually) to ensure that training and performance meet current requirements.

3.15.3 Other Management Alternatives Considered

Fort Hood is a large, open installation that demands intensive vigilance and patrol to ensure compliance with all laws, regulations, and policies. Current Natural Resource Law Enforcement staffing levels are minimally sufficient to provide adequate protection. Because a less-intensive management approach to law enforcement would not afford a sufficient level of protection and compliance, this approach was not considered.

3.16 ITLM PROGRAM

Fort Hood Command's vision for the long-term sustainability of Fort Hood involves maintaining training areas that fully support mission requirements and sustain their resources. To achieve the vision, Fort Hood formed an Integrated Training Land Management (ITLM) committee to prepare an LSMP. The purpose of the Fort Hood LSMP (Appendix A) is to implement an integrated land management and sustainment plan to guide the use, conservation, repair, protection, and long-term sustainment of Fort Hood training land resources. The plan should integrate DPW

(NRMB, Roads and Grounds, Master Planning, and Engineering), Directorate of Emergency Services (DES), and DPTMS (ITAM) to support training requirements, land stewardship education, trail repairs, prescribed burn plans, and training, as well as to incorporate environmental, cultural, and conservation management into the proactive sustainment of Fort Hood training land resources.

According to the LSMP, the primary training land issues that concern the long-term sustainability of training and natural resources at Fort Hood include the following (Fort Hood, 2011):

- Maintaining tank trail network for trafficability and erosion reduction
- Sustainment of Endangered Species while reducing training limitations
- Protection and mitigation of eligible cultural sites while reducing training limitations
- Maintaining and hardening stream crossings for trafficability and erosion reduction
- Maintaining and hardening of hilltop access trails for trafficability for erosion control
- Maintaining erosion control structure construction and maintenance for erosion control
- Maintaining and hardening of high use staging/assembly areas for trafficability and erosion reduction
- Refigure of Critical Area (unserviceable areas, and gully systems) Treatments to reduce erosion, improve maneuver and water quality
- Maintaining vegetation establishment and maintenance for training support and erosion control
- Maintaining woody species (brush) management (juniper and mesquite)
- Maintaining the Firebreak trails network and prescribed burn plans to support live fire training
- Maintaining RTLA and conservation monitoring for training land health assessments and to identify trends
- Maintaining Sustainable Range and Environmental Awareness education/training and maps
- Maintaining an Installation Maneuver Damage Program for soldier education and leadership emphasis
- Maintaining installation prescribed fire programs to manage woody vegetation and wild fires on the installation
- Repair damaged or unserviceable training land infrastructure to support training and conservation

3.16.1 TRAINING LAND CONDITIONS

ITAM RTLA conducts several training land condition assessments on the west side of the installation. Individual assessments are reported in the annual RTLA report. These assessments contribute to the Installation Status Report which identifies the general land condition using the “red, amber, green” scale for every training area annually. In FY 11, 78% of the training lands were “red” (i.e a significant impediment to maneuverability caused by vegetation or terrain, and/or realistic TADSS training caused by vegetation). Insufficient funds, increased training requirements, backlogged land repairs, and new land damaged during training continue to degrade training land capabilities and conditions. Actions are needed to improve the installation land conditions to amber or green (i.e., > 85% of the training area is maneuverable and free of constraints to TADSS), which would greatly enhance Fort Hood’s capabilities to conduct realistic training.

The majority of land repair and sustainment work is programmed to occur under the Training Out Area Program. The intent of that program is to repair lands to improve readiness training, reduce erosion, promote vegetation growth, enhance training access, and shape unserviceable areas into usable areas that can sustain the training landscape. To balance training requirements and land repairs, the Western Training Lands have been divided into six sections, and each Out Area becomes the primary land repair area for the installation for a year. Training is deferred during the year an area is out to restore vegetation and ground cover. With six out areas, each area is normally visited for repairs every 6 years. Priority land repair work can be required outside the Out Area Program. Figure 3-2 illustrates the Out Areas for 2011-2013. Land Group 5 is anticipated to be the out-area for 2013-2014, and Land Group 6 in 2015-2016.

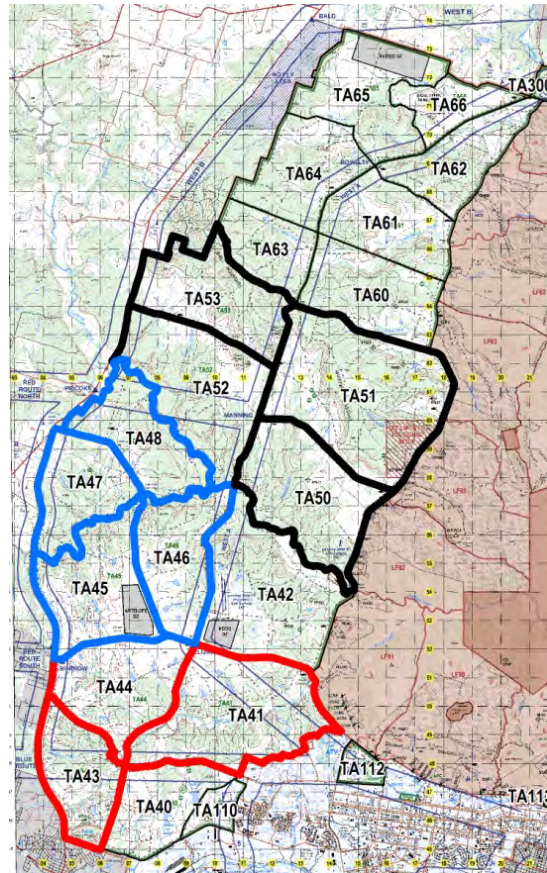
Funding drives the extent and volume of land repairs done to each out area. This is where repair work by DPW (NRMB, Engineering, and Roads and Grounds) and DPTMS (ITAM) troop construction is integrated to maximize funding and land resource repairs. Teamwork and the coordination of work reduce redundant work efforts and paperwork while making the most of the resources available to sustain the training lands.

Implementation of the management actions in the LSMP is divided into three categories: (1) short-range (through FY 2017), (2) mid-range (FY 2018-2021) and (3) long-range (FY 2022-2027). The goal of the short-range LSMP is to repair and enhance land resources and use conservation BMPs to sustain training.

The mid-range and long-range LSMP will continue to sustain training requirements and the installation landscape from FY 2018 through FY 2027. Management initiatives slated for implementation from FY 2013 through FY 2027 to ensure the long-term sustainability of Fort Hood training lands include the following:

- Mitigation of cultural resource sites. Cultural resource sites inside the training lanes are protected and are worked only when the land is in the Training Out Area Program. Mitigation continues to maximize site recovery and removal from the eligible inventory.
- Public outreach programs to educate concerned citizens. Primary outreach topics include:
 - Releasing studies that show no munitions are migrating from Fort Hood
 - Removing sediment from the mouth of Belton Lake to restore reservoir capacity
 - Removing sediment from erosion dams to prolong their lifespan to support water quality and quantity for drinking water
 - Protecting compatible land uses on adjacent lands to support Full Spectrum Operations (FSO) requirements, reducing mission restrictions associated with endangered species habitats in maneuver and live-fire training lands, and lessening the effects of noise and dust on the public
- Use of conservation and ITAM resources to repair new maneuver land damage, minimize erosion, and reduce the repair backlog.
- Use of lead-free ammunition (when available) in live-fire training and use of simulators by training units during 50 percent of the yearly OPTEMPO.
- Scrap metal and target residues on ranges are worked as needed to prevent a stockpile of residue sites.
- Maintenance of trail networks to enhance training land capabilities and reduce erosion.
- Environmental stewardship of military lands and stewardship and awareness education. DPW integrates sustainable range awareness into environmental courses and classes. Environmental awareness and land stewardship education courses will be made available for Soldiers, leaders, units, and senior commanders.
- Contaminated water and soils will be collected, processed and recycled back into the landscape.

Figure 3-2 Training Out Area Program, FY 2011-2013



BLUE: Current through May 2012
RED: October 2011 through December 2012
BLACK: April 2012 through July 2013

SECTION 4.0: IMPLEMENTATION

4.1 ACHIEVING NO NET LOSS TO THE MILITARY MISSION

Section 101(b)(1)(I) of the Sikes Act states that each INRMP must, to the extent appropriate and applicable, and consistent with the use of the installation to ensure the preparedness of the Armed Forces, provide for “no net loss in the capability of military installation lands to support the military mission of the installation.”

DoD policy stipulates that appropriate management objectives to protect the mission capabilities of installation lands (from which annual projects are developed) should be clearly articulated in the planning process and should be high in INRMP resourcing priorities. The effectiveness of the INRMP in preventing “net loss” must be evaluated annually. Mission requirements and priorities identified in the INRMP must, where applicable, be integrated into other environmental programs and policies. It is not the intent that natural resources are to be consumed by mission requirements, but sustained for the use of mission requirements. To achieve this, environmental programs and policies must have the goal of sustaining the environment for the purpose of the mission.

There may be, however, instances in which a “net loss” is unavoidable because of the need to fulfill regulatory requirements other than the Sikes Act Improvement Act, such as complying with a Biological Opinion under the provisions of the Endangered Species Act (ESA).

No net loss in the capability of Fort Hood training lands to support the military mission is expected as a result of implementation of this INRMP.

4.2 SUPPORTING SUSTAINABILITY OF THE MILITARY MISSION

As stated in Section 1.2, the goal of the Fort Hood INRMP is to ensure that the natural resources located on the training lands are managed in such a way as to provide the optimum environment that sustains the military mission and provides the conditions required for sustainable training. The management measures in this INRMP have been developed to successfully achieve the stated objectives necessary to meet this goal.

The overlap of similar management measures for different resource areas is indicative of the relationship that various components of an ecosystem have with one another. The need for integrated natural resources management is evident from the complexity of these relationships. For example, a significant portion of the training lands are forests, woodlands, or grasslands. Forests and woodlands support the military mission by providing cover and the grasslands provide the open maneuver areas necessary for mechanized training, as well as the location of LZs and DZs. In addition to being essential for the military mission, the condition of the forests and grasslands directly influences the quality of wildlife habitat and, therefore, the condition and diversity of wildlife inhabiting Fort Hood. The condition of the vegetated watersheds also directly influences water quality, the condition of the fisheries, and sensitive habitats like the wetlands. These habitats are necessary to maintain or to increase the biodiversity at Fort Hood.

Managing forests, woodlands, and grasslands using an ecosystem approach will maintain, protect, and enhance natural resources. Furthermore, results from screening-level watershed and habitat assessments serve as indicators of the overall condition of natural resources. Degraded watershed and habitat conditions will result in loss of ecological integrity and biodiversity. Soil stabilization and revegetation projects conducted by the NRMB and ITAM programs ultimately improve the habitat conditions on a small scale and watershed conditions on a larger scale. The effects from these types of improvements reach beyond the particular area in which they are performed. Soil stabilization and revegetation stops erosion, decreases sediment loads to streams, lakes, ponds and wetlands and ultimately improves the habitat for the biological communities, including fish, inhabiting those water bodies. Soil stabilization and revegetation creates or improves habitat conditions for terrestrial wildlife species, and also supports tactical training.

4.2.1 Impacts to the Military Mission and Sustainable Land Use

At Fort Hood, as at many U.S. military installations, security considerations and the need for safety buffer zones have limited access and created islands of biodiversity amid seas of ever-expanding residential and industrial development (TNC, 2005). This development encroaches on both the military mission and the biodiversity that the installations harbor. To address the problem of incompatible development or “encroachment,” Congress authorized DoD to partner with “eligible entities” (EEs) to create “buffers” in the vicinity of bases (section 2811 of the FY 2003 National Defense Authorization Act). The program is named the Readiness and Environmental Protection Initiative (REPI), but the Department of the Army refers to it as the Army Compatible Use Buffer (ACUB) program. Fort Hood is actively engaged in the ACUB program to evaluate the feasibility of acquiring conservation easements, purchase of development rights (PDR), or other long-term agreements on surrounding lands that will both provide an effective buffer to encroachment on the military training mission and have a high conservation value. In FY 2011, Fort Hood requested a total of nearly \$5.2M in REPI funds to support the purchase of conservation easements on several parcels

of land along the installation boundary, as well as submitted a new ACUB proposal to the Army Chief of Staff for Installation Management (ACSIM), and added Compatible Lands Foundation as a new partner.

The military training mission at Fort Hood is impeded by several forms of encroachment, which DoD defines as “the cumulative result of any and all outside influences that inhibit necessary training and testing.” The forms of encroachment affecting the mission at Fort Hood include regulatory encroachment, urban development, and the intrusion of livestock during live-fire exercises (TNC, 2005).

Regulatory encroachment involves the restrictions on training and the effort expended to comply with the provisions described in the ESMP and the BO for management of habitat for the black-capped vireo and the golden-cheeked warbler. However, recent revisions to the ESMP, which were approved by the March 2005 BO and implemented in the 1 December 2010 BO, permit the lifting of training restrictions associated with the change in endangered species habitat designation from core to non-core habitat in specific areas. There are no training restrictions in non-core endangered species habitat.

Like most military installations, Fort Hood is surrounded by increasing urban and suburban development. As such development occurs, there is increasing potential for conflict between urban residents or business interests and certain aspects of military training, which are not confined to Army property. For example, noise and smoke produced on Fort Hood might be detected in adjacent urban settings and deemed undesirable there.

Training stops when livestock wander into ranges and live-fire areas during live-fire exercises. Fencing training areas to prevent livestock from entering these areas would restrict military training even more than cattle and therefore is not an option. Actions being taken to manage livestock grazing to levels that minimally impede military training should reduce interruptions in training. In addition, limitations on the level of grazing permitted on the installation could be expected to improve training land conditions, thereby increasing training opportunities.

4.3 FISH AND WILDLIFE CONSULTATION REQUIREMENTS

The Office of the Undersecretary of Defense (OUSD) has issued guidance for implementing the Sikes Act Improvement Act (SAIA), including requirements to consult with the USFWS and state fish and wildlife agencies (DoD, 2005). That guidance is summarized below.

Section 101(a)(2) of the Sikes Act states that the INRMP must be prepared “in cooperation with” and reflect the “mutual agreement” of the USFWS and state fish and wildlife agency “concerning conservation, protection, and management of fish and wildlife resources.” The “old” Sikes Act §101(a)(1) “authorized,” but did not require, the Secretary of Defense to develop cooperative plans “mutually agreed upon” by the three parties. The new Sikes Act Improvement Act (SAIA) “requires” the Secretary of the Army to prepare INRMPs in cooperation with the other two parties and requires that the plans reflect “mutual agreement of the parties concerning the conservation, protection, and management of fish and wildlife resources” (DoD, 2005).

The new §101(a) language achieves a number of important objectives, including that mutual agreement should be the goal with respect to the entire plan. However, mutual agreement is required only with respect to those elements of the plan that are subject to the otherwise applicable legal authority (i.e., authority derived from a source other than the Sikes Act, such as the ESA) of the USFWS and state fish and wildlife agencies to conserve, protect, and manage fish and wildlife resources. Nothing in the SAIA is intended to either enlarge or diminish the existing responsibility and authority of the USFWS or state fish and wildlife agencies concerning natural resources management on military lands. Although it is not expected to occur often, where the USFWS or a state fish and wildlife agency withholds its agreement with an INRMP on the basis of objections to elements of the INRMP clearly not within the scope of the

particular agency's authority, an installation may, notwithstanding the objections, finalize the INRMP and proceed to manage its natural resources in accordance with the terms of the plan.

Endangered Species Act Consultation. The Sikes Act has no requirements regarding the necessity for ESA consultation on INRMPs. DoD policy stipulates that in most cases INRMPs will incorporate by reference the results of an installation's previous species-by-species ESA consultations, including any reasonable and prudent measures that might have been identified in an incidental take statement. Consequently, neither a separate biological assessment nor a separate formal consultation should be necessary concerning most INRMPs or INRMP revisions. Nonetheless, because the INRMP might include management strategies or other actions designed to balance the potentially competing needs of multiple species, listed or not, it could be prudent to engage in informal consultation with the USFWS during the INRMP revision process to confirm that such proposed actions will not affect listed species or designated critical habitat. If the INRMP does include management strategies or other actions that might affect listed species or designated critical habitat and these actions have not been the subject of previous consultations, Section 7 consultation on these actions will be necessary before they may be implemented.

DoD Policy on Specific Coordination Requirements. In accordance with DoD policy guidance (DoD, 2005) each installation must do the following:

- Establish and maintain regular communication with the appropriate USFWS and state fish and wildlife agency offices to address issues concerning natural resources management that are not addressed in the INRMP. At a minimum, this communication must include annual coordination with all cooperating offices.
- Invite the USFWS and state fish and wildlife agency to participate cooperatively in the scoping, design, and preparation of the INRMP. Doing so will inform these offices about the DoD mission, invite them to consider solutions to difficult resource management problems, and expedite final INRMP coordination.
- Advise all appropriate internal and external stakeholders of the intent to prepare or revise an INRMP within 30 days of starting such an action. When providing this notification to USFWS and state fish and wildlife agencies, each DoD installation must concurrently request the USFWS and state fish and wildlife agencies to participate in the development or revision of the INRMP.
- Notify appropriate USFWS and state fish and wildlife offices of its intent to provide a draft INRMP for review and coordination at least 60 days before delivering the document.

For the USFWS, the appropriate office for initial contact by installations for the development and review of INRMPs is a field office. Pursuant to current USFWS Sikes Act guidance, a field office must review the INRMP and provide preliminary agreement concerning the conservation, protection, and management of fish and wildlife resources detailed in the INRMP prior to review in the regional office and final action by a Regional Director.

4.4 GIS MANAGEMENT, DATA INTEGRATION, ACCESS AND REPORTING

Efficient data collection, storage, management, and analysis are essential for conducting a comprehensive natural resource management program, especially at Fort Hood given the size of the installation and the scope of activities. A geographic information system (GIS) is a particularly useful tool for evaluating the relationship between various natural resource management activities and the military mission. Global Positioning System (GPS) technology allows the field staff to accurately map geographic features and to delineate various habitats in the field or to mark the exact location of a resource, such as a cave opening.

GIS databases and map coverages can serve as a powerful management tool for facilitating the integration and implementation of the resource-specific management measures presented in this INRMP. An overlay of the coverages for the natural and cultural resource areas can graphically illustrate the complexity of the environment and provide the means to readily identify and resolve potential conflicts between natural resource issues and mission requirements.

4.5 TRAINING OF NATURAL RESOURCE PERSONNEL

NRMB will send at least one person to each of the following annual workshops or professional conferences as appropriate (dependent on availability of funding):

- International Erosion Control Association
- National Military Fish and Wildlife Association annual workshop
- American Society of Agronomists annual meeting
- North American Natural Resources Conference
- Southeastern Association of Fish and Wildlife Agencies
- TSS Workshop
- The Wildlife Society Conference
- ArcView Users Conference
- American Fisheries Society Annual Workshop
- Society for Range Management
- Speleology conferences and workshops
- Bat/mammalogy conferences and workshops
- Land Trust Alliance conference
- Ornithological conferences and workshops

Other conferences and workshops will be evaluated for their usefulness, and decisions will be made based on the relevance to ongoing projects and funding availability. Meetings that are especially useful include ornithological workshops, remote sensing training, GIS basic and advanced training, turkey symposia, white-tailed deer symposia, Watchable Wildlife workshops, wetlands training, and endangered species training.

Personnel will be trained in related environmental fields. NEPA training will be required of all supervisory personnel, as well as others who review or prepare NEPA documents.

4.6 ORGANIZATIONAL ENHANCEMENT, ROLES, AND RESPONSIBILITIES

The ecosystem approach described in this INRMP to manage the natural resources of Fort Hood can be implemented by the installation's existing organization. The NRMB has the primary role and responsibility for the implementation of this INRMP, which addresses the period from FY 2013 through FY 2017. An annual review is required to track any changes and evaluate effectiveness with the USFWS and appropriate state agencies. Each INRMP must be reviewed for operation and effect at least every 5 years. If found current, a new INRMP is not required. No changes of organization are expected, or necessary, to implement this INRMP.

4.6.1 Staffing

Fort Hood has the core staff of professionally trained natural resources management personnel necessary to implement this INRMP. As mentioned in Section 1.3.7, Fort Hood NRMB has received assistance through a cooperative agreement with TNC in the past. However, as of August, 2011, the University of Illinois (U of I) replaced TNC at Fort Hood. The personnel that currently constitute the natural resources management staff at Fort Hood, including contract personnel, are listed in Table 4-1.

Additional sources of temporary labor, hired with term limitations, include seasonal employees (NRMB and U of I), university hires, and outside agency reimbursable hires. However, the natural resources management professionals currently in-house provide the foundation and fulfill the managerial roles necessary to continue the successful natural resources program at Fort Hood.

Table 4-1
Fort Hood Natural Resources Management Staff

Permanent, Full-Time Personnel	
Number	Position
Fort Hood NRMB Staff	
1	Supervisory Natural Resource Specialist(Army civilian)
2	Supervisory Wildlife Biologist (Army civilian)
1	Agronomist (Army civilian)
2	Wildlife Biologist (Army civilian)
7	Natural Resource Specialist (Army civilian)
2	Entomologist (Army civilian)
4	Bio Science Specialist (Army civilian)
1	Geographer (Army civilian)
1	Outreach Coordinator (Army civilian)
1	Management Assistant (Army civilian)
2	Heavy Equipment Operators
U of I Staff	
1	Field Biologist - warbler
1	Field Biologist - vireo
4	Prescribed Fire Specialist -seasonal
26	Endangered Species seasonal biologists
1	Administrative Assistant

4.6.2 Outside Assistance

Implementation of a number of the projects discussed in this INRMP will require active outside assistance. This assistance, which is described as needed in Section 1.0, will come from state and federal agencies, private consortiums and organizations, universities, and contractors. Using these resources can be the most efficient and cost-effective

method for acquiring expertise on a temporary basis, when Army personnel are not available. Some of the parties will be reimbursed for their assistance, as agreed upon in Memoranda of Understanding (MOUs) and contractual agreements, whereas others will supply their assistance in accordance with cooperative agreements.

4.7 ANNUAL REVIEW AND MANAGEMENT PERFORMANCE EVALUATION

Section 101(b)(2) of the Sikes Act [16 U.S.C. 670a(b)(2)] states that each INRMP “must be reviewed as to operation and effect by the parties thereto on a regular basis, but not less often than every 5 years.” Per DoD policy, the requirement to “review” the INRMPs regularly does not mean that every INRMP necessarily needs to be revised. The Sikes Act specifically directs that the INRMPs be reviewed “as to operation and effect,” emphasizing that the review is intended to determine whether existing INRMPs are being implemented to meet the requirements of the Sikes Act and contribute to the conservation and rehabilitation of natural resources on military installations (DoD, 2005).

DoD policy requires installations to review INRMPs annually in cooperation with the other parties to the INRMP. Annual reviews facilitate “adaptive management” by providing an opportunity for the parties to review the goals and objectives of the plan, as well as to establish a realistic schedule for undertaking proposed actions (DoD, 2005).

Installations will likely find it useful to memorialize these less formal reviews through an exchange of letters or a jointly executed memorandum. These documented annual (or otherwise) reviews might be useful in developing the *ex parte* reports required by Section 101(f) of the Sikes Act. They might also expedite—or, in appropriate cases, substitute for—the more formal 5-year reviews, provided the “regular” reviews are reasonably comprehensive and the written documentation evidences the parties’ mutual agreement.

SECTION 5.0: ENVIRONMENTAL CONSEQUENCES

A Finding of No Significant Impact (FNSI) is recommended for the INRMP. No additional NEPA documentation is anticipated.

As discussed in Section 1.9.5, *Description of the Proposed Action and Alternatives*, the EA addresses two alternatives—the proposed action and the no action alternative. Other management alternatives were considered during the screening process but eliminated because they were economically infeasible, ecologically unsound, or incompatible with the requirements of the military mission. Section 3.0, *Future Management*, provides a description of the goals and objectives used to develop management prescriptions and the rationale for why certain management measures were selected. Therefore, the analytical framework supporting each resource area is not repeated in this section. This approach supports Army guidance for concurrent preparation and integration of the INRMP and National Environmental Policy Act (NEPA) documentation.

As discussed in Section 1.9.5, the Fort Hood INRMP is a “living” document that focuses on a 5-year planning period based on past and present actions. Short-term management practices included in the plan have been developed without compromising long-range goals and objectives. Because the plan will be modified over time, additional environmental analyses might be required as new management measures are developed over the long term (i.e., beyond 5 years).

5.1 NO ACTION ALTERNATIVE

Adoption of the no action alternative would mean that Fort Hood’s INRMP update (this INRMP) would not be implemented and current natural resource management practices at Fort Hood would continue “as is.” Existing conditions and management practices presented in Section 2.0, *Current Conditions and Use*, would continue and no new initiatives would be established.

Potential consequences associated with the no action alternative are discussed in this section for each resource area described in Section 2.0, *Current Conditions and Use*. Section 5.4 summarizes the analysis of potential consequences for the no action alternative and compares them to the proposed action. As shown, no significant or adverse effects would be expected. Under the no action alternative, the environmental conditions at Fort Hood would not benefit from the management measures associated with implementing the proposed INRMP.

Expected consequences of the no action alternative for each resource area are presented in the following paragraphs.

Land Use. Moderate adverse effects would be expected. Without pursuit of the ACUB program as proposed in the INRMP, urban sprawl could be expected to continue along Fort Hood’s borders resulting in further encroachments on the military mission.

Soils. Moderate adverse effects would be expected. The current INRMP does not include a comprehensive soil resource management program that minimizes and, when necessary, mitigates erosion and sedimentation at Fort Hood. The ITAM program would continue to identify and repair sites where erosion has been determined to be a problem; however, potential adverse effects from overuse of the training areas by cattle would not be adequate to address the current erosion rates.

Water Resources. Moderate adverse effects would be expected. The current INRMP does not establish a formal plan of action for monitoring and protecting the water resources, nor does it include watershed protection measures, nonpoint source pollution controls, and a comprehensive monitoring program designed to identify water quality problems at their onset.

Wetlands. Moderate adverse effects would be expected. The no action alternative does not provide a formal plan for identifying, evaluating, and monitoring wetland habitat conditions, nor does it establish formal protection measures to prevent or minimize impacts that could result from training and other mission-related activities. In addition, the no action alternative does not include the implementation of comprehensive soil resource monitoring, conservation measures, or a plan of action to minimize existing, or prevent future, soil erosion and sedimentation problems affecting wetlands on Fort Hood. Lack of a comprehensive soil conservation and management plan could result in adverse impacts on wetlands. Also, the no action alternative does not establish limited-use wetland buffers to protect water quality by reducing nonpoint source impacts associated with runoff and adjacent land uses.

Aquatic Habitat. Moderate adverse effects would be expected. Because Fort Hood has undertaken needed planning efforts (i.e., efforts prior to the implementation of the INRMP, such as road upgrades, gully plugs, and other efforts conducted through programs like the LSMP) that indirectly might have mitigated future significant adverse impacts, the effects of the no action alternative might now be characterized as moderate. However, the no action alternative does not provide for the implementation of routine habitat assessments and monitoring programs. Implementation of such programs not only would provide a method for protecting these habitats but also would provide a baseline of data that could be used to prioritize projects and identify the most efficient allocation of resources. In addition, the no action alternative does not establish management measures to further protect and enhance these habitats by preventing or minimizing potential impacts such as sedimentation. Sedimentation of the surface waters on Fort Hood limits and in some cases might eliminate viable fish spawning areas. Furthermore, adverse effects on the aquatic habitat in the lakes would continue under the no action alternative. Currently, there are no actions or controls in place to monitor aquatic vegetation and invasive aquatic species. Without these controls, uncontrolled aquatic vegetation growth could limit the potential of the recreational fisheries and decrease the overall ecological condition of the aquatic environments of Fort Hood.

Terrestrial Habitat. Moderate adverse impacts would be expected. Under the no action alternative, there would be no formal plan of action to improve and maintain terrestrial habitat conditions and diversity, resulting in a continued challenge for Fort Hood to maintain or improve overall biodiversity. The no action alternative would result in habitats that are not desirable for military training. Furthermore, under the no action alternative, there would be no coordinated effort or plan to create or maintain the quality of habitat attractive to or required by a diverse population of wildlife. Under the no action alternative, the health and condition of the plant communities on Fort Hood would not be improved.

The current collection of management practices would not be expected to cause significant impacts on floral species because it involves no change in current activities. Recent trends in the reduction of unique native warm season grasses due to successional pressures would continue. These successional pressures have been impeded by current management practices (e.g., prescribed burning); however, increases in woody growth coverage and edge encroachment would continue to occur. Thus, thick stands of Ashe juniper would continue to overtake open areas. The decline in habitat quality and complexity would continue to adversely affect biodiversity. The spread of exotic weeds on Fort Hood is a recognized problem, and exotic species have been recorded as part of the basic inventory work. The status quo alternative has few aggressive measures to remove or prevent the spread of exotic species, and compliance monitoring is not designed to determine the effectiveness of management practices. The current reactive approach to vegetation management has allowed several exotic species to become established, and more exotics would be expected to become established and degrade the natural biodiversity in the future under this alternative.

Fish and Wildlife. No effects would be expected. Current resource management measures would be expected to continue to maintain and potentially increase the abundance and biodiversity of wildlife, protect and enhance wildlife habitats (aquatic, riparian, wetland, and terrestrial), and increase the quality and complexity of the habitat.

Endangered, Threatened, and Rare Species. No effects would be expected. The current management of federally listed endangered species would continue in accordance with the Fort Hood ESMP and the 1 December 2010 Biological Opinion issued by USFWS.

Cultural Resources. Long-term minor adverse effects on cultural resources would be expected from the no action alternative and a continuation of existing management strategies and environmental circumstances. Potential adverse impacts on cultural resources in the training areas at Fort Hood are comparable to those at military installations with substantial training missions and might result from maneuver damage from tracked vehicles and wheeled vehicles, vandalism or looting of historic structures or archaeological sites, earth-moving activities, explosive ordinance, and natural processes of erosion that might be exacerbated by the activities described above. Cultural resources would continue to be administered by the Cultural Resource Manager, as outlined in the Integrated Cultural Resources Management Plan (ICRMP), but the no action alternative could result in a lesser degree of integration of cultural resource concerns, information exchange, and cultural resource goals with those of the Natural Resources program, including integration of relevant planning processes for forthcoming and continuing projects. This could result in disturbance of significant cultural resources, such as archaeology sites. A joint effort on the part of many Fort Hood Directorates and their divisions has been and is required to sustain the environmental conditions necessary for the readiness training of Soldiers in a realistic setting, while at the same time protecting the ecological and biological integrity of the natural setting and the integrity of the cultural resources within the boundaries of the installation.

In summary, analysis of the existing (baseline) conditions identifies no serious environmental concerns. In addition, AR 200-1 requires installations to conduct a major revision of “all parts” of their INRMPs every 5 years. An annual review has been required to track any changes and evaluate effectiveness with the USFWS and appropriate state agencies. Each INRMP must be reviewed for operation and effect at least every 5 years. Therefore, implementation of the no action alternative is not favored.

5.2 PROPOSED ACTION (PREFERRED ALTERNATIVE)

The potential consequences associated with the proposed action are discussed in this section for each resource area described in Section 3.0. Section 5.5 summarizes the potential consequences of the proposed action and compares them with the consequences of the no action alternative (baseline or existing conditions). Implementing the INRMP would result in no effects or beneficial effects on the resource areas. Compared to the no action alternative, environmental conditions at Fort Hood would improve as a result of implementing the proposed INRMP. Therefore, the proposed action is the preferred alternative.

Expected consequences of the preferred alternative for each resource area are presented in the following paragraphs.

Land Use. Beneficial effects would be expected. Under the proposed action, Fort Hood would continue to pursue and implement an effective ACUB, which would limit urban sprawl and reduce potential encroachments on the military mission.

Soils. Beneficial effects would be expected. By implementing the comprehensive soil resource management program, impacts on soils associated with erosion and sedimentation on Fort Hood would be minimized. As part of the proposed action, existing sites where erosion has been determined to be a problem would be addressed through the LSMP and the Training Out Area Program. In addition, monitoring soil conditions to identify potential problem areas, implementing conservation measures, improving the type and area of vegetative cover, managing cattle grazing, and, when possible, avoiding activities likely to result in erosion would minimize potential impacts on the soil resource and result in a reduction in erosion at Fort Hood.

Water Resources. Beneficial effects would be expected. Implementing a comprehensive sampling and assessment plan and developing a database would allow Fort Hood to readily track the status and trends of water and habitat quality in the training areas and provide a methodology for evaluating the effectiveness of best management practices (BMPs). The proposed action also facilitates the identification of problem areas with high erosion and sedimentation and establishes protective riparian buffer zones to prevent degradation of water resources and aquatic habitats.

Wetlands. Beneficial effects would be expected. Implementation of the proposed action would protect wetlands by providing a basis to evaluate and monitor habitat conditions through the development of a wetland database and management plan for Fort Hood. Establishing buffers would minimize potential impacts on wetlands associated with adjacent activities. Additional efforts would be made to reduce impacts on wetlands by planning mission activities, when possible, in a manner consistent with wetland protection objectives. Where current activities might be affecting wetland functions, efforts would be made to identify the types and sources of impacts; where applicable, restoration of affected habitats would be implemented.

Aquatic Habitat. Beneficial effects would be expected. The assessment of aquatic habitats at Fort Hood would provide a basis for developing a management program that would both protect and enhance these habitats on the installation. Assessment of aquatic habitats would also provide a baseline that could be used in tracking the conditions and trends of these habitats, which would allow management practices to be applied where and when needed. The establishment of riparian buffers around surface water bodies at Fort Hood would provide protection to habitats both in and adjacent to the resource. Where impacts on aquatic habitats occur as a result of mission activities, management objectives would provide for the timely mitigation of the impacts. Beneficial effects could be expected as a result of the development of a plan to monitor and control aquatic vegetation before it becomes a significant problem.

Terrestrial Ecosystems. Beneficial effects would be expected. From the perspective of habitat, implementation of the proposed action would result in improved terrestrial habitat conditions for wildlife because maintaining a high level of habitat diversity is a priority of the INRMP. Implementation of the proposed action would result in improved habitat conditions, expansion of unique native warm season species, and control of nonnative invasive species at Fort Hood.

Fish and Wildlife. All the projects composing the proposed action are designed to mimic or enhance natural processes and would be expected to enhance fish and wildlife resources in general. There is a high potential for beneficial results from these management activities. The proposed action would provide management of fish and wildlife resources at Fort Hood on an integrated basis. The INRMP uses an ecosystem management strategy to achieve biological diversity while emphasizing the use of native species for restoration activities. The programs incorporated into various management plans under this INRMP include protection from wildfires, monitoring of a variety of plants and animals, and minimization and repair of damage to habitats from training activities.

Vegetation Management. Moderate adverse impacts to wildlife and vegetation would be anticipated as the result of the Woody Species Management Program implemented by ITAM. However, implementation of the proposed action, which limits construction during the Endangered Species and Migratory Bird nesting seasons, would minimize adverse effects to these species. Loss of vegetation would be a temporary adverse effect, as vegetation re-growth will most likely occur.

Endangered, Threatened, and Rare Species. Beneficial effects on all federally listed endangered species at Fort Hood would be expected. Current natural resource management practices do, however, meet the minimum requirements of the ESA and limit incidental take of endangered species and their habitat to the minimum necessary to implement projects on the installation and consider the loss of habitat due to wildfire. Implementation of the proposed action would provide additional and expanded protection and management for these species. Furthermore, these species would be treated with added importance and valued for their contributions to the unique natural heritage of Fort Hood.

An emphasis on mechanical, cultural, and biological techniques would reduce the overall probability that threatened or endangered species are harmed, directly or indirectly, by invasive exotic species. Use of the pest management techniques outlined in the integrated pest management guidance would be expected to protect sensitive species in and around specific project sites. No pest management operation that has the potential to adversely affect endangered or protected species or their habitats would be conducted without prior coordination with the USFWS. Actions for natural resource management under this alternative would be more proactive than reactive and would be expected to allow fewer impacts than the other alternatives.

Cultural Resources. Beneficial effects on the cultural resources at Fort Hood would be expected. The primary concern regarding resources pertains to protecting prehistoric and historic sites within the boundaries of Fort Hood. Implementation of the proposed action provides for consultation and coordination with the Cultural Resources Manager prior to the initiation of any activity that might affect historic or cultural resources. The purpose of the consultation is to determine whether historic or cultural resources are in close proximity to the proposed activity and whether the activity would have the potential to adversely affect those resources. Under the proposed action, the probability of disturbing potential cultural resources, including those identified between implementation of the original INRMP and this revised version, would be greatly reduced.

The EA findings are consistent with the goals of the natural resources management program to ensure the long-term sustainability of desired military training area conditions; to maintain, protect, and improve ecological integrity; to protect and enhance biological communities, particularly sensitive, rare, threatened, and endangered species; to protect the ecosystems and their components from unacceptable damage or degradation; and to identify and restore degraded habitats. The management measures recommended by the INRMP, if implemented, would directly and positively affect the health and condition of natural resources at Fort Hood.

5.3 RESOURCE AREAS NOT EXAMINED IN DETAIL

This is a “focused EA,” consistent with guidance issued by the Council on Environmental Quality (CEQ) at 40 CFR 1501.7(a)(3). In considering environmental and socioeconomic resources and conditions, the Army has determined that certain resources would not be affected by either the proposed action or no action alternative and, therefore, do not need to be evaluated in detail. The following resources would not be measurably affected by the proposed action or the no action alternative.

Facilities. No effects would be expected. All facilities would continue to be maintained and operated in accordance with required permits and capabilities of the systems. Under the proposed action, the demand for utilities and roads would not be expected to increase and therefore would not adversely affect existing facilities.

Air Quality. No effects would be expected. The primary concern regarding air quality and potential environmental effects pertains to increases in pollutant emissions; exceedances of National Ambient Air Quality Standards and other federal, state, and local limits; and impacts on existing air permits. Potential effects on existing pollutant emissions are precluded by the fact that the proposed action does not involve any activities that would contribute to changes in existing air quality. Therefore, there would be no effects regarding air quality as a result of implementing the proposed action.

Noise. No effects would be expected. The primary concern regarding noise and potential environmental effects pertains to increases in sound levels, exceedances of acceptable land use compatibility guidelines, and changes in public acceptance (i.e., noise complaints). However, potential effects are precluded by the fact that the proposed action does not involve any activities that would affect noise conditions. Therefore, there would be no effects regarding noise levels or sound quality as a result of implementing the proposed action.

Hazardous and Toxic Materials. No effects would be expected. All hazardous and toxic materials would continue to be handled in accordance with federal laws and Army regulations, including the Resource Conservation and Recovery Act (RCRA), the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Toxic Substances Control Act (TSCA), and AR 200-1. Thus, no adverse effects regarding the generation of hazardous and toxic materials would be expected under the proposed action.

Socioeconomic Resources. No effects would be expected. The proposed action would not involve any activities that would contribute to changes in population, housing, industry earnings and employment, or personal income.

Environmental Justice. No effects would be expected. Implementation of the proposed action would not create any advantage or disadvantage for any group or individual and would not create disproportionately high or adverse human health or environmental effects on children or minority or low-income populations at or surrounding Fort Hood.

5.4 CUMULATIVE EFFECTS

In 40 CFR 1508.7, the CEQ defines *cumulative effects* as the “impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions.” Seven actions on and near Fort Hood warrant identification:

- *Residential Communities Initiative Program.* In 2001 Fort Hood transferred operational management of its on-post family housing (5,622 units) to a private sector developer. The transaction has led to demolition, renovation, and construction; and in 2010, the inventory is 6,430 units. Future construction of additional replacement units and demolition of many legacy units will result in an end-state inventory of more than 5,900 RCI-owned family housing units. Additionally, a second-party, private sector developer also operates inside Fort Hood at Liberty Village under a separate ground lease and maintains a constant 300 family housing units.
- *North Fort Hood.* In an effort to increase capacity for deployment of Reserve and National Guard troops, the North Fort Hood area has been steadily adding new infrastructure and increasing capacity at both Longhorn and Shorthorn Airfields.
- *Robert Gray Army Airfield (RGAAF).* A second runway and Assault Landing Strip have been proposed to the southwest of the existing airfield. The City of Killeen funded an Environmental Impact Assessment (EIS) for the project, which Fort Hood has subsequently reviewed.
- *Digitization of Ranges.* In ongoing projects, Fort Hood continues to digitize existing ranges to enhance realism and improve scoring accuracy so that Soldiers can obtain greater benefit from their training. A recent proposal includes digitization of aerial ranges for use by rotary-wing aircraft stationed at Fort Hood.
- *Road Improvements.* In addition to the tactical vehicle road that is part of the proposed action, two road projects were proposed: (1) widening of Tank Destroyer Boulevard to four lanes from Clear Creek Road to Clark Road and establishment of a single commercial cargo entrance at Clark Road and US Highway 190, as well as the proposed addition of a reliever route on US 190 in Copperas Cove (completed); and (2) improvements providing for an overpass/cloverleaf or widening of Clear Creek Road and State Highway 201 for travelers to Killeen-Fort Hood Regional Airport.
- *Texas A&M University Campus.* Fort Hood transferred approximately 672 acres to the Texas A&M University System for development of a campus to serve 20,000 students. The essentially undeveloped land in the southeastern portion of West Fort Hood, in Training Area 74, is along State Highway 195, southeast of Robert Gray Army Airfield. Construction on the property has begun.
- *Grazing Management Plan.* Fort Hood has recently signed a new 5-year lease for grazing on the installation. More information can be found in 2.1.11.1 of this document.

USFWS has recognized that Fort Hood is critical to the recovery of the black-capped vireo and the golden-cheeked warbler and that conservation and protection of habitat for these species is essential to recovery. In addition, Fort Hood's endangered species biologists conduct important research on these endangered songbirds that can be used to further recovery efforts for the species and provide a greater understanding of the ecology of the warbler and vireo. Fort Hood has taken steps toward evaluating the feasibility of participating in DoD's ACUB program. Fort Hood has submitted an updated ACUB proposal and a Readiness and Environmental Protection Initiative (REPI) request for FY12 funds.

Fort Hood's karst habitats are home to karst/ cavernicole species that are endemic to Fort Hood. Because Fort Hood is the only location currently known for these rare species, it is possible that without proactive management, monitoring and protection, the species, their habitat, and surface processes could become candidates for listing under the ESA. This could then lead to increased restrictions on training activities at Fort Hood.

Implementation of the INRMP would result in a comprehensive environmental strategy for Fort Hood that represents compliance, restoration, prevention, and conservation; improves the existing management approach for natural resources on the installation; and meets legal and policy requirements consistent with national natural resources management philosophies. Over time, adoption of the proposed action would enable Fort Hood to achieve its goal of maintaining ecosystem viability and ensuring the sustainability of desired future conditions.

Fort Hood can be viewed as an island of generally stable, well-managed natural systems surrounded by areas of varying levels of growth and development. Although growth and development can be expected to continue in the areas surrounding Fort Hood, the environmental effects, although possibly adversely affecting natural resources within the ecoregion, would not be expected to result in cumulatively adverse effects on these resources when added to the effects of activities associated with the proposed management measures contained in the INRMP.

5.5 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES

Implementation of the INRMP would be expected to provide long-term beneficial effects on the existing environmental conditions at Fort Hood (Table 5-1).

Table 5-1
Summary of Potential Environmental Consequences

Resource Area/Environmental Condition	Environmental Consequences	
	No Action	Proposed Action
Land Use	Moderate adverse effects	Beneficial effects
Soils	Moderate adverse effects	Beneficial effects
Water Resources	Moderate adverse effects	Beneficial effects
Wetlands	Moderate adverse effects	Beneficial effects
Aquatic Habitat	Moderate adverse effects	Beneficial effects
Terrestrial Habitat	Moderate adverse effects	Beneficial effects
Fish and Wildlife	No effects	Beneficial effects
Vegetation Management	No effects	Moderate adverse effects
Endangered, Threatened, and Rare Species	No effects	Beneficial effects
Cultural Resources	Minor adverse effects	Beneficial effects
Facilities	No effects	No effects
Air Quality	No effects	No effects
Noise	No effects	No effects
Hazardous and Toxic Materials	No effects	No effects
Socioeconomic Resources	No effects	No effects
Environmental Justice	No effects	No effects

Cumulative Effects	Adverse effects	Beneficial effects
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SECTION 7.0: PERSONS CONSULTED

Buchanan, Tim. Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX.

Burrow, Steve. Chief, Environmental Programs, Directorate of Public Works, Fort Hood, TX.

Cagle, Kevin. Wildlife Biologist, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX.

Dankert, Amber. Supervisory Natural Resource Specialist, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX.

Dean, Vicki. Natural Resource Specialist, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX

Eckrich, Gil. Natural Resource Outreach Coordinator, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX.

Hamilton, Anne. Pest Management Coordinator, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX.

Hammer, Mary. Endangered Species Biologist, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX

Harmon, Eric. Range Officer, DPTMS Range Division, Fort Hood, Texas

Miller, Chris. GIS Coordinator, ITAM Program, Directorate of Plans, Training, and Security, Fort Hood, TX.

Navarro, Rey. Range Planner, DPTMS Range Division, Fort Hood, TX.

Noble, Marion. Geographer, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX

Paruzinski, Jerry. ITAM Coordinator, ITAM Program, Directorate of Plans, Training, and Security, Fort Hood, Fort Hood, TX.

Pekins, Charles. Wildlife Biologist, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX.

Picinich, Carla, Agronomist, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX.

Sanders, Virginia. Natural Resource Specialist, Natural Resources Management Branch, Directorate of Public Works, Fort Hood, TX.

Young, Riki. Environmental Management Division, Directorate of Public Works, Fort Hood, TX.

SECTION 8.0: DISTRIBUTION LIST

Tim Buchanan
Fort Hood
ATTN: DPW - ENV (Mr. Tim Buchanan)
4612 Engineer Drive, Room 76
Fort Hood, TX 76544-5028
254-287-1088

Omar Bocanegra
Wildlife Biologist
U.S. Fish and Wildlife Service
711 Stadium Drive, Suite 252
Arlington, TX 76011
817-277-1100

Kathy Boydston
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, TX 78744
512-389-4638

SECTION 9.0: APPENDICES

Appendix A:
Land Sustainment Management Plan (LSMP)

FORT HOOD Land Sustainment Management Plan

Sustainable Training Areas



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EXECUTIVE SUMMARY

1. PURPOSE

The purpose of the Fort Hood Land Sustainment Management Plan (LSMP) is to establish a detailed execution plan in support of the Installation Sustainability Plan (ISP) and Integrated Natural Resource Management Plan (INRMP). The LSMP is an integrated land management and sustainment plan to guide the use, conservation, repair, protection, and long-term sustainment of Fort Hood training land resources. This plan integrates DPW and DPTMS agencies to support training requirements, land stewardship education, and training, environmental, cultural, and conservation management into the proactive sustainment of Fort Hood training land resources.

This plan incorporates the goals of the Fort Hood INRMP and integrates: the Cultural Resource Management Plan (CRMP); Environment Management System (EMS); AR 350-19, the Army Sustainable Range Program (SRP); the Endangered Species Management Plan (ESMP); Real Property infrastructure Sustainment, Restoration & Modernization (SRM) plan; the Integrated Training Area Management (ITAM) Program work plan; and Fort Hood Reg 350-40, on training excavation procedures and the maneuver damage program.

2. SCOPE

The focus of the LSMP is on the sustainment and management of installation training land resources. Training lands, for this plan, are the lands and ranges outside of the cantonment/garrison areas where military training, operations, and readiness exercises are or will be conducted. This plan applies to land managers and the installation's training lands users; military, governmental, and nongovernmental agencies; and the public.

3. RELATIONSHIP TO MILITARY MISSION

LSMP supports the primary mission of Fort Hood which is to train, sustain, and promote the mission readiness and survivability of soldiers for worldwide deployment and Army readiness mission accomplishment while sustaining the installation's training land resources. The LSMP enhances training while integrating environmental compliance, land conservation, and land repairs needed to sustain Fort Hood natural resources and provide realistic training lands, now and in the future, for Army readiness training and installation sustainment.

4. ENVIRONMENTAL COMPLIANCE

LSMP projects/repairs support the Fort Hood Integrated Natural Resources Management Plan (INRMP), Integrated Cultural Resources Plan (ICRMP), and promote excellent environmental stewardship using Sustainable Range Program concepts for natural and cultural resource management. The main legal drivers are natural and cultural resources, conservation, wildlife, and endangered species laws and regulations. LSMP complies with all Army requirements, such as the Sikes Act, good land stewardship, conservation, environmental management systems, and facilitates integrated work relationships with all Garrison Directorates.

5. RELATIONSHIP TO CONSERVATION

LSMP has a positive impact on Fort Hood land resources and conservation. Projects enhancing readiness training have conservation and environmental applications. Projects can be funded by

individual agencies or shared in a combination to meet funding and planned requirements. Conservation principals, Fort Hood best management practices (BMPs) and infrastructure maintenance are integrated into the projects list for sustaining training land resources to upgrade and construct facilities and ranges to provide for a viable Integrated Training Land Management (ITLM) system.

6. PRIORITIZED WORK

Work responsibilities are divided mainly between 4 primary installation agencies:

- a) DPTMS, Range Control, Integrated Training Area Management Program (ITAM)
- b) DPW, Grounds and Roads (GR)
- c) DPW, Environmental, Natural Resources (NR)
- d) DPW, Environmental, Cultural Resources (CR)
- e) DES, Directorate of Emergency Services

The following 2002 primary training land issues remain valid and are concerns to sustaining training and long-term land resource sustainment with proponent agency identified:

- 1) Maintaining tank trail network for trafficability and erosion reduction (ITAM and GR)
- 2) Sustaining Endangered Species while reducing training limitations (NR)
- 3) Protection and mitigation of eligible cultural sites while reducing training limitations (CR)
- 4) Maintaining and hardening stream crossings for trafficability and erosion reduction (ITAM and GR)
- 5) Maintaining and hardening of hillside access trails for trafficability and erosion reduction (ITAM and GR)
- 6) Maintaining erosion control structure construction and maintenance for erosion reduction (NR)
- 7) Maintaining and hardening of high use staging/tactical areas for trafficability and erosion reduction (ITAM and GR)
- 8) Refiguring Critical Area (unserviceable areas, and gully systems) Treatments to improve maneuver, reduce erosion, and improve water quality (ITAM and NR)
- 9) Maintaining vegetation re-establishment and maintenance for training support and erosion control (ITAM and NR)
- 10) Maintaining woody species and brush management to support maneuver and TADSS training (ITAM)
- 11) Maintaining the Live Fire Firebreak trail network (NR) and prescribed burn plans (Directorate of Emergency Services, [DES]) to support live fire training
- 12) Maintaining Range and Training Land Assessment (RTLA) and conservation monitoring for training land health assessments and to identify trends (ITAM and NR)
- 13) Maintaining Sustainable Range and Environmental Awareness education/training and maps (ITAM and NR)
- 14) Maintaining an Installation Maneuver Damage Program for soldier education and leadership emphasis (ITAM)

- 15) The DES maintains the installation prescribed fire program to manage woody vegetation and reduce wild fires to support training
- 16) Repairing damaged or unserviceable training land infrastructure to support training and conservation (ITAM and NR)

7. TRAINING LAND CONDITIONS

Discussed in the Fort Hood INRMP

8. BENEFITS

The LSMP, with adequate DPW and ITAM funding, can reverse degraded land conditions and achieve the sustainment of Fort Hood Training Land Resources. Proactive and integrated land resource management will reduce redundancy of work, reduce costs for work between installation agencies, and promote a cooperative work effort on the following land sustainment goals:

- Repair and sustainment of training land to provide adequate and realistic training, now and for future trainers
- Improve quality of training resources through land management and repairs
- Establish and sustain training land vegetation
- Sustain the installation ecosystem
- Improve water quality and quantity and reduce sediment leaving the installation
- Improve trainer access across training lands
- Reduce erosion rates on the installation
- Sustain the endangered species and cultural resources on the installation
- Reduce critical/unserviceable areas in training lanes
- Reduce 60 years of backlogged land repairs using the Training Out Area Program and integrated land repairs by DPTMS and DPW
- Enhance TADSS use and dismounted training on the installation
- Prioritize and manage installation land repairs to improve installation training land conditions
- Integrate land stewardship practices into military planning and responsibilities
- Provide a forum for trainers, Range Control and DPW to discuss concerns and plans

9. COSTS

The estimated cost to implement the FY10-15 LSMP is \$102.75 million. Ideally costs would be divided equally between ITAM, Cultural and Natural Resources, DPW Engineering and Maintenance. However, the funding reality is that only limited Services Restoration and Modernization (SRM), Environmental, and ITAM funds are available to implement the projects to optimally support conservation and readiness. Training dollars, and or partnerships with other non-military and governmental agencies can also be used to implement these goals.

10. IMPLEMENTATION

Implementation of the LSMP will improve our training land capabilities/conditions and provide for the sustainment of readiness training and protect our limited training land resources. The following actions must occur to properly implement the plan.

- Command emphasis and resource support to enhance this program

-
- Adequate funding, dedicated resources to execute this plan in conjunction with the Training Out Area Program, the ITAM plan, and the conservation plan
 - Sustainable Range and Environmental Awareness education of military units and commanders
 - Military spot reports on damaged areas under the Maneuver Damage Program
 - Implement realistic military training area management plans to support training and sustain Fort Hood training land resources.

11. FUNDING TRENDS

Historically, LSMP funding, a combination of ITAM, conservation (not provided), cultural and Grounds and Road dollars, was less than 20% of required annual funds. If funding support is not increased, it may take 20 years to repair current Fort Hood Training Land Resource backlog and requirements, programmed in this six year plan.

INTRODUCTION

The June 2002 Installation Sustainability Program Conference conducted with Fort Hood organizations and surrounding communities and both state and Federal regulators culminated with the primary goals for the Sustainable Training Land group, which encompasses this LSMP. Five long term goals were established at that time to maintain Fort Hood's ability to sustain its mission, and secure our future, implementing the Army's overall Strategy for the Environment.

- 1) Mitigate 100 archeological sites without impacting training by 2027.
- 2) Recover (de-list) threatened and endangered species by 2027.
- 3) Resolve all encroachment issues by 2027.
- 4) Eliminate risk from contaminants on training lands and ranges by 2027.
- 5) Reduce and maintain soil erosion levels at accepted soil loss tolerance standards on training lands by 2012.

To achieve the goals, an installation land sustainment committee, Integrated Training Land Management (ITLM) was formed to expand and define the Fort Hood land sustainment issues with focus towards:

- 1) Identifying the sustainment issues and acquire project funding
- 2) Selling strategies to sustain Fort Hood lands for training
- 3) Change policies and procedures that inhibit both training and conservation
- 4) Execution of strategies to sustain Fort Hood lands, providing long term survival for Fort Hood, and procurement of funds to support Fort Hood land sustainment

This document is the work of the ITLM committee to define the land issues, goals, and sustainment concerns for implementation/execution (pending availability of funds) to improve and sustain Fort Hood Training Lands. NEPA documentation may be required for this plan and this plan should be documented as part of the ISP, INRMP, and the Range Complex Master Plan (RCMP).

This document incorporates updates to the Installation Sustainability Program's Training Area Management Team's Sustainability Report Card (TAB A).

Chapter 1

Installation Land Sustainment Management Plan (LSMP) Agencies

1. The missions of the Installation Land Sustainment Management Plan are to identify land repair requirements, hold installation agencies responsible for land repair and maintenance, and ensure the agencies plan, work, repair, and sustain the training landscape as a cohesive, integrated team. It remains each agency's responsibility to plan, request, and capture resources to sustain our training lands. The LSMP functions as part of the INRMP execution plan to work on known problem areas that can impact unit training and land sustainment.
2. The primary installation agencies responsible for sustaining Fort Hood Training Lands are:
Installation Garrison Commander
Directorate for Public Works (DPW)
DPW, Environmental, Natural and Cultural Resources
DPW, Grounds and Roads
Directorate for Planning, Training, Mobilization, and Security (DPTMS)
DPTMS, Range Division, Integrated Training Area Management (ITAM)
3. Supporting agencies:
USDA, Natural Resource Conservation Services (NRCS)
AgriLife, Blacklands Research Experiment Center (BREC)
AgriLife, Institute of Renewable Natural Resources (IRNR)
4. The training land sustainment mission addresses maneuver training sustainment.
 - a. DPW uses OMA, SRM, and conservation dollars to sustain the maneuver training areas.
 - b. ITAM uses TATM and leverages partnerships with various agencies to repair and sustain maneuver training areas.
5. DPTMS and DPW responsibilities in the installation land sustainment management plan are similar as projects and issues overlap in maintaining our maneuver training areas. Both agencies must balance mission/use requirements and land resources to sustain the mission and protect existing resources for current and future mission/use requirements.
6. An integrated installation LSMP is the ideal method of sustaining land resources and allowing for land repair and maintenance, while sustaining training and ancillary land use requirements.
7. Land sustainment is a myriad of complex issues, which continues to evolve as the Army missions and equipment change and as new resource requirements and concerns are identified. It is the responsibility of each LSMP agency to remain flexible and adapt to changing requirements to indefinitely protect and sustain our land resources to meet all training land use requirements.
8. DPW, ITAM and supporting agencies provide expertise for land monitoring and installing of best management practices (BMPs) to support training and conservation to sustain our land resources.

-
9. Land activities must be proactively managed to ensure adequate land resources are available for future Army generations and training.

CHAPTER 2

Land Sustainment Goals

The Training Land Committee 25-year sustainment goal from 2002:

Training landscapes managed to support current and future mission requirements while sustaining cultural, natural and land resources

Sub-goals, initiatives and issues

1. Develop and implement an installation land sustainment management plan (LSMP) to sustain the Fort Hood Training Landscapes, balancing all land use with the natural resources within their capability to be sustained at an acceptable healthy level (Short range (FY12-17); Mid range (FY18-21); Long range (FY22-27)
 - a. The following items are required in the INRMP and integrate all training land activities/plans. The INRMP Training Needs (Section 3.2) states that improving the training landscape includes:
 - 1) Enhancing readiness training capabilities
 - 2) Reducing training obstacles in the primary heavy maneuver training lanes
 - 3) Reducing soil erosion rates
 - 4) Improving vegetative cover
 - 5) Providing an environment that will remain viable to support current and future maneuver and readiness training
 - 6) Improving water quality both on and off the installation
 - b. Integrate and maintain an installation GIS database using applicable SRP GIS standards
 - 1) Establish Training land baselines
 - 2) Maintain installation repair list with detailed information for planning, funding, and repairs
 - c. Sustain and de-list endangered species (ES)
 - 1) Conduct proactive ES habitat management
 - 2) Develop dismounted training support in Non-Core habitats
 - 3) Improve the Firebreak Network to protect ES habitats without impacting live fire training
 - d. Protect eligible cultural sites on training lands
 - e. Prioritize land activities according to mission requirements
 - f. Improve training land conditions
 - 1) Reduce erosion rates
 - 2) Improve water quality with BMPs
 - 3) Repair and maintain trail networks
 - 4) Reduce training constraints
 - 5) Reduce bare ground
 - 6) Improve native species vegetation biodiversity, where practical
 - 7) Reduce vegetation constraints to training
2. Develop and implement sustainable range awareness education and environmental awareness programs
 - a. Educate military and leadership on land stewardship

-
- b. Implement Sustainable Range Awareness education
 - c. Educate leadership on environmental awareness
 - d. Implement awareness education for company and field grade officers in command positions
 - e. Develop and Implement an Army Compatible Use Buffer Program
 - f. Implement soldier in-processing awareness education
 - g. Integrate ITAM and environmental training standards and practices into education
 - h. Expand land stewardship training taught at West Point, basic training, AIT and NCO and Officer advance courses
 3. Develop and implement accountability and reporting system
 - a. Command emphasis and support of the land sustainment management plan
 - b. Maintain the installation maneuver damage program
 - c. Units conduct land inventories to identify damaged, areas of training concern
 - d. Unit responsible for clearing subordinate and joint-use units from training areas
 - e. Update the command inspection checklists to address land resource considerations/management
 - f. Provide a forum for trainers, Range Control and DPW to discuss concerns and annual land and training plans
 - g. Break the 'you can do anything you want during training at Fort Hood' mind set
 4. Balance training requirements with land resources
 - a. Balance virtual and live training to reduce training costs and encroachment issues
 - b. Improve quality of training through land management and repairs
 5. Future Forces issues/support changes
 - a. Evaluate range requirements
 - b. Evaluate training land requirements
 - c. Evaluate training support requirements
 - d. Evaluate training densities impacts on erosion rates on the installation
 - e. Evaluate training densities impacts on sediment leaving the installation
 - f. Develop a mesquite management plan to support future forces light maneuver training.
 - g. Improve the trail network to support future forces training
 - h. Increase mid and high level crossing to support future forces training
 6. Integrate all training land users/plans
 - a. Maintain the balance of land use between the training mission and endangered species/ancillary land requirements
 - b. Manage the training land dig/excavation permit procedures
 - c. Manage the ITLM (user) meetings to integrate all land use/requirements
 - 1) Identify membership
 - 2) Identify relevant plans and programs
 - 3) Consolidate training land management processes
 - 4) Establish a formal review process
 - 5) Establish a land decisions process for garrison
 - d. Update the Training Out Area Program to support training and integrate land repairs and conservation requirements
 7. Protect existing sediment retention measures to sustain training without the loss of additional training land or training capabilities
 - a. Monitor and forecast sediment structure capacity and remaining life span

-
- b. Remove sediment from retention structures to extend structure life span
 - d. Coordinate sediment placement from structure

Chapter 3

FUNDING

1. The revised Short Range Funding Requirements to fund the FY12-17 plan is \$89.15 M.
 - a. \$50.4 M is required to fund the ITAM workplan to repair lands to sustain training.
 - b. \$15 M is required for the Grounds and Roads to repair and maintain the tank trail networks.
 - c. \$23.75 M is required to fund cultural programs.
 - d. Environmental, Natural Resource program funding is not available.
2. Here are the installation organizational requirements for training land sustainment.
3. TATM training land funding for FY11 was less than 20%. FY12 TATM training land funding is projected at 20%.
4. The Short Range Management Plan (ITAM, DPW Maintenance, DES, and Cultural Resources) will:
 - a. Sustain:
 - 1) 400 Miles of Trails
 - a. 497 Stream Crossings
 - b. 142 Hillside Access Trails
 - 2) 83,000 acres of Heavy maneuver training land
 - 3) 46,000 acres of Dismount light training landBy Repair /Maintenance:
 - a. 300 Maneuver Access Structures
 - b. 33000 Acres of Vegetation Management
 - c. 46,000 Acres of Woody Species Management
 - d. 100 area plots Monitored under RTLA
 - e. 1 installation-wide Photo flight to identify and monitor changes in the landscape and land conditions every 4 years
 - f. 25,000 acres of Prescribed Burning
 - g. 25 Staging Areas
 - b. Cultural Sites
 - 1) All properties protected (cap & barricade) in maneuver lanes; 6 funded by ITAM by FY15
 - 2) 10 historic properties mitigated
 - c. Sustainable Range Awareness Education
 - 1) Update the Fort Hood Military Installation Map (MIM)
 - 2) Produce/update SRA videos/materials for education and awareness program for soldiers and leaders.

Chapter 4

Training Out Area Program

1. The majority of land repair and sustainment work is programmed to occur under the Training Out Area Program. The Out Area Program becomes a driving force for repair funding requirements and divides the Training Lands into 6 sections/years to balance training requirements and land repairs to sustain the installation.
2. Each Out Area becomes the primary land repair area for the installation but other projects may occur outside the Out Area, with proper coordination. Training is minimized during the year an area is out to restore vegetation/ground cover. Cattle grazing should be deferred until the latest forage assessments indicate adequate forage availability and the area is not scheduled for the out area land repairs/vegetation recovery; however, existing grazing leases and lack of fencing in the Out Areas may prevent this deferment. With six out areas, each area is normally visited for repairs every six years. Out area rotations will be focused on known repair costs each year, previous year's funding shortfalls may not follow as the next year's UFR.
3. Funding drives the extent and volume of land repairs done in each Out Area. This requires DPW and DPTMS to combine work efforts, integrate planned repair work to maximize funding and land resource repairs. Projects cost can be combined or one entity can fund the various repair practices. Teamwork and coordination of work reduces redundant work efforts and paperwork while making the most of the funding resources available to sustain our training lands.
4. The Out Area Program intent is to maximize land repairs to improve readiness training, reduce erosion, promote vegetation growth, enhance training access, shape unserviceable areas into useable areas that are safe and can sustain the training landscape and protect land resources. The program results are successful but limited to specific areas by inadequate funding.

Chapter 5

The Short Range Land Sustainment Management Plan

1. The plan uses the 2002 Installation Sustainment Program's five sub-goals as baselines in identifying associated training land issues and objectives to make a detailed and workable installation Land Sustainment Management Plan. This section will outline the expanded and related goals and what the responsible agencies are planning.
2. Each agency maintains responsibility for their proponent areas and funding, but collaborates in the process for the sustainment of the installation landscape. This concept will continue throughout the 25 (2002-2027) year sustainment plan. A detailed plan is focused towards a short range plan while keeping options open towards changing priorities and resolving other complex land sustainment issues programmed in the mid and long range timeframes.
3. The primary mission of the installation Land Sustainment Management Plan is executing repair plans for land sustainment to provide adequate land resources for future missions. The mission objectives of the plan are to (1) repair land damage before it impacts training and safety; (2) conduct repairs before erosion damage and costs increase; (3) implement a land management system that ensures land resources meet training requirements and land sustainment objectives; (4) protect eligible cultural sites until they can be mitigated; and (5) protect endangered species until they can be de-listed. Additionally, subtasks implement an education system that will neutralize some encroachment concerns, expand land stewardship, and minimize ecosystem damage and land contamination.
4. The plan identifies numerous land best management practices (BMPs) to rehabilitate and sustain land resources. These BMPs are:
 - a. Erosion Control, Landscape Sustainment
 - 1) Critical Area Treatment (CAT)
 - 2) Tank Trail networks
 - 3) Stream Crossings
 - 4) Hillside Access Trails
 - 5) Staging/Tactical Area Treatment
 - 6) Training Damage Repair
 - 7) Prescribed Burning
 - b. Cultural Sites Sustainment
 - c. Endangered Species Habitat Sustainment, and
 - d. Updates of training infrastructure documentation with Real Property to maximize sustainment, restoration, and modernization (SRM) funding for training land repairs.
5. These practices enhance our land capabilities to train and maneuver, while reducing erosion, and sustaining endangered species and cultural resources.

6. The short range LSMP mission is to plan and execute repairs to enhance training and repair land resources. Sustainment cannot be maintained without viable land resource plans to support training, agencies resources, and command support.

7. Each agency is responsible for their FY12-17 work plans and to capture adequate resources to implement their plans. The primary agencies for preparing work plans, acquiring funding, and management for training land sustainment are the DPTMS and DPW.

Chapter 6

Mid and Long Range Land Sustainment Management Plan

1. The mid (FY18-21) and long (FY22-27) range LSMP continues to sustain training requirements and the installation landscape. The Installation Sustainment Program (ISP) has goals for implementing several installation land sustainment missions by 2027.
2. The two Endangered Species can only be de-listed if Golden Cheeked Warbler (GCW) and Black Capped Vireo (BCV) regions meet their sustainment population goals. By 2025, we request for de-listing from the ES Act.
3. Cultural sites are the next objective once sites inside the training lanes are protected. Demonstrations of data recovery are conducted outside training lanes and costs estimates are refined. Mitigation continues to maximize site recovery and removal from the eligible inventory. State and federal funding is leveraged for the protection of these sites. Sites in maneuver lanes are evaluated and only worked when land is in the Training Out Area Program, a one year window. Sites in the live fire area are work inside the range modernization program, if applicable.
4. Public outreach programs are implemented to educate concerned citizens. The public is educated to understand training noise is a patriotic cost for living around Fort Hood. Studies are made public to show no munitions are migrating from Fort Hood. Fort Hood promotes and enlists the Corps of Engineers into the good neighbor policy as it removes sediment the mouth of Belton Lake to restore reservoir capacity as local populations increase in Bell County, and removes sediment from erosion dams to prolong their lifespan to support and improve water quality/quantity for drinking water.
5. Fort Hood has an active ACUB although it is still in its infancy. This plan will be updated as the program develops. Fort Hood continues to reduce ES habitat restrictions from maneuver and live fire training lands, and lessen the effects of noise and dust public concerns.
6. Training land infrastructure is updated and maintained through Real Property. Conservation and ITAM resources are used to repair new maneuver land damage, minimize erosion, reduce the land repairs backlog, and sustain Fort Hood training lands at an ISR C2 rating.
7. Training units are to use simulators for 50% of their yearly required training, reducing units' usage of maneuver land by half.
8. Scrap metal and target residues on ranges are worked as needed to prevent a stock pile of residue sites. Residue is contracted, shipped and smelted without lengthy paperwork and can be moved from ranges to smelters without Fort Hood conducting numerous inspections and certifications. This uses the recycle funds to improve the live fire range infrastructure.

9. Trail networks are maintained to support future forces combat vehicles, reducing accidents, safety concerns, repairs, training capability concerns, and erosion.

10. Military Land Stewardship and awareness education are part of the Army training at Fort Hood. Officer Professional Development and NCO Professional Development classes promote awareness. DPW integrates sustainable range awareness into environmental courses and classes. Environmental awareness and land stewardship education courses are available for soldiers, leaders, units, and senior commanders. Command emphasis, command inspections, and the maneuver damage program are working. Leaders are teaching the new soldiers about land stewardship. Units are receiving “Green” awards.

11. Contaminated water and soils are a rarity, and those materials are immediately collected, processed and recycled.



Integrated Training Land Management (ITLM) Team



Goal: Landscapes Managed to Support Current and Future Mission Requirements While Sustaining Cultural, Natural, and Land Resources

Overall Rating

R ☐ **A** ☐ **G** ☐

OBJECTIVES:

RED: 2

AMBER: 1

GREEN: 0

7 initiatives archived

INITIATIVES:

RED: 9

AMBER: 4

GREEN: 0

8 Sep 11



Integrated Training Land Management (ITLM) Team



Initiative Comments

- **Top 3 (Green) Initiatives**
 - **Improve Heavy Training land conditions; Objective 2: Implement critical measures of LSMP (t-rate, water quality)**
 - **Improve Heavy western training land conditions; Objective 2: Implement critical measures of LSMP (MAS/maneuverability)**
 - **Fund PM team for maintenance and repairs; Objective 2: Implement critical measures of LSMP (22+ miles/yr)**

8 Sep 11



Integrated Training Land Management (ITLM) Team



Initiative Comments

- **Bottom 3 (Red) Initiatives**
 - **Improve training land conditions, maintain/repair TA Tank Trails, 520 miles; Objective 2: Implement critical measures of LSMP (G=237; R=285)**
 - **DPW funding of land rehabilitation and conservation projects; Objective 2: Implement critical measures of LSMP (NR)**
 - **Repair training land infrastructure to support Future Force training; Objective 6: Ensure training lands support Future Forces (Tank Trails, XNG, HAT, SAT)**

8 Sep 11



Integrated Training Land Management (ITLM) Team



Goal: Landscapes Managed to Support Current and Future Mission Requirements While Sustaining Cultural, Natural, and Training Resources

Overall Rating

R **A** **G**

Objective #2: Implement critical measures of LSMP.

Initiatives: 9: 0 = Green; 2 = Amber; 7 = Red

R **A** **G**

Objective #5: Protect existing sediment retention measures to sustain training by Sep 15

Initiatives: 1: 0 = green; 0 = amber; 1 = red

R **A** **G**

Objective #6: Ensure training lands support Future Forces by Sep 11

Initiatives: 3: 0 = green; 2 = amber; 1 = red

R **A** **G**

8 Sep 11



Integrated Training Land Management (ITLM) Team



**Goal: Training Landscapes Managed to Support Current
And Future Mission Requirements While Sustaining Cultural,
Natural, and Land Resources**
Objective #2: Implement critical measures of LSMP.

Overall Rating

R **A** **G**

•Improve East side training land conditions (FCC17720/17710)

R **A** **G**

Actions:

- Reduce training land erosion rates (10T/YR) to NRCS guidelines – 5 tons/ac/yr
- Improve Water Quality (compare water quality data: pre vs. post BMP) – >85%
- Improve vegetation coverage and reduce bare ground – <24%

(Based on:)

Red = <70% of land meet standards

Amber = > 70% but <85% of land meet standards

Green = > 85% of land meet standards

8 Sep 11



Integrated Training Land Management (ITLM) Team



**Goal: Training Landscapes Managed to Support Current
And Future Mission Requirements While Sustaining Cultural,
Natural, and Land Resources**
Objective #2: Implement critical measures of LSMP.

Overall Rating

R **A** **G**

•Improve training land conditions (FCC17700/17710/17720 132,295 acres)

R **A** **G**

Actions:

- Repair and maintain tank trails, 520 miles

(Based on:)

Red = <70% of trails are serviceable

Amber = > 70% but <85% are serviceable

Green = > 85% are serviceable

•Improve training land conditions (FCC17700/17710/17720 132,295 acres)

R **A** **G**

Actions:

- Repair 4 bridges to support tank traffic : Curry, Cowhouse, Jackson, House

(Based on:)

Red = <50% of bridges are serviceable

Amber = 75% are serviceable

Green = 100% are serviceable

8 Sep 11



Integrated Training Land Management (ITLM) Team



**Goal: Training Landscapes Managed to Support Current
And Future Mission Requirements While Sustaining Cultural,
Natural, and Land Resources**

Objective #2: Implement critical measures of LSMP.

Overall Rating

R **A** **G**

**•Improve east side training land conditions
(FCC17720/17710)**

R **A** **G**

Actions:

**•Reduce constraints to maneuver – reconfigure unusable land by MAS/
gully plugs to restore land to support training**

(Based on:)

Red = <70% of land meet standards

Amber = > 70% but <85% of land meet standards

Green = > 85% of land meet standards

8 Sep 11



Integrated Training Land Management (ITLM) Team



**Goal: Training Landscapes Managed to Support Current
And Future Mission Requirements While Sustaining Cultural,
Natural, and Land Resources**

Objective #2: Implement critical measures of LSMP.

Overall Rating

R **A** **G**

• Capping of Cultural Sites

R **A** **G**

(Based on:)

25 Sites remain

Red = Capping < 15 sites completed of the 25 sites remaining

Amber = Capping > 15 < 20 sites completed of the 25 sites remaining

Green = Capping > 22 sites completed of the 25 sites remaining

8 Sep 11



Integrated Training Land Management (ITLM) Team



Goal: Training Landscapes Managed to Support Current
And Future Mission Requirements While Sustaining Cultural,
Natural, and Land Resources
Objective #2: Implement critical measures of LSMP

Overall Rating

R **A** **G**

•ITAM funding of Training Land Rehabilitation projects

R **A** **G**

(Based on:)

Red = no funding received

Amber = < 50% of required work funded

Green = > 65% of required work funded

8 Sep 11



Integrated Training Land Management (ITLM) Team



Goal: Training Landscapes Managed to Support Current
And Future Mission Requirements While Sustaining Cultural,
Natural, and Land Resources
Objective #2: Implement critical measures of LSMP

Overall Rating

R **A** **G**

• DPW funding of Land Rehabilitation and Conservation projects

R **A** **G**

(Based on:)

Red = no funding received

Amber = < 50% of required work funded

Green = > 65% of required work funded

8 Sep 11



Integrated Training Land Management (ITLM) Team



**Goal: Training Landscapes Managed to Support Current
And Future Mission Requirements While Sustaining Cultural,
Natural, and Land Resources**
Objective #2: Implement critical measures of LSMP

Overall Rating

R **A** **G**

• DPW funding of Cultural projects

(Based on:)

Red = no funding received

Amber = < 50% of required work funded

Green = > 65% of required work funded

R **A** **G**

• Land plans published and work coordinated

(Based on:) ITAM, ESMP, CRMP, RCMP, Conservation

Red = all plans not published or work not coordinated

Amber = all plans published and work activities not coordinated

Green = all plans published and work activities coordinated

R **A** **G**

8 Sep 11



Integrated Training Land Management (ITLM) Team



**Goal: Training Landscapes Managed to Support Current
And Future Mission Requirements While Sustaining Cultural,
Natural, and Land Resources**
**Objective #5: Protect existing sediment retention measures
to sustain training by Sep 15**

Overall Rating

R **A** **G**

Red = <50% of measures green

Amber = > 50% < 80% of measures green

Green = >80% of measures green

• DPW Removes sediment from retention structures by to extend structure life Sep 15

(Based on:)

Red = > 2 or more sediment retention structures with about or less than 25% life remaining

Amber = 1 sediment retention structure with about or less than 25% life remaining

Green = 0 sediment retention structures with about or less than 25% life remaining

FY09 and FY10 RTLA reports, three structures reported with about or less than 25% life remaining (Eister, 46F & 44C)

R **A** **G**

8 Sep 11



Integrated Training Land Management (ITLM) Team



Goal: Training Landscapes Managed to Support Current And Future Mission Requirements While Sustaining Cultural, Natural, and Land Resources

Overall Rating

☐ R ☒ A ☐ G

Objective #6: Ensure training lands support Future Forces

Red = <50% of measures green

Amber = > 50% < 80% of measures green

Green = >80% of measures green

- Non-core habitat managed to support Future Force maneuver training and sustain TES populations on the same land by Sep 15

☐ R ☒ A ☐ G

Actions:

East side of post

- Sustain ES population requirements
- Sustain Heavy and Light BCT maneuver training requirements

(Based on :)

Red = Plan not developed or approved

Amber = plan approved and implemented, <70% of each action completed

Green = Plan implemented, >70% of each action completed

TOP

8 Sep 11



Integrated Training Land Management (ITLM) Team



Goal: Training Landscapes Managed to Support Current And Future Mission Requirements While Sustaining Cultural, Natural, and Land Resources

Overall Rating

☐ R ☒ A ☐ G

Objective #6: Ensure training lands support Future Forces

Red = <50% of measures green

Amber = > 50% < 80% of measures green

Green = >80% of measures green

- Repair training land infrastructure to support Future Force training by Sep 15

☒ R ☐ A ☐ G

Actions: (FY07 thru FY11)

- Harden 70 water crossing sites (26/70)
- Harden 25 hilltop access trails (12/25)
- Harden 14 high use staging/tactical areas (4/14)
- Harden 18 pipeline crossing on the landscape (2/18)
- Repair 80 miles of maneuver trails on the west side (10/80)

(Based on :)

Red = < 50% of each action completed

Amber = > 50% and < 80% of each actions completed

Green = > 80 % of each actions completed

TOP

8 Sep 11



Integrated Training Land Management (ITLM) Team



**Goal: Training Landscapes Managed to Support Current
And Future Mission Requirements While Sustaining Cultural,
Natural, and Land Resources**

Overall Rating

☐ R ☒ A ☐ G

Objective #6: Ensure training lands support Future Forces

Red = <50% of measures green

Amber = > 50% < 80% of measures green

Green = >80% of measures green

**•Training land vegetation managed to support Future
Force by Sep 15**

☐ R ☒ A ☐ G

Actions:

- Increase Juniper and hardwood management for 66K acres on western training areas 42%
- Seed tank resistant vegetation in high use maneuver areas 41%
- Increase mesquite management on 28K acres for Light/SBCT training on western training areas

(Based on):

Red = < 50% of action completed

Amber = > 50% to < 80% of action completed

Green = > 80 % of action completed

TOP

8 Sep 11

 DPW, Environmental, Cultural Resource Plan

41cv1235*
 41cv0389*
 41cv1133??? Maybe
 41cv1132??? maybe
 41cv1553*
 41cv1092
 41cv1141* barricade
 41cv1038
 41cv0594 (Capp with pm team??)
 41cv1049 * barricade
 41cv1027
 41cv1104 (two year old creek-may need to excavate)
 41cv1200* barricade
 41cv0095* barricade
 41cv1138* barricade
 41cv0960*
 41cv1122*
 41CV0095* barricade
 41CV1200* barricade
 41cv1269* barricade

East

41cv0048*
 41bl0740* barricade
 41bv0662* barricade

North

41cv1507
 41cv0580

Note: * does not require geotextile before capping or barricading

FY12 SUMMARY			
CODE	UNIT	QUANTITY	EST.COST (K)
Cap Hist-Elig sites in Training Lanes	ea	10	200
Site Excavation / non outarea, maneuver, livefire	ea	2	6,000
Site Study Assessments	ea	na	920
		TOTAL	7,120
FY13 SUMMARY			
CODE	UNIT	QUANTITY	EST.COST

			(K)
Cap Hist-Elig sites in Training Lanes	ea	15	250
Site Excavation / non outarea, maneuver, livefire	ea	1	3,000
Site Study Assessments	ea	na	920
TOTAL			4,170
FY14 SUMMARY			
CODE	UNIT	QUANTITY	EST.COST (K)
Cap Hist-Elig sites in Training Lanes	ea	10	200
Site Excavation / non outarea, maneuver, livefire	ea	1	3,000
Site Study Assessments	ea	na	920
TOTAL			4,120
FY15 SUMMARY			
CODE	UNIT	QUANTITY	EST.COST (K)
Cap Hist-Elig sites in Training Lanes	ea	15	250
Site Excavation / non outarea, maneuver, livefire	ea	1	3,000
Site Study Assessments	ea	na	920
TOTAL			4,170
FY16 SUMMARY			
CODE	UNIT	QUANTITY	EST.COST (K)
Cap Hist-Elig sites in Training Lanes	ea	10	200
Site Excavation / non outarea, maneuver, livefire	ea	2	6,000
Site Study Assessments	ea	na	920
TOTAL			7,120
FY17 SUMMARY			
CODE	UNIT	QUANTITY	EST.COST (K)
Cap Hist-Elig sites in Training Lanes	ea	15	250
Site Excavation / non outarea, maneuver, livefire	ea	1	3,000
Site Study Assessments	ea	na	920
TOTAL			4,170

The Preventative Maintenance Team requires ~\$3M per FY to repair and maintain tank trails.

FY12: team priority is to complete LG4.

FY13: team priority is to LG3.

FY14: team priority is to complete LG3.

FY15: team priority is to LG5.

FY16: team priority is to complete LG5.

FY17: team priority is to LG6.

DPW, Environmental, Natural Resource, Conservation Plan
FY2012-2017

Not available

ENDANGERED SPECIES MANAGEMENT PLAN FOR FORT HOOD

EXECUTIVE SUMMARY

The management and monitoring of Federally-listed endangered species on Fort Hood is a natural resource management obligation for the Army and Fort Hood. In accordance with the Endangered Species Act (ESA) of 1973, as amended, the Army must assist in recovery of all listed threatened and endangered (T&E) species and their habitats under the Army's land management authority.

Army Regulation (AR) 200-3 requires installations to prepare an Endangered Species Management Plan (ESMP) for all listed and proposed T&E species. The installation ESMP should be used as a tool to achieve conservation objectives for populations of listed and proposed T&E species and to minimize impacts on the training mission. AR 200-3 further encourages, but does not require, the development of ESMPs for all candidate species and species of concern. AR 200-3 recommends that installations prepare an integrated ESMP covering all T&E species if more than one such species occurs on an installation. The ESMP is published as a component of the Installation Natural Resources Management Plan (INRMP). The U.S. Fish and Wildlife Service Biological Opinion for Fort Hood (1 December 2010; Appendix A) provides terms and conditions for endangered species management on Fort Hood.

Fort Hood conducts research and monitoring of significant breeding populations of two endangered avian species: the black-capped vireo (*Vireo atricapilla*) (vireo) and golden-cheeked warbler (*Dendroica chrysoparia*) (warbler). U.S. Fish and Wildlife Service (USFWS) recovery team meetings have recognized that populations on Fort Hood are important for range-wide recovery of these two species. In addition to these species, Fort Hood provides habitat for a variety of endemic karst (cave)-restricted fauna, transient occurrences of other listed species, and numerous species of concern are documented to occur on Fort Hood.

To ensure that the full range of military training can be effectively accomplished on Fort Hood, the Army has developed this comprehensive, integrated ESMP for management of endangered species on Fort Hood. Despite military training activities on Fort Hood, the installation presents a much less hostile environment for endangered species than most of the surrounding landscape, which is dominated by ranching, intensive agriculture, and rapid urban development. Through implementation of this ESMP, Fort Hood is in a vital and unique position to help conserve and recover listed species.

This ESMP is written specifically for use by natural resource managers and leaders of training operations on Fort Hood to accomplish military training objectives while meeting conservation objectives for Federally-listed species and species of concern. Implementation of this ESMP will also assist USFWS in achieving recovery objectives for these species and will provide a guide for natural resource personnel at other

military installations facing similar endangered or sensitive species management and land use requirements.

The Plan provides for continued ongoing monitoring of intensive study areas for assessing critical population parameters of Golden-cheeked Warblers and Black-capped Vireos. Cowbird control through an active trapping and shooting program will be continued throughout the post. Prescribed burning is used to reduce fire hazards near habitat, maintain habitat for vireos, and reduce the risk of wildfire in the Live Fire area. Ongoing karst (cave) research and monitoring will be furthered by the completion of survey, mapping, and biotic collections in known karst features and the implementation of the *Karst Management Plan*.

The objective of this ESMP is to provide a comprehensive plan for protecting and conserving populations and habitats of federally listed and candidate species on Fort Hood while maintaining mission readiness in a manner consistent with Army and Federal environmental regulations.

WILDLIFE MANAGEMENT on FORT HOOD, TEXAS

Wildlife Habitat Management

The wildlife habitat management program at Fort Hood is targeted toward restoring the ecological health of the mission lands. The primary needs have been identified as:

- Reduction of the sheet, rill, and gully erosion to acceptable limits;
- Increased native food plants;
- Reduction of wildfires;
- Additional water supplies.

The measures being implemented to restore the ecological health of the mission lands will contribute directly to improved wildlife habitat. Features are incorporated in the plans for the projects to enhance the habitat for wildlife when possible.

Game Management

The DPW, Natural Resources Management Branch (NRMB) establishes a harvest quota for white-tailed deer, which is approved by the Texas Parks and Wildlife Department. Harvest quotas for Rio Grande Turkeys are also established by the NRMB. Seasons and bag limits for all game animals will conform to state and federal laws and regulations and in some cases will be more restrictive.

Deer surveys will be conducted each year beginning in late August and terminating in late September. Surveys are conducted along ten mobile spotlight lines. This method is used to determine deer density. These lines are eight to fifteen miles in length. Incidental surveys are conducted throughout the installation by driving or aurally from a helicopter. The information collected from methods used in conjunction with spotlight data to determine ratios and composition of the deer herd. Medium-sized mammal surveys are conducted in conjunction with the spotlight deer surveys.

During the deer and turkey seasons all harvested game animals must be brought to the game check station. Biological data is collected and recorded for future use by biologists. All data collected at the game check station and from the surveys is forwarded to the Texas Parks and Wildlife Department.

Game Fish Management

The following species of game fish are being managed: largemouth bass, channel catfish, and bluegill.

Game fish on Fort Hood will be monitored on a lake by lake basis. Each lake population is evaluated for stability based on the predator/prey relationship and desirable vs. undesirable biomass of species. When the biomass of undesirable species reaches unacceptable levels, renovation of the pond may be necessary. When an unbalanced population of game fish and forage fish is observed, the removal

of the excess species and/or supplemental stocking of the lacking species may be required.

Harvest regulations for fish and wildlife can be found in FH Cir 210 -22. All daily bag and possession limits are in accordance with the current Texas Parks and Wildlife regulations. In no instance will Fort Hood be less restrictive than the state.

Lakes on the installation are stocked by Inks Dam National Fish Hatchery (NFH) for Fort Hood's "Put and Take" fisheries program (see Cooperative Plan Agreement). The "Put and Take" program will facilitate fish management by concentrating the greatest fishing pressure into specific areas. For a list of specific ponds/impoundments that are stocked annually, and the stocking numbers at each location, refer to sections 2.1.12 and 3.9.1 of the INRMP.

Other Non-game Species Management

Management of non-game species is managed in conjunction with populations of game species. There are no management plans for any particular species.

SUBJECT: Oak Wilt Management

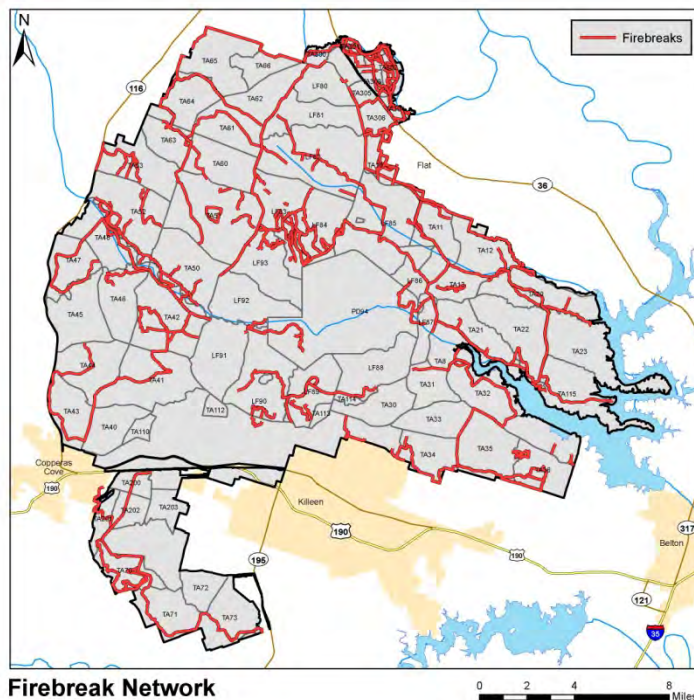
This tab has been omitted due to the lack of recent research, and subsequent projects, regarding Oak Wilt Management.

SUBJECT: Fort Hood Firebreak Program

PURPOSE: To provide information on the Firebreak Program.

In 1996, there were massive fires on Fort Hood, which destroyed over 10,000 of endangered species habitats. Massive fires were recurring on Fort Hood in 6-10 year cycles. Fort Hood agreed with the U.S. Fish and Wildlife Service to increase the military units' fire fighting responsibilities and to construct a network of roads for firefighters to stop habitat-endangering fires inside the live fire area.

ITAM is no longer able to fund the firebreak network program. DPW is now responsible for all firebreak construction and performs firebreak network maintenance. The firebreak network benefits training by allowing rapid fire fighting access to remote sites, area compartments to limit fire spread, and decreases range and training down time by minimizing soldier and fire department time spent fighting fires. There are 497 miles of roads/firebreaks in the Fort Hood Firebreak Network.



Annual maintenance of firebreaks is a necessary requirement to prevent grasses from growing on firebreaks. Clean firebreaks have stopped fires from burning habitats with minimal fire fighting response and impact to training. The network must be maintained as Fort Hood is again within the massive fire trend window.

Prescribed Burn Program

This Tab has been omitted due to the transfer of the Prescribed Burn Program from DPW to DES.

Appendix B:

Agency Correspondence

No formal agency correspondence regarding the INRMP was received since the last INRMP was completed.

Appendix C:
Finding of No Significant Impact (FNSI)

**FINDING OF NO SIGNIFICANT IMPACT
FOR THE IMPLEMENTATION OF AN INTEGRATED NATURAL RESOURCES
MANAGEMENT PLAN
ON FORT HOOD, TEXAS**

1.0 Name of the Action

The U.S. Army, Headquarters III Corps and Fort Hood propose to create and implement an Integrated Natural Resources Management Plan (INRMP). Fort Hood has conducted an Environmental Assessment (EA) of the potential effects associated with implementing the INRMP. Fort Hood has prepared this INRMP in accordance with the provisions of the Sikes Act (16 U.S.C. 670a et seq.) and Army Regulation 200-1.

This Finding of No Significant Impact (FNSI) and the accompanying EA were prepared in compliance with National Environmental Policy Act, (NEPA) (42 U.S.C. 4321 et seq.) and pursuant to the Council on Environmental Quality (CEQ) Regulations (40 *CFR* Parts 1500-1508) as well as provisions of the Department of the Army's regulation, 32 *CFR* Part 651 (*Environmental Analysis of Army Actions*).

2.0 Description of the Proposed Action and Alternatives

2.1 Proposed Action

Fort Hood proposes to implement an INRMP for Fort Hood, Texas. The purpose of the proposed action is to carry out the set of resource-specific management measures developed in the INRMP, which would enable Fort Hood to effectively manage the use and condition of natural resources located on the installation. Implementation of the proposed action would support the Army's continuing need to train Soldiers in a realistic natural setting while meeting other mission and community support requirements, practicing sound resource stewardship and complying with environmental policies and regulations.

The proposed action supports an ecosystem approach and includes natural resource management measures to be undertaken on Fort Hood, Texas. The proposed action focuses on a 5-year planning period, which is consistent with the time frame for the management measures described in the INRMP. This planning period would begin in Fiscal Year (FY) 2013 and end in FY 2017. Additional environmental analyses may be required as new management measures are developed over the long-term.

2.2 Alternatives

The development of proposed management measures for the INRMP included a screening analysis of resource-specific alternatives. The screening analysis involved the use of accepted criteria, standards, and guidelines, when available, and best professional judgment, to identify management practices for achieving Fort Hood's natural resource management objectives. The outcome of the screening analysis led to the development of the proposed action, as described above. Consistent with the intent of NEPA, this screening process focused on identifying a range of reasonable resource-specific management alternatives and, from that, developing a plan that

could be implemented, as a whole, in the foreseeable future. Management alternatives deemed to be infeasible were not analyzed further.

As a result of the screening process, the EA, made an integral part of the INRMP, formally addresses two alternatives, the proposed action (i.e., implementation of the INRMP) and the no action alternative.

Implementation of the no action alternative means that the proposed management measures set forth in the INRMP would not be implemented. Current management measures for natural resources would remain in effect, and existing conditions would continue. This document refers to the continuation of existing (i.e., baseline) conditions of the affected environment, without implementation of the proposed action, as the no action alternative. Inclusion of a no action alternative is prescribed by CEQ regulations and serves as a benchmark against which the proposed action could be evaluated.

3.0 Factors Considered in Determining that No Environmental Impact Statement is Required

The EA, which is incorporated by reference into this FNSI, examines potential effects of the proposed action and the no action alternative on resources and areas of environmental concern that could be affected by implementing the INRMP. These include air quality, noise, topography, geology, soils, water resources, wetlands, aquatic habitat, riparian habitat, terrestrial ecosystems, fauna, endangered, threatened, and rare species, cultural resources, land use, facilities, hazardous and toxic materials, socioeconomic resources, and environmental justice. Implementation of the proposed action would result in short- and long-term, beneficial effects on identified resources and areas of environmental concern.

4.0 Findings

Based on the results of the EA, it is determined that implementation of the proposed action would have no significant direct, indirect or cumulative impacts on the quality of the natural or human environment. Implementation of the INRMP would be expected to improve existing conditions at Fort Hood, as shown by the potential for beneficial effects. The proposed action would enable Fort Hood over time to achieve its goal of maintaining ecosystem viability and ensuring sustainability of desired military training area conditions. Because there would be no significant environmental impacts resulting from implementation of the proposed action, an Environmental Impact Statement is not required and will not be prepared.

5.0 Public Review

III Corps and Fort Hood invite public participation in the National Environmental Policy Act (NEPA) process. Consideration of the views and information of all interested persons promotes open communication and enables better decisions. All agencies, organizations, and members of the public having a potential interest in the Proposed Action are encouraged to participate in the decision-making process. The public is invited to review the INRMP and EA, and provide comments to the Fort Hood Environmental Division. Comments by any interested party may be submitted to Amber Preston Dankert, DPW-ENV (Natural Resources), 4612 Engineer Drive, Room 76, Fort Hood, TX 76544-5028. The deadline for receipt of comments is 30 days from publication of the Notice of Availability (NOA). The INRMP/EA will be made available for public review at the Killeen Public Library, 205 East Church Avenue, Killeen, Texas and at the Fort Hood Environmental Management Office, located at the Directorate of Public Works (DPW), Environmental Management Branch, Bldg 4622, Engineer Drive, Fort Hood, Texas. The

INRMP/EA will also be available online at the Fort Hood DPW Public Notice Web site:
<http://www.dpw.hood.army.mil> ; select “Public Notices.”

Appendix D:

Soils

GEOLOGY AND SOILS BACKGROUND INFORMATION

D1 TOPOGRAPHY

The topography at Fort Hood is defined by rolling prairies and steep breaks (Fort Hood, 2001b). Fort Hood is located northwest of the Balcones Fault Zone, a region of many small faults. Over geologic time the area surrounding this fault zone, including Fort Hood, has elevated as much as 500 feet in certain areas. The subsequent erosion of these areas has created an irregular and steeply sloping terrain (USACE, 2003).

Elevations range from 561 feet above sea level (asl) near the shores of Belton Lake in the Northeast Region, to 1,231 feet asl in the Seven Mile Mountain area in the South Region of the installation. Slopes generally range from level in the floodplains of Cowhouse Creek to as much as 33 percent on tributary valley walls (USGS, 1990). The average slope of the installation is between 5 and 8 percent. The area north of Highway 190 generally slopes east, while the area south of Highway 190 generally slopes south and east (Fort Hood, 2001b). Figure 2-3 shows the topographic relief on Fort Hood.

D2 GEOLOGY

General Geology

The Fort Hood region is characterized as “hill and lake country,” with topographic features and landforms characterized by valleys, buttes, and mesas. Fort Hood is located near the southeastern edge of the Mid-Continent Plains and Escarpments physiographic region, and near the eastern edge of the Edwards Plateau region (USACE, 2003).

This area was originally a rolling prairie underlain by limestone beds, but softer limestone has slowly eroded away, leaving long narrow valleys and streams flowing in a generally southeastern direction separated by ridges of harder limestone (Fort Hood, 2001b). The dissolution of the remaining limestone has formed the karst topographic features (caves, sinkholes, underground springs) that are found throughout the region (Reddell and Veni, 2004). Karst features are primarily found in the Northeast Region of Fort Hood near Belton Lake. Figure 2-3 shows the karst features on Fort Hood.

Geologic Formations

Several geologic formations from the Cretaceous and the younger Quaternary Ages can be found on Fort Hood. These formations are, from oldest to youngest, the Glen Rose, Paluxy Sand, Walnut Clay, Comanche Peak Limestone, Edwards Limestone, Kiamichi Clay, Duck Creek Limestone, Fort Worth Limestone, and Denton Clay formations. In general, these formations are comprised of limestone, sandstone, calcareous clay, shale, sand, and/or sandy marl (USACE, 2003). All Cretaceous strata cropping out on Fort Hood strike generally in a north-northeasterly direction, and dip in an east, southeasterly direction. The Glen Rose Formation is a major outcrop in the southern portion of Fort Hood, and due to its composition and differential erosion, exhibits a typical terraced or ‘stair step’ configuration (Fort Hood, 2001b). Formations from the Quaternary Age can be found near Leon River, Cowhouse Creek, and their tributaries. These formations are Pleistocene terrace remnants and Holocene flood plain sediments. These formations are comprised of gravel, sand, silt and clay size sediment eroded from upstream uplands (USACE, 2003).

Seismicity

Small seismic events with magnitude less than 4.0 have occurred in the region surrounding Fort Hood. Minor earthquakes were recorded in the region in 1891 and 1932. Nineteen other minor earthquakes have been recorded in the region since 1981. The largest of these earthquakes was recorded in 1993 with a magnitude of 4.3 (USGS, 2005).

D3 PETROLEUM AND MINERALS

There is no petroleum production on Fort Hood. Topsoil, sand, gravel, and road base materials are the only known mineral resources that occur within the Fort Hood installation (USACE, 2003). These minerals are of limited quantities and quality (Fort Hood, 2001b).

D4 SOILS

There are 40 unique soil series found on Fort Hood (USDA, 1977; 1985). The most abundant soil series are shown on Figure 3.8-1. The six predominate soil series include Topsey Clay Loam, Doss-Real Complex, Eckrant-Rock Outcrop Complex, Real-Rock Outcrop Complex, Nuff Very Stony Silty Clay Loam, and Evant SiC. These soils account for 154,640 acres, or 77 percent of Fort Hood. In general the soils of Fort Hood are well drained and moderately permeable, but can vary widely in other characteristics such as depth, parent material, and slope. Table 3.8-1 lists the names of each soil series found on Fort Hood, including the acreage, prime farmland and erodibility classification, drainage, landscape position, and parent material.

Many of the soils on Fort Hood are naturally susceptible to soil erosion. Soils categorized as highly erodible cover approximately 25,736 acres, or 13 percent of the installation, and soils categorized as potentially highly erodible cover approximately 173,208 acres, or 80 percent of the installation. The remainder of the soils on the installation are not highly erodible. As a result of the soil erodibility and land use activities, gullies have formed in many areas of the installation (NRCS, 2005). The locations of highly erodible soils, potentially highly erodible soils, and recorded gullies are shown on Figure 2-4.

Five soils that occur on Fort Hood are considered to be hydric soils (USDA-NRCS, August 2005). These soils cover approximately 5,453 acres, or 2.5% of the installation, and are generally located along the stream banks of Cowhouse Creek, Nolan Creek, and Leon Creek and their tributaries (USDA-NRCS, 2005). The hydric soils are generally located along the stream banks of Cowhouse Creek, Nolan Creek, and Leon Creek and their tributaries. Twenty soils that occur on Fort Hood are considered to be prime farmland soils. These soils cover approximately 41,697 acres, or 19 percent of the installation. The prime farmland soils are generally located near the main cantonment area, West Fort Hood (WFH), North Fort Hood (NFH), and along floodplains (NRCS, 2005). Portions of Fort Hood are used for grazing activities. Currently, no land on Fort Hood is used for growing crops (USACE, 2003).

Table D-1

Soils on Fort Hood

Soil Series Name	Acres	Prime Farmland	Erodibility	Drainage	Landscape Position	Parent Material
Topsey CL, 3 To 8 % Slopes Severely Eroded	40,113	No	PHE	well drained	gently sloping to moderately sloping sideslopes	surface: CL subsoil: Si (upper) shaley SiCL (lower)
Doss-Real Complex,	33,477	No	PHE	well drained	gently sloping to	surface: gravelly SiC

1 To 8 %					steeply sloping uplands	subsoil: gravelly C
Eckrant-Rock Outcrop Complex, 1 To 5 % Slopes	26,374	No	PHE	well drained	undulating to very steep uplands	surface: very gravelly C subsoil: limestone
Real-Rock Outcrop Complex, 12 To 40 % Slopes	22,294	No	HE	well drained	gently sloping to steeply sloping uplands	surface: gravelly CL subsoil: extremely gravelly CL (upper) cemented caliche (lower)
Nuff Very Stony SiCL, 2 To 6 % Slopes	19,359	No	PHE	well drained	gently sloping to moderately sloping uplands	surface: SiCL subsoil: SiCL (upper) Marly shaley SiL (lower)
Evant SiC, 1 To 3 % Slopes	12,756	No	PHE	well drained	gently sloping uplands	surface: SiC subsoil: C
Krum SiC, 1 To 3 % Slopes	10,765	Yes	PHE	well drained	moderately sloping uplands	surface: SiC subsoil: SiC
Slidell SiC, 0 To 2% Slopes	9,584	Yes	NHE	moderately well drained	nearly level to gently sloping uplands	surface: C subsoil: C
Denton SiC, 1 To 3 % Slopes	5,691	Yes	PHE	well drained	upland	surface: SiC subsoil: SiCL
Eckrant Cobbly SiC, 1 To 5 % Slopes	5,699	No	PHE	well drained	undulating to very steep uplands	surface: very gravelly C subsoil: cobbly C
Cho Clay L 1 To 3 % Slopes	4,675	No	PHE	well drained	nearly level to moderately sloping stream terraces and alluvial fans	surface: L subsoil: L
Bosque CL, 0 To 1 % Slopes, Occasionally Flooded	5,294	Yes	NHE	well drained	nearly level flood plain	surface: L subsoil: CL
Lewisville CL, 1 To 3 % Slopes	3,970	Yes	PHE	well drained	nearly level to strongly sloping stream terraces	surface: SiC subsoil: SiC
Topsey-Pidcoke Association 2 To 8 % Slopes	3,613	No	PHE	well drained	gently sloping to moderately sloping sideslopes	surface: CL subsoil: gravelly CL (upper) shaley SiCL (lower)
Tarrant-Purves Association, 5 To 10 % Slopes	1,885	No	HE	well drained	moderately sloping to steeply sloping uplands	surface: cobbly C subsoil: limestone
Georgetown CL, 0 To 2 % Slopes	1,519	Yes	PHE	well drained	nearly level to gently sloping uplands	surface: CL subsoil: cobbly clay (upper) limestone (lower)
Seawillow CL, 3 To 5 %	1,663	No	PHE	well drained	gently sloping stream terraces	surface: CL subsoil: CL
Cisco FSL, 1 To 5 % Slopes, Moderately Eroded	1,545	No	PHE	well drained	upland	surface: FSL subsoil: SCL (upper) FSL (lower)
Bastis FSL,	980	Yes	NHE	well drained	gently sloping terraces	surface: FSL

1 To 3 % Slopes						subsoil: SCL
Purves SiC, 1 To 4 % Slopes	819	No	HE	well drained	gently sloping to moderately sloping uplands	surface: C subsoil: very gravelly C
Minwells FSL, 1 To 3 % Slopes	735	Yes	NHE	well drained	stream terraces	surface: FSL subsoil: CL (upper) gravelly S
Frio SiC, 0 To 1 % Slopes, Occasionally Flooded	677	Yes	NHE	well drained	nearly level bottomlands	surface: SiCL subsoil: CL (upper) SiC (lower)
Topsey CL, 3 To 8 % Slopes,	593	No	PHE	well drained	gently sloping to moderately sloping sideslopes	surface: CL subsoil: shaley SiCL
Crawford SiC, 1 To 3 % Slopes	521	Yes	PHE	well drained	nearly level to gently sloping uplands	surface: SiC subsoil: SiC
Water	473	No	-	-	-	-
Brackett Association, 8 To 12 % Slopes	403	No	HE	well drained	gently sloping to steeply sloping uplands	surface: gravelly CL subsoil: gravelly CL
Wise CL, 3 To 5 % Slopes, Moderately Eroded	255	No	HE	well drained	uplands	surface: CL subsoil: SiL
Quarry, 1 To 40 % Slopes	243	No	-	-	-	-
Frio SiC, 0 To 1 % Slopes, Frequently Flooded	238	No	NHE	well drained	bottomlands	surface: SiCL subsoil: CL (upper) SiC (lower)
Bolar Gravelly CL, 1 To 4 % Slopes	799	No	PHE	well drained	steep uplands	surface: CL subsoil: CL
Speck Soils, 1 To 3 % Slopes	80	No	HE	well drained	nearly level to sloping uplands	surface: CL subsoil: C (upper) limestone (lower)
Lewisville SiC, 3 To 5 % Slopes	42	Yes	PHE	well drained	uplands	surface: SiC subsoil: SiC
San Saba C, 1 To 3 % Slopes	19	Yes	PHE	moderately well drained	nearly level to gently sloping uplands	surface: C subsoil: C (upper) limestone (lower)
Venus CL, 3 to 5 % Slopes	15	Yes	PHE	well drained	nearly level to moderately sloping soils mainly on stream terrace and valley fill positions	surface: L subsoil: FSL

Note:

HE= Highly Erodible

PHE= Potentially Highly Erodible

NHE= Not Highly Erodible

LFS= Loamy Fine Sand

FSL= Fine Sandy Loam

SCL= Sandy Clay Loam

Sources: USDA, 1977; 1985; USDA-NRCS, 2007.

C= Clay

L= Loam

Si= Silt

CL= Clay Loam

SiC= Silty Clay

SiCL= Silty Clay Loam

SiL= Silty Loam

Appendix E:
2011 Endangered Species Management Plan (ESMP)

Endangered Species Management Plan for Fort Hood, Texas: FY11-16

May 2011



Approved for public release; distribution is unlimited.

Endangered Species Management Plan for Fort Hood, Texas: FY11-16

Mary Hammer

*DPW, Environmental Division
4612 Engineer Drive, Room 76
Fort Hood, Texas 76544-5028*

Timothy J. Hayden

*Construction Engineering Research Laboratory
U.S. Army Engineer Research and Development Center
2902 Newmark Drive
Champaign, Illinois 61826-9005*

Final report

Approved for public release; distribution is unlimited.

Abstract: Fort Hood Military Reservation is an 88,389-ha U.S. Army installation located in central Texas. It is one of the Army's premier installations, providing training facilities for the full range of mission requirements, including maneuver exercises for units up to brigade level, firing of live weapons, and aviation training. Federally-listed endangered species are present on Fort Hood. In accordance with the Endangered Species Act of 1973, as amended, the Army must assist recovery of all listed threatened and endangered (T&E) species and their habitats under the installation's management authority. Army Regulation (AR) 200-3 requires installations to prepare an Endangered Species Management Plan (ESMP) for all listed and proposed T&E species. The installation ESMP should be used as a tool to achieve conservation objectives for populations of listed and proposed T&E species and to minimize impacts on the training mission. AR 200-3 further encourages, but does not require, the development of ESMPs for all candidate species, and recommends that an integrated ESMP covering all T&E species be prepared if more than one such species occurs on an installation. The ESMP is a component of the Installation Natural Resources Management Plan (INRMP).

The U.S. Fish and Wildlife Service Biological Opinion for Fort Hood (1 December 2010) provides requirements and guidance for endangered species management on Fort Hood. This ESMP is written specifically for use by natural resource managers and leaders of training operations on Fort Hood to accomplish military training objectives while meeting conservation objectives for T&E species. The objective of this ESMP is to provide a comprehensive plan for maintaining and enhancing populations and habitats of Federally-listed endangered species and species of concern on Fort Hood while maintaining mission readiness in a manner consistent with Army and Federal environmental regulations.

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Preface

This work was edited and revisions incorporated by Mary Hammer, Directorate of Public Works, Natural Resources, Fort Hood Texas. Editorial changes and revisions were made to the previous version of the ESMP (2005) which was prepared by Dr. Timothy J. Hayden, Ecologist, U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC/CERL).

Several individuals provided revisions, data, information, and review for this effort, including David Cimprich, Rebecca Peak, Gil Eckrich, Kevin Cagle, Scott Summers, and Charles Pekins of the Fort Hood Natural Resources Branch. The Natural Resources Branch at Fort Hood wishes to thank the legion of dedicated field workers and installation staff who, over the years, have collected the data and performed the management activities that have led to the successful support of the military mission and conservation of endangered species on Fort Hood.

Unit Conversion Factors

Multiply	By	To obtain
acres	0.40	hectares
feet	0.3048	meters
miles	1.609344	kilometers

Introduction

Background

Fort Hood Military Reservation is an 88,389-ha (218,413 acres) U.S. Army installation located in central Texas. Fort Hood provides resources and training facilities for active and reserve units in support of the Army's mission. This mission is to maintain a total force, trained and ready to fight, to serve our nation's interests both domestically and abroad, and to maintain a strategic force capable of decisive victory. Fort Hood is one of the Army's premier installations in support of this mission. The full range of mission-related training activities, including maneuver exercises for units up to brigade level, firing of live weapons, and aviation training, are conducted on Fort Hood.

In addition to these activities, the Army allows a number of other non-military uses of the land on Fort Hood, including grazing, fishing, hunting, and other types of recreational activities. These uses, together with military training, affect the soil, water, vegetation, and animals that occur on the installation.

The management and monitoring of Federally-listed endangered species on Fort Hood (Table 1) is a natural resource management obligation for the Army and Fort Hood. In accordance with the Endangered Species Act (ESA) of 1973, as amended, the Army must assist in recovery of all listed threatened and endangered (T&E) species and their habitats under the Army's land management authority.

Army Regulation (AR) 200-3 requires installations to prepare an Endangered Species Management Plan (ESMP) for all listed and proposed T&E species. The installation ESMP should be used as a tool to achieve conservation objectives for populations of listed and proposed T&E species and to minimize impacts on the training mission. AR 200-3 further encourages, but does not require, the development of ESMPs for all candidate species and species of concern. AR 200-3 recommends that installations prepare an integrated ESMP covering all T&E species if more than one such species occurs on an installation. The ESMP is published as a component of the Installation Natural Resources Management Plan (INRMP). The U.S. Fish and Wildlife Service Biological Opinion for Fort

Hood (1 December 2010; Appendix A) provides terms and conditions for endangered species management on Fort Hood.

Fort Hood conducts research and monitoring of significant breeding populations of two endangered avian species: the black-capped vireo (*Vireo atricapilla*) (vireo) and golden-cheeked warbler (*Dendroica chrysoparia*) (warbler). U.S. Fish and Wildlife Service (USFWS) recovery team meetings have recognized that populations on Fort Hood are important for range-wide recovery of these two species. In addition to these species, Fort Hood provides habitat for a variety of endemic karst (cave)-restricted fauna, transient occurrences of other listed species, and numerous species of concern are documented to occur on Fort Hood (Table 1).

To ensure that the full range of military training can be effectively accomplished on Fort Hood, the Army has developed this comprehensive, integrated ESMP for management of endangered species on Fort Hood. Despite military training activities on Fort Hood, the installation presents a much less hostile environment for endangered species than most of the surrounding landscape, which is dominated by ranching, intensive agriculture, and rapid urban development. Through implementation of this ESMP, Fort Hood is in a vital and unique position to help conserve and recover listed species.

This ESMP is written specifically for use by natural resource managers and leaders of training operations on Fort Hood to accomplish military training objectives while meeting conservation objectives for Federally-listed species and species of concern. Implementation of this ESMP will also assist USFWS in achieving recovery objectives for these species and will provide a guide for natural resource personnel at other military installations facing similar endangered or sensitive species management and land use requirements.

Objective

The objective of this ESMP is to provide a comprehensive plan for conserving and protecting populations and habitats of federally listed species and species of concern on Fort Hood while maintaining mission readiness in a manner consistent with Army and Federal environmental regulations.

Table 1. Federal endangered, threatened, candidate species and species of concern that occur or may occur on Fort Hood. There are several endemic cave invertebrates a salamander species and at least one mussel species found on Fort Hood that may eventually become candidate or listed species (see text).

Common name	Scientific name	Listing status ^a	Status ^b
FEDERALLY LISTED SPECIES			
Whooping crane	<i>Grus americana</i>	E	B
Bald eagle	<i>Haliaeetus leucocephalus</i>	de-listed 28 June 2007	B
Black-capped vireo	<i>Vireo atricapilla</i>	E	A
Golden-cheeked warbler	<i>Dendroica chrysoparia</i>	E	A
CANDIDATE SPECIES			
Sprague's pipet	<i>Anthus spragueii</i>	C	B
Salado salamander	<i>Eurycea chisholmensis</i>	C	C
Smalleye shiner	<i>Notropis buccula</i>	C	C
Jollyville Plateau salamander	<i>Eurycea tonkawae</i>	C	C
SPECIES OF CONCERN			
Peregrine falcon	<i>Falco peregrinus anatum</i>	N/A	B
Texabama croton	<i>Croton alabamensis</i> var. <i>texensis</i>	N/A	A
Slimy salamander	<i>Plethodon albagula</i>	N/A	A
Cave invertebrates	See text.	N/A	A
Cave myotis	<i>Myotis velifer</i>	N/A	A
Texas horned lizard	<i>Phrynosoma cornutum</i>	N/A	A
Smooth pimpleback	<i>Quadrula houstonensis</i>	N/A	A
False spike mussel	<i>Quadrula mitchelli</i>	N/A	C
Texas fawnsfoot	<i>Truncilla macrodon</i>	N/A	C

^a Federal listing status; E = endangered, T = threatened, C = candidate

^b Status refers to population status on Fort Hood according to these definitions: (A) Population established on Fort Hood. Recent information documents an established breeding population (even if small) or regular occurrence on the installation. This includes those species for which research and management is ongoing and several endemic cave invertebrates. (B) Recently recorded on Fort Hood, but there is no evidence of an established population. This includes species considered to be transient, accidental, or migratory (e.g., some migrating birds may use the installation as a stopover site during migration to and from their wintering grounds). For some species in this category, further inventory may reveal breeding populations. (C) Not known to occur on Fort Hood. These species are not considered further in this ESMP.

Approach

Development of this ESMP is based on the concept of adaptive management. Adaptive management is founded on the idea that management of renewable natural resources involves a continual learning process (Walters 1986). This concept is a key guiding principle in the Department of Defense's ecosystem management policy (S. Goodman memorandum, 8 Aug 1994) and is promoted as an effective approach to successful T&E species recovery.

An adaptive management approach recognizes that protection and management actions are often implemented, by necessity, with imperfect knowledge. Recognition of this uncertainty allows development of monitoring and research approaches to progressively improve knowledge, and thus enhance decision-making and management capabilities.

This ESMP is based on the premise that protection, management, inventory, monitoring, and research are necessary components of an integrated, adaptive management approach for endangered species on Fort Hood. In this ESMP, objectives, justifications, and actions are developed and implemented under a framework that is mutually supportive of these components.

Fort Hood is in the fortunate position of being able to draw on several years of natural resource and endangered species inventory, monitoring, and research data in developing this ESMP. The endangered species research and monitoring programs implemented by Fort Hood since 1987 are regarded by the environmental and scientific community as among the most comprehensive and credible sources of information available for the endangered golden-cheeked warbler and black-capped vireo. Information for this ESMP was gathered from installation project status reports, from related published reports, reports from cave research, and other published and unpublished documents. Personnel from the USFWS, Texas Parks and Wildlife Department, The Nature Conservancy, and the Army provided data on distribution and abundance of endangered species on and around Fort Hood.

Even with this wealth of available knowledge, this ESMP recognizes the current state of knowledge is incomplete in many cases and further reinforces the adaptive management concept as a necessary and continual

learning process for management of endangered species and species of concern on Fort Hood. AR 200-3 provides the mechanism for incorporating new information and approaches by requiring annual reviews and major revision of this ESMP every five years.

Mode of Technology Transfer

This ESMP is written to meet requirements of AR 200-3, the 1 December 2010 Biological Opinion for Fort Hood, and the ESA. It will be distributed to military and natural resource managers at Fort Hood, U.S. Army Installation Management Command (IMCOM), Headquarters Department of Army (HQDA), and to state and federal resource management agencies.

This plan will be reviewed annually and updated as required to meet conservation goals and Army mission requirements. This ESMP will be incorporated by inclusion or by reference into the installation Integrated Natural Resources Management Plan (INRMP). Once every five years, the INRMP, including the ESMP section, must undergo major revision to all parts (AR 200-3, 9-4).

Site Description and Land Use Activities

Mission and History

Fort Hood Military Reservation encompasses 88,389 ha (218,413 ac) located in central Texas in Bell and Coryell Counties adjacent to the city of Killeen. Fort Hood lies at the northern extent of the Edward's Plateau between the cities of Waco, 64 km (40 mi) to the northeast, and Austin, 97 km (60 mi) to the south.

Fort Hood dates to 1942 when the Army established Camp Hood to prepare soldiers for tank destroyer combat during World War II. Renamed Fort Hood, it became a permanent installation in 1950. Various armored divisions have been assigned to Fort Hood since 1946.

The installation provides the infrastructure and training lands for the 1st Cavalry Division, III Corps Headquarters and its combat aviation assets, combat support, and combat service support units. With increased emphasis on force structure changes and Base Realignment and Closure (BRAC) initiatives, Fort Hood likely will remain the largest active U.S. installation in terms of assigned personnel. Total assigned personnel authorization is approximately 50,000 soldiers.

Fort Hood provides state-of-the-art facilities to support the full spectrum of training requirements of today's modern armed forces. Installation lands and ranges provide excellent training opportunities for mechanized maneuver and small unit exercises, combined arms training, and live-fire training.

Terrain

Fort Hood lies entirely within the Lampasas Cut Plains physiographic region and is within the Grand Prairies Land Resource Zone. The forces creating the Balcones Fault Zone, just east of the installation, have uplifted underlying rock formations as much as 152 m (498 ft). Weathering and erosion over the past two million years have produced the present "cutplains" landscape characterized by the stair-step topography of a dissected remnant plateau. Numerous steep sloped mesas rise above the

flat to gently rolling plains. This benching is the result of erosion-resistant limestone cap rocks of the plateau and mesa-hill structures. These formations are generally composed of massive, structurally sound limestone or a mix of limestone and shale known as marl, which crumbles and weathers. Soil cover generally is shallow to moderately deep, clayey, and underlain by limestone bedrock. Major soil associations are described in Tazik et al. (1992).

Elevation ranges from 180 m (590 ft) to 375 m (1,230 ft) above sea level with 90 percent of the area below 260 m (853 ft). Higher elevations occur on the western portions of Fort Hood and the lowest at the Belton Lake shoreline adjoining the installation on the east. Surface water drains mostly in an easterly direction. Most slopes are in the two-to-five percent range. Lesser slopes occur along flood plains, while slopes in excess of 45 percent occur as bluffs along flood plains and as side slopes of mesa-hills.

Fort Hood lies in the Cross Timbers and Prairies vegetation area of Texas, which normally is composed of oak woodlands with grass undergrowth. Woody vegetation on the installation is derived mostly from the Edward's Plateau vegetation community to the southwest and is dominated by Ashe juniper (*Juniperus ashei*), Plateau live oak (*Quercus fusiformis*), and Texas red oak (*Quercus buckleyi*). The grasses are derived from the Blackland Prairie area to the east. Under climax condition, these would consist of little bluestem (*Schizachyrium scoparium*) and Indian grass (*Sorghastrum* ssp.).

Maneuver Training

Maneuver training exercises are conducted at all unit levels to ensure a combat-ready fighting force. Training programs focus on units attaining and maintaining proficiency in collective tasks that support mission-essential tasks. Units involved in the training process span all echelons from section to corps. III Corps' primary training focus at Fort Hood is the brigade level and below.

Units train as they will fight. Training exercises replicate combat conditions as closely as possible. Combat effects such as smoke, noise, and simulated nuclear, biological, and chemical conditions are integrated into every training event to condition units for operations in a difficult, stressful battlefield environment. Trainers are careful not to "simulate" or "assume away" any facet of a training mission. For example, units

conducting defensive operations “dig-in” vehicle fighting positions and actually emplace the barrier and obstacle plan in those areas that have been previously approved for sub-surface excavation by environmental and archaeological managers. This level of training realism ensures a high level of combat readiness.

Units train for combat in a task-oriented manner. Trainers integrate combat, combat support, and combat service support elements to conduct multi-echelon, combined arms training. Combined arms training involves formations that include members of the entire fighting force. Commanders synchronize the activities of these forces within a battlefield framework that includes maneuver and operations within the deep, the close-in, and rear battle areas. Such exercises involve greater depth and rapidity of movement dimensions and, therefore, also incur greater demands for concurrent land use.

Maneuver training areas are located west, east, and southwest of the Live-Fire Areas (Fig. 1). Maneuver training areas constitute 53,300 ha (131,707 ac) or 60 percent of the entire installation. The West Range Maneuver Training Areas (Land Groups 4–6) provide excellent training opportunities for large armored and mechanized infantry forces. The training area averages seven to 10 km (4.3–6.2 mi) east to west and 30 km (18.6 mi) north to south. The area features a wide variety of terrain and vegetation characteristics that greatly enhance cross-country, combined arms maneuver. Because of its large, contiguous size, this is the only maneuver area on Fort Hood capable of supporting brigade-level operations.

The Northeast (Land Groups 1 and 2) and Southeast Range Maneuver Training Areas (Land Group 3) are divided by Belton Lake Reservoir. The northeast sector is heavily vegetated and cross-compartmentalized, providing limited value as a mechanized maneuver area. The southeast sector provides more favorable terrain for mechanized units, but is only four to seven km (2.5–4.3 mi) north to south and 15 km (9.3 mi) from east to west. Because of limited area, the Northeast and Southeast Range Maneuver Training Areas are best suited for unit assembly and logistical areas, artillery firing points, and company- and platoon-level mounted and dismounted training. Also, these eastern training areas support engineer,

combat support, and combat service support training, and provide locations for amphibious and river crossing operations.

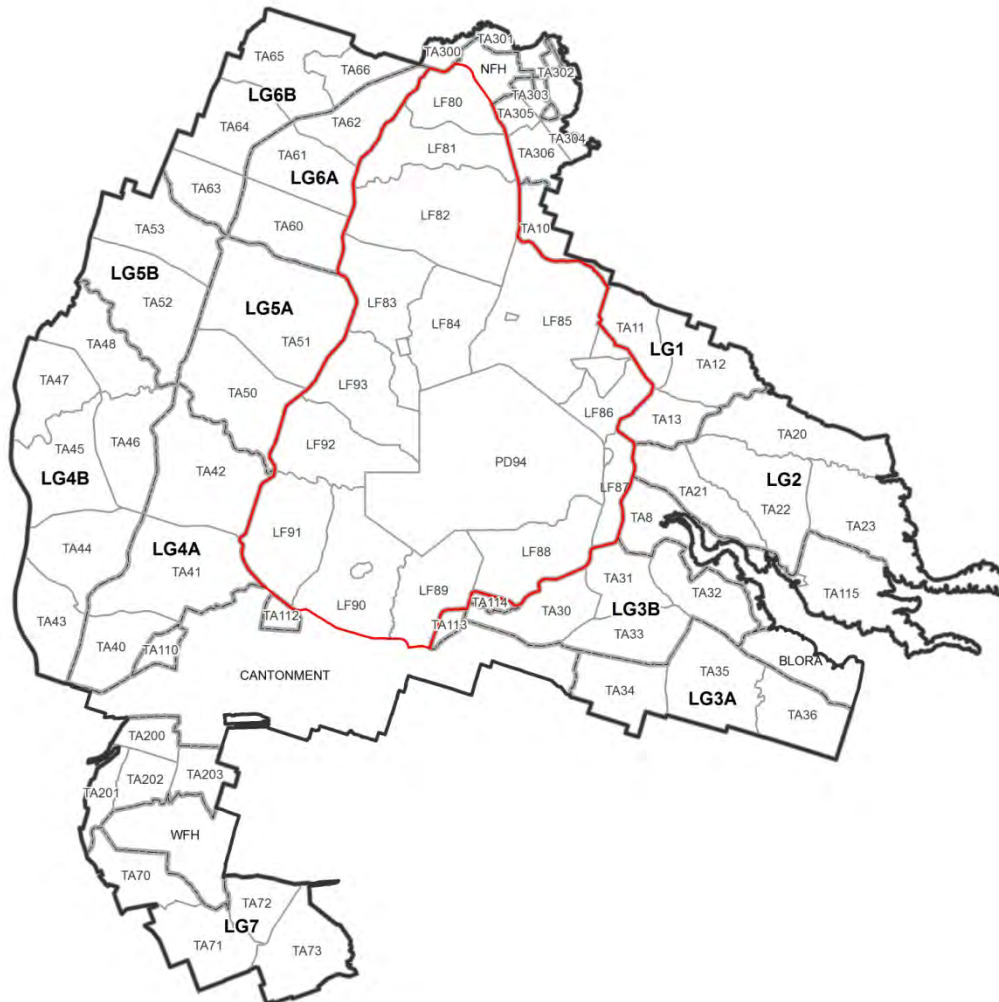


Figure 1. Training Area designations for Fort Hood, Texas.

TA = Training Area. PD = Permanently Dudded area. LF = Live-Fire training area. WFH = West Fort Hood. LG = Land Group. LTA = Local Training Area. NFH = North Fort Hood. FH = Fort Hood. BLORA = Belton Lake Outdoor Recreation Area.

The Southwest Maneuver Training Area (Land Group 7; “Southwest Fort Hood”) is not used for maneuver training because of its small size and

isolated location. The Southwest Maneuver Training Area is separated from the main cantonment area by U.S. Highway 190. This training area includes many restricted areas, including Robert Gray Army Airfield and the Ammunition Supply Point (ASP). The Southwest Maneuver Training Area is used primarily for small mechanized unit and dismounted infantry training and for logistical sites.

Live-fire Training

Weapons proficiency is a critical component of combat power. Fort Hood units train with the most modern and sophisticated weapon systems available. These weapons are constantly evolving to stay ahead of advancements in armament technology by threat forces. Fort Hood has some of the most modern live-fire training ranges in the world. These ranges provide realistic combat conditions and scenarios to train crews to exacting standards of gunnery proficiency as well as test the capabilities of new weapons systems. Live-fire training facilities must be continuously upgraded to keep pace with evolving technology and changes in war fighting doctrine. Fort Hood uses a 5-Year Range Modernization Program to manage upgrades and expansion of existing facilities and new construction projects to meet future training and evaluation requirements. Live-fire training facilities are located primarily in Live-Fire Areas (LF) 80–93 and Permanent Dugged Area (PD94; Fig. 1).

The Live-Fire Areas and PD94 (Fig. 1) cover about 25,335 ha (62,605 ac) in the central portion of the installation, bounded on the east, west, and south by the East Range, West Range, and South Range roads, respectively. Direct fire occurs inside these roads, and is directed toward PD94 and other target arrays. Indirect fire from artillery and Multiple Launch Rocket Systems (MLRS) is directed from numerous locations in surrounding maneuver areas. Much of the Live-Fire Area provides a buffer zone for PD94 and has limited impacts from exploding ordnance. The Live-Fire Areas provide training and evaluation facilities for all individual, crew-served, and major weapons systems, up to and including brigade live fire. These Live-Fire Areas are used by all active units assigned to III Corps and Fort Hood, as well as by attached units from the Army National Guard and the Army Reserve.

Modernized live-fire training facilities require continuous maintenance to maximize range design capability. Sensor devices must be serviced and cleared of concealing vegetation to ensure unimpaired operation. Target

arrays must be visible at maximum engagement ranges. A program of range maintenance to routinely clear vegetation from target arrays and sensor devices is a critical component of range operation.

Aviation Training

Fort Hood has one of the largest military aviation commands in the United States. The aircraft, primarily rotary-wing, are some of the most modern and sophisticated in the world. Aviation units on Fort Hood train at all levels from individual through battalion/squadron.

The training tasks accomplished in the training areas (Fig. 1) include all tactical maneuvers in accordance with each aircraft's aircrew training manual and the unit's standard operating procedures. This includes nap-of-earth, contour, and low-level flight. Fixed-wing aircraft of the Air Force and Air National Guard also conduct training missions in Fort Hood air space and use impact areas on the installation for weapons delivery practice.

Two major airfields are located on Fort Hood. The Hood Army Airfield is a 293-ha (724-ac) area located at the eastern end of the cantonment area. Hood Army Airfield is the primary airfield for rotary-wing air operations and has a 1,436-m (4,712-ft) runway. Robert Gray Army Airfield is an 867-ha (2,142-ac) area located at West Fort Hood with a 3,050-m (10,000-ft) runway. Several dirt landing strips are located on the installation for tactical air supply and support training.

Aircraft gunnery for AH-64 units is conducted on multi-purpose training ranges and PD94. However, the Dalton-Henson Range Complex (LF 80–82) is used most often for this training. Hellfire Missile Shots are conducted at Blackwell Multi-Use Range's Impact Area (PD94). Helicopter Door Gunnery is primarily conducted at Dalton Mountain Range or Crittenger Range (LF 85–86). National Guard and Army Reserve units use the Dalton-Henson Range Complex for aviation training.

Operational Testing

Fort Hood's large maneuver and Live-Fire Areas, coupled with III Corps' modernized force, provide excellent conditions for operational testing of various weapons, equipment, and doctrine. The U.S. Army Operational Test Command (OTC) is a tenant activity located at West Fort Hood

directly involved in training, doctrine, and combat development of the products that soldiers use on a daily basis and will use on the future battlefield.

Most OTC tests employ “user testing,” allowing front-line soldiers to try out new equipment or concepts. The tests generally encompass activities similar to those described in this report’s sections on maneuver, live fire, and aviation training.

Controlled/Prescribed Burning

Prescribed fire is a natural, economical, and effective management practice in some ecosystems. During the past 150 years in Texas, fire suppression practices have contributed substantially to the ecological imbalance of endangered species habitats as well as habitat for many sensitive wildlife species and non-listed wildlife species. In many instances, properly applied fire can be one of the better tools to correct this problem. However, fire presents a particular dilemma for the management of endangered species on Fort Hood. Recovery times differ for golden-cheeked warbler and black-capped vireo habitats after a stand-replacing fire. In two to five years golden-cheeked warbler habitat that burns on Fort Hood generally regenerates as black-capped vireo habitat. Regeneration to golden-cheeked warbler habitat can require 25 or more years post-disturbance. Because of fire’s potential effects, both positive and negative, on endangered species habitats, it plays an important role in management of endangered bird species habitats on Fort Hood.

During extremely hot and dry conditions in late February 1996, approximately 2,728 ha (6,741 ac) of endangered species habitat were burned by wildfires on Fort Hood. This included about 2,313 ha (5,716 ac) of warbler habitat and 415 ha (1,025 ac) of vireo habitat. The warbler habitat that burned substantially converted to vireo habitat during the subsequent two to five years. As of 2010, much of the burned area is continuing to undergo seral change in the vegetation. While some locations within the burned area still provide suitable vireo habitat, other locations are maturing beyond the shrubby vegetation preferred by vireos, thus becoming less suitable over time.

New fire protection policies have been implemented on Fort Hood as a result of the 1996 fires and consultation with the USFWS. Fort Hood currently has a fire danger rating system to alert trainers when

pyrotechnic operation should be limited or halted based on current (daily) weather and estimated moisture content of vegetation and soil. Details of this rating system are found in OPLAN 8-93, "Operation Brush Fire," and Fort Hood Regulation 350-40. These fire ratings are:

Condition Green: No restrictions on training. Troops may use pyrotechnics and incendiary munitions for training.

Condition Amber: Caution must be taken in use of pyrotechnics. Aerial flares are not to be used outside the impact area. Other pyrotechnics are to be used only in roadways, tank trails, in areas clear of vegetation, or in containers.

Condition Red: No pyrotechnics or incendiary munitions authorized for training purposes.

Condition Red with Waiver: Once a risk assessment is conducted by Range Control and the recommendation for training with waiver is approved by the Director, Range Control, specific restrictions are imposed on training units.

Currently, under all fire condition ratings, fires are reported to Range Control by military units or installation personnel. If the fires are within range fans where live-fire training is being conducted, units will cease firing until a fire risk assessment is conducted or control measures are implemented. Range Control will determine the location of the fire and risk to facilities, personnel, or sensitive resources such as endangered species habitats. If Range Control determines there is no risk to facilities or habitats, the fire will be allowed to burn. Typical examples are fires occurring in the permanently duded impact area (PD94; Fig. 1) where fires are extremely frequent and fuel loads are low. If a fire may risk endangered species habitat, Range Control will contact the installation Natural Resources Management Branch (NRMB) for an assessment of the risk based on proximity to high hazard areas, fuel load, topography, and other parameters. If the fire risk to habitats is obviously high, Range Control may immediately implement fire control actions concurrent with notification of the NRMB. Within the Live-Fire Areas, the first response is usually by a contracted helicopter on standby for fire control. Under Condition Red this helicopter is on 30-minute standby during 1100–1800

and two-hour standby during the rest of the day/night period. Other installation fire-fighting assets are available for fire control as needed.

Fort Hood will establish a “let burn” policy for range fires that occur during periods when Fire Danger Rating is Green or Amber. Under Green and Amber ratings, fires will be allowed to burn in all habitat areas within the Live-Fire Area unless there is obvious threat to personnel or facilities or until such time as changing environmental conditions warrant implementing increased fire control procedures.

Current prescribed burn policy emphasizes reduction of fuel loads in grasslands surrounding endangered species habitats on Fort Hood. Prescribed burn policies emphasize use of preventative prescribed fire to maintain blacklines near habitat areas annually. Fort Hood employs firebreaks in association with endangered species habitats to reduce fire risk. Reduction of fuel loads mitigates the threat of wildfire damage in these habitats. Prescribed burns are managed through the Fort Hood NRMB. Other objectives of the installation prescribed burn program are to reduce encroachment of Ashe juniper in all range sites, improve vegetation composition, reduce wildfire risk in the Live Fire area, and improve wildlife habitats.

Juniper Removal

After the listing of the warbler in May 1990, juniper cutting on Fort Hood was suspended temporarily following informal consultation with the USFWS. Since Ashe juniper is an essential component of the habitat for the warbler, it was determined by the USFWS that juniper removal may have a negative impact on this species.

During the period 1997–2000, under an agreement with the Natural Resources Conservation Service (NRCS), Fort Hood resumed mechanical clearing of juniper in old-field and other areas not occupied by warblers. These control efforts were focused on juniper removal on West Maneuver Training Areas and resulted in clearing juniper from approximately 14,500 ha (35,830 ac) from old fields and other non-endangered species habitat areas. All control efforts and contracts were coordinated through the Fort Hood NRMB to avoid impact on endangered species habitats. Control efforts were not allowed within a 100-m (328-ft) buffer around endangered species habitats.

From 2005 to 2010, juniper was removed from approximately 9,145 ha (22,598 ac) on the installation, including habitat and non-habitat areas. Of this acreage, approximately 2,307 ha (5,700 ac) was vireo habitat and 151 ha (372 ac) was warbler habitat. The USFWS has determined that juniper removal in vireo habitat typically does not adversely affect the species. In many instances juniper removal improves vireo habitat by thinning out the density of the shrubland, providing more sunlight for other species of woody shrubs, and maintaining the openness of the habitat preferred by vireos. Juniper removal within warbler habitat does adversely affect the warbler, therefore incidental take must be authorized by the USFWS for this activity. Incidental take for the 273 acres of juniper removal in warbler habitat was authorized by the 2009 Recovery Credit System biological opinion between Fort Hood and the USFWS and by the 2005 Fort Hood biological opinion.

Grazing

Cattle grazing is permitted on Fort Hood under a lease agreement with the Central Texas Cattlemen's Association. The current lease term is 1-Apr-2010 to 31-Mar-2015. This lease provides grazing opportunities on 80,000 ha (approximately 197,000 ac) of Fort Hood training area. Stocking rates will be driven by the results of annual forage inventories. Grazing is deferred or stocking rate is reduced where forage production fails to meet thresholds that allow for training impacts and land management practices such as prescribed burning. The lease agreement requires the lessee not to impact endangered species, historical, archaeological, architectural, or other cultural features on the installation, and requires compliance with local, state, and federal water pollution regulations.

Cowbird Control Program

Fort Hood conducts extensive operations to reduce numbers of brown-headed cowbirds (*Molothrus ater*) on the installation. The cowbird control program consists of trapping and shooting activities that target feeding concentrations of cowbirds throughout the installation and cowbird individuals in endangered species nesting habitat. The objective of the control program is to maintain the incidence of cowbird parasitism of black-capped vireo nests below 10 percent annually.

Summers and Norman (2004) provide details on the current implementation of the control program. Incidence of cowbird parasitism on black-capped vireo nests on Fort Hood in 2005 was 8.0 percent. However, the overall parasitism rate of vireo nests rose to 11.0 percent in 2010 due the implementation of a cowbird trapping cessation study on the western side of Fort Hood. This study took place from 2006-2010 with the objective of determining how the nest parasitism rate would respond to the cessation of trapping and determine if Fort Hood could reduce trapping efforts with minimal effects to the vireo. From 2005 - 2010, 10,138 cowbirds were removed from the installation averaging 1,690 individual cowbirds removed per year. Results of the cessation experiment suggest that cowbirds are still a threat to the vireo, as parasitism exhibited an increasing trend (5.7-31.3) on the unmanaged western half of the installation when compared to no increased parasitism rate on the managed eastern side of the installation (0.0-4.4). In 2011, Fort Hood resumed cowbird trapping and shooting efforts of the western side of the installation in an effort to reduce nest parasitism rates to pre-cessation experiment levels.

Recreation

The post is open to public hunting and fishing. Access is regulated by the Directorate of Plans, Training, Mobilization, and Security (DPTMS), Range Control Branch with the cooperation of Directorate of Family, Morale, Welfare, and Recreation (DFMWR) and the Natural Resources Management Branch. Over 80,500 ha (198,920 ac) are managed for fish and wildlife, including 100 surface ha (247 surface ac) of lakes and ponds, 88 km (55 mi) of rivers and permanent streams, and 85 km (53 mi) of shoreline access to Belton Lake. White-tailed deer, wild turkey, migratory waterfowl, northern bobwhite, and mourning dove are hunted during restricted seasons. Deer and turkey hunts are carefully controlled. Small-game hunting with shotgun is available in accordance with State of Texas seasons and bag limits.

Various low-impact outdoor recreation activities take place at the Belton Lake Outdoor Recreation Area located adjacent to TA 36. These include a swimming beach, camping, boating, trail bicycling, and cottage use. Boy Scout Camps are located in TA 36 and LTA 203. Hiking and nature observation activities are also allowed on many parts of the installation and are coordinated through Range Control Division. Mountain bike riding is restricted to a designated trail system at Belton Lake Outdoor

Recreation Area. LTA 111 has been approved for use by ATVs and motorcycles. However, no off road recreational vehicle use is permitted anywhere else on the installation.

Species Accounts and Current Status on Fort Hood

FEDERALLY-LISTED SPECIES

Golden-cheeked Warbler

Nomenclature and Classification

Scientific Name: *Dendroica chrysoparia*

Family: Parulidae

Original Description: Sclater and Salvin 1860

Type Specimen: Adult female collected by Osbert Salvin near Tactic, Vera Paz, Guatemala, on 4 November 1859. Specimen in the British Museum 1885-3-8-262.

Current Federal Status: Endangered (55 FR 53153-53160 [27 December 1990]).

Past Federal Status: Emergency listing as Endangered (55 FR 18844-18845 [4 May 1990]); Category 2 (47 FR 58454 [30 December 1982], 50 FR 37958 [18 September 1985], 54 FR 554 [6 January 1989]).

History of the Taxon

The name of this species has not changed since the original description of a specimen collected in Guatemala (Sclater and Salvin 1860). The first U.S. specimen was collected by D.C. Ogden in Bexar County, Texas (Dresser 1865). The species may have originated as part of a super species complex including the black-throated green warbler, the Townsend's warbler, and the hermit warbler (Mengel 1964, Lytle 1994). Pulich (1976) completed the definitive and only major bioecological study of the golden-cheeked warbler. Sections of this study have been updated in Ladd and Gass (1999).

Because of rapid urban development, there is considerable interest in the status of the species in the Austin–San Antonio corridor. The Army is conducting studies of the species on Fort Hood, Texas, and the Camp Bullis Training Site of Fort Sam Houston, Texas.

FORT HOOD: Monitoring and research activities for the golden-cheeked warbler on Fort Hood were initiated in 1991 and continue through the present. Current and past research and conservation efforts include point count surveys to determine population trends, demographic monitoring in selected study sites, research in habitat selection, studies to determine the effects of habitat fragmentation and wildfire on golden-cheeked warbler demographics, and population viability analyses.

Description

The golden-cheeked warbler (*Dendroica chrysoparia*) is a small, Neotropical migratory songbird (Pulich 1976). Both males and females have yellow cheeks outlined in black and a thin black eye line (Oberholser 1974, Ridgway 1902, Pyle et al. 1997). The back feathers of older males have large, distinct black centers while the back feathers of females and younger males have smaller, less distinct black centers (Pyle et al. 1997). The center of the chin and throat of older males is black while the center of the chin of females and younger males is yellow or white with variable amounts of black along the side of the throat (Pyle et al. 1997). The upper breast and abdomen of both sexes are white with lateral black streaking along the flanks (Oberholser 1974, Ridgway 1902, Pyle et al. 1997). Golden-cheeked warblers that have completed their first pre-basic molt can be reliably sexed by plumage characteristics (Peak and Lusk *in preparation*).

FORT HOOD: Plumage characteristics are consistent with those within the range.

Geographic Distribution

The golden-cheeked warbler is the only North American bird species whose breeding range is restricted to a single state (Texas). Currently, its nesting range is confined to 25 counties in central Texas. Historically, it has been recorded in 38 of the 254 counties in Texas (Ladd and Gass 1999). It breeds exclusively in the juniper-oak (*Juniperus ashei-Quercus* spp.) woodlands of the Edwards Plateau, Lampasas Cut-Plain, and Llano Uplift regions of central Texas (Pulich 1976, Oberholser 1974, Kroll 1974). The range of the golden-cheeked warbler corresponds closely with that of Ashe juniper (Pulich 1976).

The golden-cheeked warbler winters in the Central American pine-oak (*Pinus-Quercus* spp.) forest region. This region extends through the highlands of southern Mexico, Guatemala, central Honduras, northern El Salvador, and northwestern Nicaragua. Analysis of habitat characteristics collected at wintering sites demonstrate this species occurs in areas with $\geq 30\%$ encino (deciduous) and roble (semi-deciduous) oak species and 70% pine species between 900-2,000 masl (Conservation Plan for Mesoamerican Pine-Oak Forests and the Golden-cheeked Warbler 2007).

FORT HOOD: Known distribution of potential warbler habitat on Fort Hood is based on visual interpretation of aerial photography and ground surveys (Fig. 2). Currently, it is estimated that approximately 20,782 ha (51,353 ac) of suitable golden-cheeked warbler habitat occur on Fort Hood. Warbler occurrence is widespread and has been documented in all training areas with suitable habitat on the installation.

Migration

The golden-cheeked warbler is a migratory species that arrives early on its breeding grounds in Texas. The earliest spring arrival known to Pulich (1976) was a 2 March arrival in Austin in 1956. It is not certain whether male warblers arrive earlier than females. The mean spring arrival date for Bexar, Dallas, Kerr, and Travis Counties was between 12 and 16 March.

The species begins post-breeding migration rather early, with some birds headed toward their wintering grounds as early as mid-June (Pulich 1976). The main portion of the population leaves the breeding grounds by the end of July (Ladd and Gass 1999). Observers have recorded the presence of this species on the wintering grounds as early as July and as late as April (Conservation Plan for Mesoamerican Pine-Oak Forests and the Golden-cheeked Warbler 2007).

FORT HOOD: The earliest documented spring arrival on Fort Hood is 2 March. Peak arrival period is between 15 and 25 March. Similar to other populations throughout the range, most warblers on Fort Hood begin migration by the end of July.

Habitat

General: The USFWS recovery plan provides a general overview of warbler habitat requirements (USFWS 1992). Golden-cheeked warbler

habitat includes Ashe juniper and a variety of oak species. Several other hardwood species also occur (Pulich 1976). Fifteen stands sampled by Wahl et al. (1990) were dominated by Ashe juniper and Texas oak. Other important tree species included live oak, cedar elm (*Ulmus crassifolia*), Lacey oak (*Quercus laceyi*), Arizona walnut (*Juglans major*), post oak (*Quercus stellata*), and bigtooth maple (*Acer grandidentatum*). Studies by Johnston et al. (1952) and Huss (1954) reported juniper–oak stands occupied by the golden-cheeked warbler with juniper composition of 14 to 50 percent and hardwood composition of 20 to 70 percent. For good warbler habitat at Meridian State Recreation Area, Kroll (1980) reported 52 percent Ashe juniper, 33 percent shin oak (*Quercus sinuate* var. *breviloba*), and 5 percent Texas oak. Similarly, the most important species in warbler habitat at Kerr Wildlife Management Area were Ashe juniper, Texas oak, and shin oak (Ladd 1985). While Ashe juniper is the dominant woody species throughout the warbler range, the composition of oak species varies geographically (Ladd 1985, Ladd and Gass 1999).

Pulich (1976) suggested that the golden-cheeked warbler requires woodland habitat with junipers averaging 50 years of age and 20 feet in height with some deciduous cover. Kroll (1980) quantified habitat of the species at Meridian State Recreation Area and found that 86 percent of the junipers within the study area were less than 50 years old (average 40.8 ± 29.4 years). Good habitat that was consistently occupied from year to year differed significantly from unoccupied areas. Good habitat was characterized by older Ashe juniper (mean of 47.4 versus 25.6 years of age in good vs. poor habitat) but a greater variability in age, greater distance between trees, and a smaller juniper:oak density ratio (1.35 vs. 2.77). The warbler appears to be attracted to more mesic areas within the juniper–oak complex, such as canyons and seepy hillsides where deciduous hardwood vegetation is more abundant (Diamond, personal communication). Recent observations indicate warblers will reoccupy second growth areas (Ladd, personal communication; Diamond, personal communication) presumably in areas that have the appropriate mixture of juniper and deciduous oaks. Arnold et al. (1996) reported that 23 ha may be the minimum threshold size of habitat in which golden-cheeked warblers can produce young. Coldren (1998) found that golden-cheeked warblers select for habitat patches > 100 ha.

FORT HOOD: Warblers on Fort Hood occupy similar habitat to that described above. Peak (*in review*) found that golden-cheeked warbler density did not differ between upland and slope habitat.

Nest Sites: Chapman (1968) reported that the favorite nesting areas of the golden-cheeked warbler were “isolated patches or clumps of scrubby cedar, with scant foliage on the summits of the scarped canyon slopes and in the thick cedar ‘brakes’.” Nests are placed in juniper trees and a variety of hardwood tree species (Chapman 1968, Pulich 1976). Nest height varies from 1.8 to 6.5 m, averaging 4.6 m (Brewster 1879, Chapman 1968, Pulich 1976). Nests average 8 cm in external width and 5 cm in external depth. They are composed mostly of bark collected in strips from juniper trees by female golden-cheeked warblers. Kroll (1980) estimated that juniper bark does not start to peel sufficiently for warblers to collect until juniper trees are about 20 years of age.

FORT HOOD: Nests have been found in Ashe juniper, Texas red oak, post oak, Texas ash (*Fraxinus texensis*), shin oak, blackjack oak (*Quercus marilandica*), slippery elm (*Ulmus rubra*), cedar elm, hackberry (*Celtis laevigata*), pecan (*Carya illinoensis*) and Plateau live oak trees. Nest heights ranged from 2.0 m to 14.7 m, with an average height of 5.7 m (Peak et al. 2011).

Foraging Site: The golden-cheeked warbler forages for insects in tree canopies (Smith 1916, Simmons 1924, Pulich 1976). Essential foraging habitat is provided by oak species within the habitats occupied (Kroll 1980, Ladd 1985, Wahl et al. 1990). Beardmore (1994) reported that oaks were used out of proportion to availability during April, but in proportion to availability during May and June. Fifty-seven percent of the foraging observations made by Kroll (1980) found warblers in oaks. Beardmore (1994) also reported foraging differences between male and female golden-cheeked warblers.

FORT HOOD: No data are available on foraging preferences on Fort Hood although foraging behavior is likely similar to that observed in other parts of the warbler’s range.

Food Resources

The golden-cheeked warbler is considered a generalist, consuming a wide variety of arthropods including Lepidopterans, Coleopterans,

Hemipterans, Homopterans, Hymenopterans, Dipterans, Psocopterans, and Arachnids (Pulich 1976, Wharton et al. 1996). Kroll (1980) observed that most prey items used by the warbler were of Lepidopteran larvae (54 percent) and Orthopterans (13 percent).

FORT HOOD: No data are available on food resources on Fort Hood although food resources are likely similar to that observed in other parts of the warbler's range.

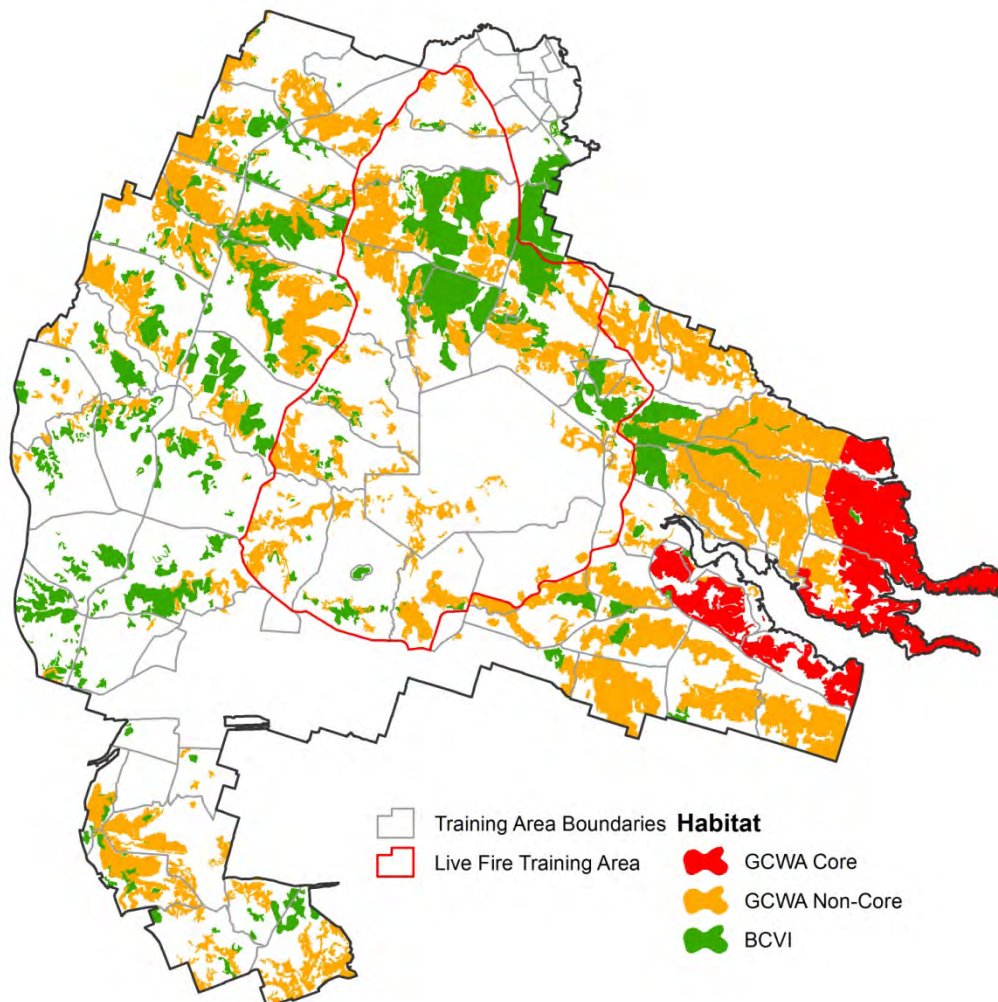


Figure 2. Golden-cheeked warbler and black-capped vireo habitats on Fort Hood, Texas.

Population Estimates

Pulich (1976) estimated that the breeding population of the warbler in 1962 and 1974 was between 15,000 and 17,000 birds. Wahl et al. (1990) estimated a range of 4,822 to 16,016 individuals in 1989. The two

estimates are not directly comparable, because they were derived in different ways (Wahl et al. 1990). Also, Wahl et al.'s (1990) estimate may be inflated since not all males are mated and all available habitat may not be fully occupied at the assumed average density of 15 pair per 100 ha.

Population estimates were derived from estimates of habitat availability and population density. Most studies report golden-cheeked warbler territory sizes ranging from 1.9 to 4.3 ha per pair (Ladd 1985). Wahl et al. (1990) reported density estimates of 0 to 62.5 males per 100 ha with a median of 15 per 100 ha for several sites throughout the golden-cheeked warbler's range. Pulich (1976) classified warbler habitat into excellent, average, and marginal corresponding to 12.3, 5.0, and 2.9 pair per 100 ha.

FORT HOOD: Between 1992 and 2010 the mean number of golden-cheeked warblers reported on point count transects increased (Fig. 3 Peak and Moe 2010a). Mean number of detections/point was 0.802 for 2010. The mean number of detections from 2000–2010 suggests that abundance of the golden-cheeked warbler on Fort Hood may be stabilizing (Peak and Moe 2010a).

Currently, it is estimated that approximately 21,422 ha (53,935 ac) of suitable golden-cheeked warbler habitat occurs on Fort Hood (Fig. 2). Estimated abundance from 491 point counts conducted in 2008 was 4482–7236 male golden-cheeked warblers not including extrapolation to the Live-fire Area.

Survival and Dispersal

One-year banding returns reported by Pulich (1976) were 44.8 percent for males and 22.2 percent for females. USFWS (1996a) estimated 30 percent juvenile and 57 percent adult annual survival.

FORT HOOD: USFWS estimates of juvenile and adult survival were based on mark–recapture analysis of Fort Hood banding return data (USFWS 1996a). In the intensive study area in TA 13B, one-year banding

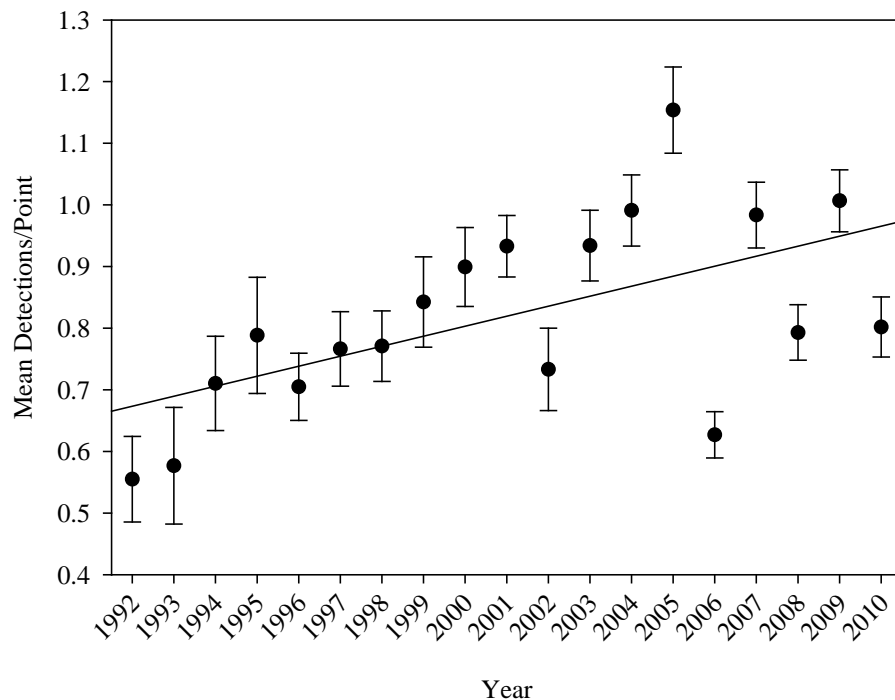


Figure 3. Mean detections/point/year of the golden-cheeked warbler increased during 1992–2010 on Fort Hood Military Reservation, Texas, USA (Peak and Moe 2010a).

returns of adult males ranged from 30 percent (15 of 50 males) in 1996 to 65.6 percent (21 of 32 males) in 1995, averaging 48 percent (61 of 127) for the period 1992–96 (Jette et al. 1998). Return rates of adult males during 2000–2010 ranged from 22.52 percent in 2005 to 47.89 percent in 2004 (Peak and Thomas 2010b).

Reproductive Biology

The golden-cheeked warbler is generally considered sexually monogamous, but cases of polygyny have been documented (Peak et al. 2011). The nesting cycle is as follows: construction (4–5 days), laying (4 days), incubation (11–12 days), and nestling (9–12 days). Adults continue to feed young for 28–45 days after they leave the nest. Construction of first nesting attempts is initiated during mid- to late March, but most first nesting attempts occur during early April (Peak et al. 2011). Pairs may make up to 5 nesting attempts throughout the breeding season when a previous attempt is not successful (Peak et al. 2011). Clutches typically consist of four eggs, sometimes three, and rarely five (Pulich 1976). The

female performs most of the nesting duties (Pulich 1976). While males assist in feeding young during the nestling stage, they do not brood the young.

Of the 33 nests observed by Pulich (1976), 58 percent were parasitized by brown-headed cowbirds (cowbirds hereafter). Of the 55 eggs laid, 55 percent were lost or deserted due to cowbirds. Twenty-seven percent of the eggs laid fledged young.

FORT HOOD: The overall daily survival rate (95%CI) for 2010 was 0.95 (0.94, 0.97) and overall period survival estimate, assuming a 3-, 12-, and 10-day laying, incubation, and nestling stage, respectively, was 0.39 (0.15, 0.62). Period nest survival did not differ among years (Fig. 4 Peak and Thomas 2010b). Pairing success during 2003–2010 ranged from 81.25 percent in 2003 to 96.90 percent in 2009 (Peak and Thomas 2010b). During 1992–96, observed mating success ranged from 79 to 94 percent, with overall average mating success of 89 percent for adult males (Jette et al. 1998). Cowbird parasitism of golden-cheeked warblers on Fort Hood has been documented in other years but incidence appears low (Hayden et al. 2001). No evidence of cowbird parasitism has been documented in nests or fledged family groups from 2000–2010 (Peak and Thomas 2010b).

Interactions with Other Species

Habitat Associates: Other breeding birds found in association with the golden-cheeked warbler throughout most of its range include the black-and-white warbler, mourning dove, yellow-billed cuckoo, greater roadrunner, eastern screech owl, great-horned owl, barred owl, American crow, red-tailed hawk, red-shouldered hawk, common grackle, blue jay, western scrub jay, cliff swallow, Chuckwill's widow, Carolina chickadee, Bewick's wren, Carolina wren, canyon wren, northern flicker, downy woodpecker, tufted titmouse, blue-gray gnatcatcher, white-eyed vireo, brown-headed cowbird, summer tanager, northern cardinal, painted bunting, and lark sparrow (Pulich 1976, Arnold et al. 1996, Jette personal communication).

Arnold et al. (1996) reported that, of the 23 predators and parasites found in association with the golden-cheeked warbler, only the brown-headed cowbird, greater roadrunner, and red-tailed hawk were found more frequently with warblers than without.

FORT HOOD: Similar habitat associates are observed on Fort Hood.

Competition: There probably is little competition from others of the same family as the golden-cheeked warbler occupies such a narrow ecological range (Pulich 1976).

FORT HOOD: Aggressive interactions are observed between closely related black-throated green warblers and golden-cheeked warblers on Fort Hood during migration. Black-throated green warblers are not resident breeders in Texas. No aggressive interactions have been observed with other species.

Depredation: Direct depredation on adults has not been observed frequently. However, nests are depredated by snakes, grackles, jays, and possibly squirrels (Pulich 1976, Pease and Gingerich 1989). Red fire ants are a potential problem (Pulich 1976). Reidy et al. (2008) monitored 68 golden-cheeked warbler nests in 2005, 2006, and 2008 with infrared video cameras and time-lapse recorders and identified predators at 20 of them. Texas rat snakes (*Elaphe obsoleta lindheimerii*) depredated 8 nests, western scrub jays (*Aphelocoma californica*) depredated 6 nests, Cooper's Hawks (*Accipiter cooperii*) depredated 2 nests, fox squirrels (*Sciurus niger*) depredated 3 nests, and fire ants (*Solenopsis* sp.) depredated one nest. Reidy et al. (2009) estimated that 14.6 percent of breeding females were depredated on the nest during the breeding season based on observed survival rates and assuming females whose first nesting attempt was unsuccessful and which survived initiated a subsequent nesting attempt.

FORT HOOD: Stake et al. (2004) monitored 67 golden-cheeked warbler nests with infrared video cameras and time-lapse recorders to identify predators. Rat snakes (*Elaphe* spp.) were the most frequent predators, depredating 12 nests and capturing three adult females. A variety of avian predators depredated seven nests, including three American crows (*Corvus brachyrhynchos*), two brown-headed cowbirds (*Molothrus ater*), one western scrub jay, and one Coopers hawk. Fox squirrels depredated four nests and were the only mammalian predators recorded. Post-outcome recordings (i.e., after young fledged or nests failed) revealed western coachwhips (*Masticophis flagellum testaceus*), mice (*Peromyscus* sp.), and Greater roadrunners (*Geococcyx californianus*) as potential predators, though they were not recorded at active nests.

Parasites: Pulich (1976) observed no mites or ectoparasites in golden-cheeked warbler nests.

FORT HOOD: Small white mites have been observed on the rectrices of adult warblers during banding. No other data are available on parasites of warblers on Fort Hood.

Threats to Survival

Threats to golden-cheeked warbler identified in the 1994 Recovery Plan (USFWS 1992) included loss of breeding, wintering, and migration habitat, habitat fragmentation, nest parasitism by cowbirds, and destruction of oaks. A more recent population viability and habitat assessment (USFWS 1996a) also identifies concerns related to reservoir development, oak wilt, predation, and secondary effects of urbanization in proximity to warbler habitats.

Habitat loss is attributed to urban development and clearing associated with agricultural practices. Pulich (1976) estimated a juniper eradication program for range improvement reduced juniper acreage in Texas by 50 percent between 1950 and 1970. Wahl et al. (1990) reported warbler breeding habitat loss of approximately 4 percent per year over a 10-year period in urbanizing areas and about 2 to 3 percent per year in rural areas during the past 20 years. This work was based on satellite imagery from 1974 through 1981. More recent satellite imagery may show that the rate of habitat loss has increased in recent years (Grzybowski et al. 1990). Estimates of loss of wintering habitat in Central America (2-4 percent per year) are similar to estimated losses of breeding habitat (Jahrsdoerfer 1990, Lyons 1990).

Loss of habitat has resulted in increased fragmentation of warbler habitat. Wahl et al. (1990) estimated a 53- to 84-percent reduction in suitable habitat (> 50 ha in size) due to habitat fragmentation around urban areas and a 56- to 89-percent reduction in rural areas. Habitat fragmentation has been suggested as a cause of population declines in other songbird species (Gates and Gysel 1978, Brittingham and Temple 1983, Wilcove 1985, Andren and Angelstrom 1988, Pease and Gingerich 1989). However, habitat fragmentation may make warblers more susceptible to depredation by blue jays in urban areas (Engels and Sexton 1994) and more susceptible to nest parasitism by cowbirds (Brittingham and Temple 1983, Robbins et al. 1989, Thompson 1994). Coldren (1998) found that golden-cheeked

warblers selected for habitat patches > 100 ha and that territory placement selected against urban land uses including commercial development, entertainment, forested non-warbler habitat, high-density transportation, and utilities. Reidy et al. (2009b) found decreased nest survival near edges and in areas with increased open edge density.

Cowbird parasitism reduces productivity in host species (Brittingham and Temple 1983). Golden-cheeked warblers are susceptible to cowbird parasitism (Pulich 1976). Land use practices that increase the incidence of cowbird parasitism such as habitat fragmentation, cattle grazing, and increased urbanization may limit productivity in golden-cheeked warblers.

Oaks are a necessary component of warbler habitat. Loss of oaks in warbler habitat is attributed to disease (oak wilt fungus, *Ceratocystis* spp.) and overbrowsing by white-tailed deer, goats, and various exotic ungulates.

FORT HOOD: There has been no evidence to date of overbrowsing of oaks on Fort Hood (J. Cornelius, pers. comm.). Incidence of oak wilt fungus has been observed on Fort Hood and its further spread is being monitored and treated. Studies on Fort Hood to determine the efficacy of basal girdling to control spread of oak wilt were conducted in 2004 and 2005 (Reemts et al. 2005). Treated plots had a lower incidence of new infections compared with control plots. While there have been no juniper eradication contracts in warbler habitats on Fort Hood since 1990, junipers are cleared from old fields that are not suitable as warbler habitat. The only significant loss of warbler habitat comes from fires. Warbler habitat is not altered significantly by military training since vehicle transit is limited through the dense vegetative growth typical of warbler habitat. Maas-Burleigh (1997) reported that golden-cheeked warbler males in more fragmented landscapes on Fort Hood reproduced less often than males in contiguous forest. Peak (2007) found that nest survival decreased as forest edge density increased and as the breeding season progressed.

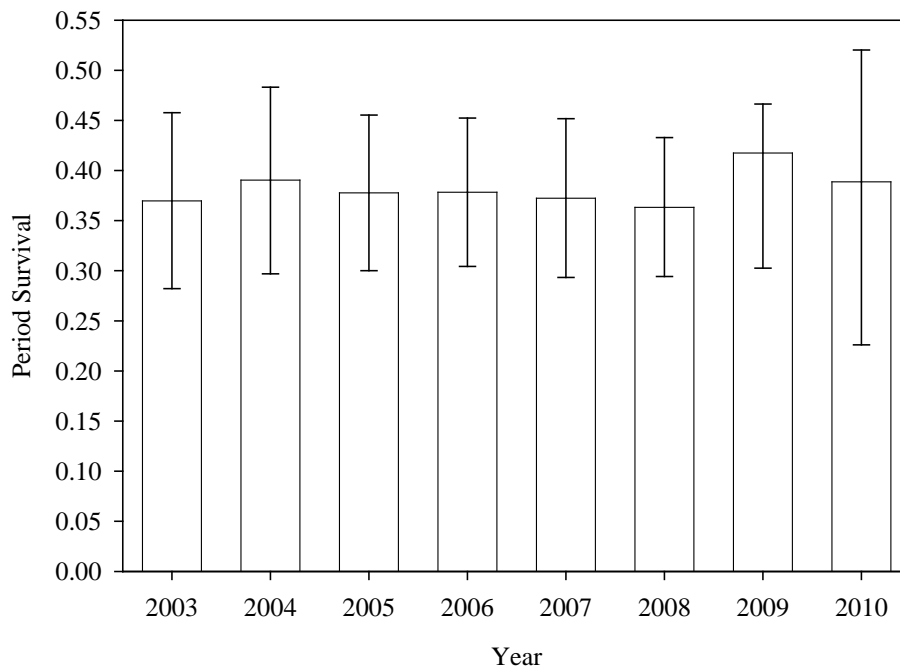


Figure 4. Period survival rate (mean \pm 95% confidence interval) for the golden-cheeked warbler nests did not differ among 2003–2010 on Fort Hood Military Reservation, Texas, USA. Effective sample size is 4692 for all years (Peak and Thomas 2010b)..

Black-capped Vireo

Nomenclature and Classification

Scientific Name: *Vireo atricapilla* Woodhouse

Family: Vireonidae

Original Description: Woodhouse 1852

Type Specimen: Adult male collected by S. W. Woodhouse on 26 May 1851 at the San Pedro River 10 miles from its source—Devil’s River, near Sonora, Sutton County, Texas (Deignan 1961). Deposited in the National Museum of Natural History, number 15040.

Current Federal Status: Endangered (52 FR 37420-37423 [6 October 1987]).

Past Federal Status: Category 2 (47 FR 58454 [30 December 1982]); Category 1 (50 FR 37958 [18 September 1985]).

History of the Taxon

Grzybowski (1995) provides a recent account of this species. The species was first described by Woodhouse (1852). Until recently, there were few major studies of the black-capped vireo. Bunker (1910) first studied nesting, stomach contents, and plumage of the vireo in Blaine County, Oklahoma. In another study, Graber (1957, 1961) examined distribution, ecology, and population biology of the species. Marshall et al. (1985) wrote a profile of the species, focusing on the distribution and abundance in the United States and Mexico. Grzybowski has continued studies on the species in parts of Texas and Oklahoma, and authored the species Recovery Plan (USFWS 1991) and the species account for the Birds of North America publication (Grzybowski 1995). Tazik (1991) initiated research on one of the largest concentrations of nesting black-capped vireos north of Mexico, on Fort Hood, Texas. Recent research efforts include studies of genetics (Fazio et al. 2004, Barr et al. 2008, Zink et al. 2010) and nest depredation (Campomizzi et al. 2009, Conkling 2010), and habitat (Myers 2006). Army-sponsored studies and/or monitoring are ongoing at Fort Hood, Texas and Fort Sill, Oklahoma. Other monitoring and research activities are conducted on other local, state, and Federal properties in Texas, Oklahoma, and Mexico.

FORT HOOD: Research and conservation efforts on Fort Hood have been numerous. Recent research projects have included studies of nest depredation (Stake and Cimprich 2003), conspecific attraction (Ward and Schlossberg 2004), the relation between nest success and snake activity (Sperry et al. 2008), nest parasitism and cowbird management (Kostecke et al. 2005, Summers et al. 2006), selection of nest sites (Bailey and Thompson 2007), demography in relation to habitat (Noa et al. 2007), survival (Kostecke and Cimprich 2008), age and sex determination (Cimprich 2005a, 2007a, 2009), and adrenocortical responses (Butler et al. 2009).

Description

The black-capped vireo is a small songbird approximately 11 cm in length and 8–10 grams in mass. The sexes are dimorphic. On the adult male, the crown and upper half of the head is black and sharply demarcated. Black extends farther posterior on older males. The back is olive-green and undersides are white with olive-yellow flanks. Wings have two pale yellow or white wing bars. The adult female is similar in color except for a gray

crown, often with some black around the white eye mask. Adults have a red to reddish-brown iris. Immature birds have a brown or gray iris (Grzybowski 1995).

FORT HOOD: Black-capped vireos on Fort Hood are similar in appearance to the description above.

Geographic Distribution

The breeding range of the black-capped vireo formerly stretched from south-central Kansas through central Oklahoma and central Texas into central Coahuila, Mexico, and possibly Nuevo Leon and Tamaulipas (Graber 1961, American Ornithologists' Union 1983). The northern extent of the range has contracted significantly over the past half-century (Grzybowski 1995, Grzybowski et al. 1986). The species has not been observed in Kansas since the late 1950s (Tordoff 1956, Graber 1961) and reaches its northern limit in Blaine County, Oklahoma (Grzybowski et al. 1986). Since 2000, the vireo is known to occur during the breeding season in 38 Texas counties, three Oklahoma counties, and three Mexican states (Wilkins 2006). Currently, the largest known populations breed at three sites: the Wichita Mountains (Comanche County, Oklahoma), Fort Hood, and Kerr Wildlife Management Area (Kerr County, Texas) (Wilkins 2006).

FORT HOOD: A single black-capped vireo vocalization was reported in a 1979 baseline ecological report for Fort Hood. Vireos were subsequently observed in 1985 by John Cornelius, a biologist with the NRMB at Fort Hood. These initial findings comprised a small number of birds (Tazik et al. 1993a). Inventory, monitoring, and research efforts were initiated in 1987 and continue through the present. Current known vireo habitat on Fort Hood is shown in Fig. 2. Vireos are known to exist elsewhere on the installation, but are typically isolated territories within habitat shown in Fig. 2 as golden-cheeked warbler habitat.

Migration

The black-capped vireo is migratory and is known to winter along the western coast of Mexico from Sonora to Oaxaca (Graber 1961). Although extensive winter surveys have not been done, most observations have been recorded in Sinaloa and Nayarit (Grzybowski 1995). Vireos first arrive on Texas breeding areas during late March to mid-April, and in Oklahoma during mid-April to early May (U.S. Fish and Wildlife Service 1991). Fall

migration takes place during August and September. Graber (1961) reported that young birds leave first, followed by adult females, and then adult males.

FORT HOOD: On Fort Hood, males typically are first observed in late March or early April. It is suspected that females arrive shortly thereafter. Many males are no longer strongly territorial by the end of July, although some have nested into August. Most black-capped vireos appear to have departed by mid-September.

Habitat

General: The black-capped vireo is found in hardwood scrub habitat that typically exhibits a patchy or clumped distribution with a scattering of live and dead trees. Characteristic is the presence of hardwood foliage to ground level. Scrubby oaks are a major feature of the habitat. Blackjack oaks are dominant in Oklahoma. Shin oak and Texas oak are the dominant oaks in vireo habitats in Texas (Graber 1961, Grzybowski 1986, Grzybowski et al. 1994). Dense juniper stands typically are avoided. In the eastern parts of the range, preferred habitat often results from fire within stands of mature, mixed oak–juniper woodlands and remains suitable for 5 to 25 years after fire. In the arid western portions of the range, shrub habitats occupied by the vireo represent climax conditions rather than early seral habitats (C. Farquhar and Kathryn Smith, personal communication). The best vireo habitats found by Marshall et al. (1985) were in 10- to 15-year-old burns that were hot enough to kill junipers. Data from some study sites indicated that there were significant differences with regard to the vegetation structure in territories held by first-year males compared to those held by older males (Grzybowski et al. 1994). First-year males tended to occupy areas that had less shrub cover.

FORT HOOD: Black-capped vireo habitat at Fort Hood typically is shrubby, and ephemeral with a “clumped” vegetation structure. Most habitat patches were caused by accidental fires or mechanical clearing related to military training and operations. Sites are generally occupied by vireos from 4 to 25 years following disturbance. The most common tree/shrub species found in black-capped vireo habitat on Fort Hood were shin oak, flame-leaf sumac (*Rhus lanceolata*), Ashe juniper, Texas oak, skunkbush sumac (*Rhus trilobata*), Texas redbud (*Cercis canadensis* var. *texensis*), and Texas ash (Tazik et al. 1993b). Tree/shrub species composition on vireo territories is variable, and that habitat structure (i.e.,

presence of low hardwood scrub) is a more critical factor in habitat selection than species composition (Tazik et al. 1993b). The current estimate of suitable black-capped vireo habitat on Fort Hood is 9,083 ha (22,444 ac).

Nest Site: The nest is open-cupped and pennisle, about 5.8–6.2 cm in depth and 5.9 cm wide, and typically is located 0.5 to 1.5 meters above ground (Graber 1961). Nests consist largely of dried leaves and bark strips bound with spider web with a lining of fine grass. Other materials may include cotton-like plant fibers, paper, and silk arthropod egg cases. A variety of woody species common to the general habitat are used as nest substrates. As with the species composition of the general habitat, nest substrates vary geographically. Blackjack oak is the most frequently used species in Oklahoma while shin oak and Texas oak are frequently used in Texas (Graber 1961, Grzybowski 1986). Juniper and live oak are used but less than in proportion to availability (Grzybowski 1986).

FORT HOOD: Nest construction on Fort Hood is similar to that observed throughout the species' range. Strips of juniper bark are a major component of nearly every nest at this location and faded pieces of plastic flagging tape are often included. Mean nest height from 2006 to 2010 was 0.88 m (Cimprich 2006, 2007b, 2008, Cimprich and Comolli 2009, 2010). The most common nest substrates are shin oak, Texas red oak, Texas redbud, Ashe juniper, and Texas ash. Other species are used less commonly but regularly including Plateau live oak, cedar elm, rusty blackhaw (*Viburnum rufidulum*), Mexican plum (*Prunus mexicana*), evergreen sumac (*Rhus virens*), elbow-bush (*Forestiera pubescens*), Mexican buckeye (*Ungnadia speciosa*), and Carolina buckthorn (*Frangula caroliniana*) (Cimprich 2006, 2007b, 2008, Cimprich and Comolli 2009, 2010). Several other shrubs, trees, and vines are occasionally used as nest substrates.

Foraging Sites: The vireo is a foliage-gleaning insectivore that forages among the trees and shrubs in its habitat. It rarely feeds on the ground (Graber 1961). Foraging substrate preferences have not been quantified but may prefer deciduous substrates such as oaks (Grzybowski 1995).

FORT HOOD: Little is known of the foraging substrates at Fort Hood, but low hardwood vegetation appears to be used (Tazik et al. 1993b).

Vireos also have been observed foraging in taller junipers and oaks when tending fledglings.

Food Resources

Graber (1961) quantified the stomach contents of 11 black-capped vireos. Insect larvae constitute the bulk of the diet. Lepidopteran larvae predominate followed by Coleopteran larvae. Other animal matter includes spiders, centipedes, Neuroptera, Odonata, Hemiptera, and Homoptera. The young are fed small larvae, with food items increasing in size as the young grow. Grasshoppers and other Orthopterans may contribute as much as one-third of their diet.

FORT HOOD: Dietary studies of the black-capped vireo have not been conducted at Fort Hood but diet is likely similar to that observed in other parts of the vireo's range.

Known Population

Wilkins et al. (2006) summarized information concerning the known populations in Oklahoma, Texas, and Mexico based on direct counts of birds rather than estimates derived from surveys. They report a total count of 6,269 vireos over the period 1996 to 2005 of which 56% of the total was from Texas, 40% from Oklahoma, and 4% from Mexico. The relatively small number counted in Mexico was likely a reflection of limited survey effort in that country and probably underestimates the portion of the total population breeding there.

FORT HOOD: Distance sampling based on surveys at 685–850 points has been used to estimate the abundance of vireos at Fort Hood. The estimate for 2010 was 4,566 male black-capped vireos (Cimprich and Comolli 2010) with a 95% confidence interval of 3,903–5,343. No trend was detected in vireo abundance from 2005 through 2010 (Cimprich and Comolli 2010).

Territory Size and Density

Graber (1961) reported an average territory size of 1.5 ha. Jim O'Donnell reported an average territory size of about 3 ha in Travis County, Texas (in Marshall et al. 1985). Graber (1961) also reported that the smallest

breeding population she ever found consisted of five males and three females.

FORT HOOD: At Fort Hood, Tazik and Cornelius (1993) reported an average territory size of 3.6 ha, ranging from 1.9 to 7.0 ha. More recently, Cimprich and Comolli (2010) reported a smaller average territory size of 1.09 ha for 210 territories monitored in 2009 and 2010. Density estimates in 2010 were 0.45 males/ha in shrub-dominated sites and 0.38 males/ha in sites with a mix of shrubs and trees (Cimprich and Comolli 2010). In contrast to Graber (1961), at Fort Hood there are regular observations of only one or two pairs at a given location. These isolated territories have been successful in fledging young.

Survival

Graber (1961) found that 69 percent of the males that she banded returned the following year, but that only 41 percent of females returned.

Grzybowski (1990) reported a similar difference between sexes; 65 percent for males versus 41 percent for females in main colony sites in Texas. One-year returns in the Wichita Mountains of Oklahoma were 62 percent for males and 44 percent for females (Grzybowski 1989a). The difference between sexes may be due to several factors: greater inconspicuousness of females compared to males, less site tenacity on the part of females, or a real difference in survivorship between the sexes.

Grzybowski (2005) estimated that annual adult female survival in the Wichita Mountains ranged from 0.57 to 0.63. He also estimated that juvenile survival in this population was 0.40–0.57. These estimates assume that this population is closed, that is, immigration and emigration do not occur. However, the extent of long-distance dispersal in this species is unknown.

FORT HOOD: Between 2006 and 2010, the estimated return rates of adult black-capped vireos at Fort Hood ranged 25–47 percent for males and 15–24 percent for females. These return rates of banded black-capped vireos to study areas have been consistent since 1997 (Cimprich and Comolli 2010).

Kostecke and Cimprich (2008) estimated survival probabilities of vireos during the period 1997–2006 at Fort Hood based on mark-recapture models. They found no support for differences in survival between adult

males and females. Adult survival depended upon year and ranged from 0.36 to 0.60. Juvenile survival depended upon whether the young were initially banded around the time they fledged or later when they had reached independence from their parents. Estimated survival probability for the former was 0.10 whereas that for the latter ranged 0.34–0.42. These estimates do not distinguish between dispersal and death and consequently may be negatively biased.

Reproductive Biology

Within a breeding season, black-capped vireos are monogamous or sequentially polygamous (Grzybowski 1995). Individual pairs establish breeding territories. The nest cycle includes construction (4–5 days), inactive construction (1–5 days), laying (4 days), incubation (14–17 days beginning after the second or third egg laid), brooding of nestlings (11 days), and fledgling (35+ days) (Graber 1961). The male is involved in all stages of the nesting cycle. Both sexes participate in nest building, although the female performs more of the construction as the male often pauses to sing and defend the territory (Graber 1961). The male conducts about one-third of the incubation. Upon hatching, the chicks are brooded by the female while the male furnishes about 75 percent of the food for the young. Pairs frequently re-nest after both successful and unsuccessful nest attempts.

Reproductive success reportedly has been poor throughout the range of the vireo due largely to the impact of brown-headed cowbird brood parasitism (Graber 1961, Grzybowski 1995, Grzybowski et al. 1986, Grzybowski 1988, 1989b, 1990). In one example, Graber (1961) observed a sample of 76 nests containing a total of 243 eggs. Only 17.6 percent (43 eggs) produced fledglings. Of the 134 eggs lost prior to hatching, 72.3 percent were lost to cowbird activity. Only 9 percent of eggs were lost to predators. Among the 95 eggs that hatched young, 26.3 percent were lost due to the presence of cowbird young in the nest, while 16.8 percent were lost to predators. In all, 19.7 percent (15 of 76) of nests in which eggs were laid and 59.7 percent of mated pairs (46 of 77) were successful in fledgling at least one vireo. A total of 43 young were fledged for an average production of 0.56 young per pair per year. In another example, Grzybowski (1990) reported production of 0.92 to 2.58 young per pair in areas with cowbird removal and 0.0 to 0.38 young per pair in areas without cowbird removal during 1988. During 1989, production was 2.00 to 3.78 in removal areas compared to 1.27 to 1.44 in non-removal areas. In

Oklahoma, production was 1.37 with cowbird removal, 0.36 without removal (Grzybowski 1990). Other productivity reports include 0.82 to 1.76 on three areas managed by the Texas Parks and Wildlife Department (Bryan and Stuart 1990), and an average of 1.0 to 1.4 young per pair per year (with cowbird egg removal) at Fort Sill, Oklahoma, during the period 1988 through 1990.

FORT HOOD: At Fort Hood, black-capped vireos appear to be primarily monogamous; however, sequential polygamy has been commonly observed.

Nest parasitism by cowbirds has been severe at times on Fort Hood, particularly in the initial years of the monitoring program. Mitigation of that phenomenon has been an integral component of the management strategy and nest parasitism rates at Fort Hood have dropped dramatically. In 1987 and 1988 nest parasitism rates were about 90 percent. In 1993, 1994, and 1995 those rates dropped to 25.8, 12.8, and 15.2 percent, respectively. By 2005, the parasitism rate was 8 percent (Cimprich 2005b). Nest success rates mirrored those trends. In 1987 and 1988, nest success rates were less than 5 percent, whereas rates averaged 32 percent between 2001 and 2005 (Cimprich 2005b). The increase in nest success was attributed to aggressive cowbird trapping and shooting efforts conducted by Fort Hood biologists. A strong negative correlation exists between the number of female cowbirds trapped during the black-capped vireo breeding season and the incidence of cowbird parasitism of black-capped vireo nests from 1987 to 2010 (Summers 2010).

A 5-year experimental cessation of cowbird control of the west side of Fort Hood began in 2006. Cowbird removal continued on the east side. The intent of this experiment was to determine whether this relatively large vireo population could sustain itself in the absence of cowbird management. On the west side, parasitism rates increased each year except 2010, reaching 34 percent in 2009. Rates this high have not been observed on Fort Hood since 1991.

During the period 2006–2010, an average of 50 percent of territorial males succeeded in producing at least one fledgling (Cimprich and Comolli 2010). The mean number of fledglings produced in each territory during this period was 1.73 (Cimprich and Comolli 2010). No trend in daily nest

survival, territory success, or productivity estimates has been found since 1997 (Cimprich and Comolli 2010).

Interactions with Other Species

Habitat Associates: The black-capped vireo co-exists with a wide variety of other species within its habitat. The particular composition of associated species differs somewhat geographically (Graber 1961).

FORT HOOD: Some characteristic associates of the black-capped vireo on Fort Hood include (in order by relative abundance) northern cardinal, white-eyed vireo, painted bunting, blue-gray gnatcatcher, mourning dove, Bewick's wren, black-crested titmouse, Carolina wren yellow-breasted chat, Carolina chickadee, rufous-crowned sparrow, and field sparrow.

Competition: Territories of the black-capped vireo sometimes overlap with that of the white-eyed vireo or Bell's vireo. No direct competition with other species was observed by Graber (1961).

FORT HOOD: At Fort Hood, black-capped vireos have been observed chasing and being chased by white-eyed vireos (D. Cimprich, unpublished data)

Depredation: Direct depredation on adult birds has rarely been observed. On Fort Hood, observers have twice found numerous adult vireo feathers beneath a depredated nest indicating that an incubating adult was also taken by a predator.

FORT HOOD: Stake and Cimprich (2003) monitored 142 black-capped vireo nests at Fort Hood, Texas, from 1998 to 2001 using time-lapse infrared video cameras to identify nest predators. They recorded 59 predator visits (where at least some of the nest contents were removed or destroyed), resulting in 48 depredated nests. Snakes and fire ants (*Solenopsis* spp.) were the leading predators, accounting for 18 (38%) and 15 (31%), respectively, of all depredated nests. They also identified a variety of avian (19% of depredated nests) and mammalian predators (11% of depredated nests). Despite intensive brown-headed cowbird (*Molothrus ater*) removal at Fort Hood, nine predator visits by females of this species were recorded, but only one resulted in nest failure. Although predator visits occurred at all hours, most (58%) took place at night. The daily predation rate was higher during the nestling stage than during

incubation, partly due to the apparent inability of fire ants to prey upon vireo eggs. Sperry et al. (2008) observed a negative relationship between seasonal variation in snake activity and vireo nest success suggesting that snake predation was largely responsible for changes in nest success.

DISEASE: The species is unusually free of ectoparasites and disease (Graber 1961).

FORT HOOD: Studies of disease and ectoparasites have not been conducted on the black-capped vireo on Fort Hood.

Threats to Survival

Major threats to the continued existence of the black-capped vireo include (1) loss of habitat due to urban development, rangeland improvement, grazing by sheep, goats, and exotic herbivores, and natural succession including juniper invasion; and (2) cowbird brood parasitism (Grzybowski 1995, Shull 1986, Ratzlaff 1987, Wilkins et al. 2006). The black-capped vireo recovery plan (USFWS 1991) and the 1995 Population Viability and Habitat Analysis (PVHA) Workshop Report (USFWS 1996b) document regional threats to survival. Wilkins et al. (2006) detail recent changes in threats to the species.

FORT HOOD: At Fort Hood, the primary threats to the black-capped vireo are brood parasitism, habitat loss and degradation, and fire suppression.

Whooping Crane

The whooping crane is a rare migrant. Three whooping cranes were sighted in Land Group 4 in March 2010 (G. Eckrich, personal communication) and this species has previously been documented on Fort Hood. They may fly over or near Fort Hood during spring (1–20 April) and fall (1–20 October) migration (Diersing et al. 1985). They may stop at Belton Lake during migration or other wetland areas on Fort Hood.

SENSITIVE SPECIES, STATE-LISTED SPECIES, AND BIRDS OF CONSERVATION CONCERN

Texabama Croton

No federally endangered or threatened plant species are known to occur on Fort Hood. The Alabama croton (*Croton alabamensis* var. *alabamensis*) is a species of concern that was formerly a category 2 candidate for federal listing. This species was formerly known from only two counties in Alabama and one county in Tennessee. In 1989 a variety of *C. alabamensis* was discovered on Fort Hood. This variety has subsequently been described and designated as *C. alabamensis* var. *texensis* (Ginzburg 1992). It is sometimes known by the unofficial common name of Texabama croton.

Nomenclature and Classification

Scientific Name: *Croton alabamensis* var. *texensis*

Family: Euphorbiaceae

Original Description: Ginzburg 1992

Type Specimen: Gainer Ranch, Travis County, Texas, (Ginzburg 1992)

Current Federal Status: Species of Concern

History of the Taxon

Alabama: *C. alabamensis* was first noticed by E.A. Smith in 1877 (McDaniel 1981), and has since been described as one of the rarest shrubs in the United States (Farmer and Thomas 1969). Habitat information and the original description were published in Mohr (1889). The Alabama variety of this taxon currently is listed as a category 2 candidate species for federal listing.

Texas and Fort Hood: In 1989, a disjunct population of this species was discovered on Fort Hood Military Reservation by John Cornelius, a Fort Hood installation wildlife biologist. Other Texas populations have subsequently been discovered in Travis and Coryell counties. After taxonomic review, the Texas population of this species was designated a new variety, *C. alabamensis* var. *texensis* (Ginzburg 1992).

Description

Texas and Fort Hood: A technical description of the Texas variety of *C. alabamensis* is given in Ginzburg (1992). In most respects, the appearance of the Texas variety is very similar to the Alabama variety (described in Kral 1983). There are distinct differences in coloration of

scales on the underside of the leaves and stems. The Texabama croton has copper-colored scale surfaces, and some scales have dark reddish-brown centers. In contrast, the Alabama variety has silver scale surfaces and scales lack dark centers.

The Texabama croton is a monoecious shrub 2–3 m tall with many branches emerging from the base. Lower branches sometimes take root and stems have thin gray bark, which gives a slightly sweet odor when scratched. Stems are leafy only near their tips and new growth is angular. Leaves are alternate, exstipulate; petioles 0.6–1.9 mm long, canaliculate; blades ovate or elliptic, 3.8–9.0 cm long, 1.5–4.0 cm wide, entire; apex acute, rounded or emarginate; base obtuse to slightly cordate, glandless; upper surface dark green with scattered scales. The inflorescence is a terminal 6–14 flowered raceme, 1.9–3.3 cm long with pistillate flowers near the base and staminate flowers above (Ginzburg 1992).

Geographic Distribution and Known Population

Alabama: Prior to its discovery in Texas, *C. alabamensis* was known only from Tuscaloosa and Bibb Counties in Alabama and Coffee County in Tennessee (Ginzburg 1992). In Alabama, the species is restricted to two major population centers. Individual populations consist of a few to many individuals covering several acres (Kral 1983). At the time of Farmer's work (1962), the species covered no more than about 40 ha.

Texas and Fort Hood: The Texas variety has been observed in Bell, Coryell, and Travis Counties. In Travis County, the plants occur mostly in deciduous forest in mesic limestone canyons and on slopes. The major known populations in Travis County are on the Gainer Ranch (500–1,000 plants) and the Penn Ranch (several thousand individuals) (Ginzburg 1992).

In Coryell County, the Texas variety is known only from Fort Hood. Both significant populations on Fort Hood occur in protected canyons along the Owl Creek river drainage in Land Groups 1 and 2 (Aplet et al. 1994). The largest population, consisting of several thousand individuals, occurs in Land Group 1 (Ginzburg 1992). Several scattered plants and a small population have been found between and around these two populations near tributaries to Owl Creek (Aplet et al. 1994). The total population on Fort Hood is estimated to be around 20,000 individuals (Aplet et al. 1994).

Habitat

Alabama: There are pronounced differences between the habitats of the two croton varieties. The Alabama variety occurs on shallow soils and rock outcrops at mid-slope positions, and occurs in areas with intense drought and high soil and air temperatures. The croton groves in Alabama have few or no large trees, are dominated by shrubs, and have relatively few herbs (Farmer 1962).

Texas and Fort Hood: The Texas variety grows on shallow, moderately alkaline, gravelly or stony clay or clay-loam overlying Cretaceous limestone (Ginzburg 1992). This variety forms dense local thickets as understory shrubs in mesic canyon hardwood forests or in full sun. The bark is thin and populations are generally confined to more mesic areas near streams and in canyons. However, populations were observed regenerating from root sprouts after fires in 1996.

Aplet et al. (1994) report that on Fort Hood, this croton variety grows in deep soils on toe slopes and fluvial deposits of canyon bottoms and is thus a drought avoider. They indicate that its occurrence exhibits no association with overstory gaps, disturbance, or particular fluvial geomorphic features. It appears to be restricted to canyon bottoms characterized by mesic conditions provided by the presence of overstory cover and a number of other species. Steeper stream gradients may produce microhabitat that is not conducive to establishment and growth.

Reproductive Biology

Alabama: The reproductive biology of the Alabama variety was evaluated by Farmer (1962). He observed no evidence of asexual reproduction, although the species has been propagated by stem cuttings. In nature, plants require 5 to 7 years of growth prior to onset of sexual reproduction. Flower buds are produced in May or June and overwinter before flowering in mid-March. Plants are self-fertile, with pistillate flowers often most numerous toward the bottom of the plant. Wind is the primary pollination agent and fruits develop by mid-May. Seeds are dispersed up to about 7 meters from the parent by a catapulting mechanism. A heavy seed crop is produced each year, much of it lost to rodents, birds, and possibly ants. Partial shade can reduce seed production by 10 to 50 percent. Forest cover can reduce it by 75 to 95

percent. Seeds, which require cold stratification, are dormant until germination takes place in February or March.

Texas and Fort Hood: Relatively little has been published about the reproductive biology of the Texas variety. Ginzburg (1992) reports that it flowers from February to March, sets fruit in May, and fruits have dehisced by early June. In contrast to the Alabama variety, Aplet et al. (1994) reported good evidence of asexual reproduction. This involved the production of “new upright shoots through the nodal rooting (layering) of prostrate branches.”

Survival and Growth

Alabama: The survival and growth in the Alabama variety have been fairly well studied. Seed survival is probably very low, perhaps 1 percent of seed production (Farmer 1962). Seedling mortality may be quite high as well. In experimental populations, Farmer (1962) reported 20 percent survival to two years. Clonal stands are all-aged and consist of individuals as old as 21 years (Farmer 1962). Following germination, seedlings grow until dormancy begins in June in Alabama (Farmer 1962). Most consistent plant growth occurs during March and April. More erratic growth occurs during periods of high moisture. Leaves turn yellow by mid-June. Growth of primary roots is restricted largely to the first 2 centimeters, with the remainder of root growth within 15 cm even on deeper soils.

Texas and Fort Hood: Aplet et al. (1994) reported that all size and age classes of the Texas variety are well represented on Fort Hood, indicating a healthy population of adults, juveniles, and new recruits. Little else has been reported about the survival and growth of the Texas variety.

Interactions with Other Species

Alabama: Other plant species characteristically found in association with the Alabama variety include golden St. Johnswort (*Hypericum* sp.), skunkbush sumac, and red cedar (*Juniperus virginiana*), with sumac usually most abundant (Farmer 1962). Seeds are thought to be utilized by various rodents, birds, and perhaps ants (Farmer 1962).

Texas and Fort Hood: On Fort Hood, species associated with the Texabama croton occur in the Texas Oak Series mesic limestone canyon

forest community (Diamond 1992, Ginzburg 1992). There is some indication that high cover of Texas ash and chinquapin oak (*Quercus muehlenbergii*) indicates a good site for this croton variety (Aplet et al. 1994).

The dominant plant species observed where this variety is found on Fort Hood include Ashe juniper (accounting for 53.6 percent of total cover), Texas ash (24.1 percent), Texas red oak (23.7 percent), and mustang grape (*Vitis mustangensis*, 15.9 percent). Other relatively common species include chinquapin oak (9.8 percent), Carolina buckthorn (7.4 percent), deciduous holly (*Ilex deciduas*, 7.2 percent), cedar elm (6.1 percent), Arizona walnut (4.1 percent), and Texas hackberry (*Celtis laevigata* var. *texana*, 3.04 percent) (Aplet et al. 1994). Within the two canyons in which it occurred, understory cover of the Texabama croton averaged 10.4 percent (Aplet et al. 1994).

Cave-adapted Fauna

The objective of this ESMP is to provide adequate and sufficient protective measures to avoid listing karst-adapted species found on Fort Hood under the Endangered Species Act. Such listings would add restrictions to military training.

Troglobitic faunal communities (karst-adapted and dependent organisms) are often represented by rare endemics due to the narrow ecological niche and natural isolation of the caves and cave systems they inhabit (Barr 1968, Poulson and White 1969, USFWS 1994, Gillieson 1996, Culver and Pipan 2009, Romero 2009).

Several endemic karst invertebrate species and one unique color morph of the slimy salamander (*Plethodon albagula*) (Baird *et al.* 2006) occur on Fort Hood. None of the species are federally-listed; however, Fort Hood endemics have G1 and S1 status, non-endemics have G2, G3, S2, and S3 status.

Karst investigations at Fort Hood have found at least eighteen species of troglobite endemic to Fort Hood (Reddell *et al.* 2010):

Spiders:

Cicurina (Cicurella) caliga (Cokendolpher and Reddell)

Cicurina (Cicurella) coryelli (Gertsch)
Cicurina (Cicurella) hoodensis (Cokendolpher and Reddell)
Cicurina (Cicurella) mixmaster (Cokendolpher and Reddell)
Cicurina (Cicurella) troglobia (Cokendolpher)
Neoleptoneta paraconcinna (Cokendolpher and Reddell)

Pseudoscorpions:

Tyrannochthonius muchmoreorum (Cokendolpher)
Tartarocreagris hoodensis (Muchmore)

Millipedes:

Speodesmus castellanus (Elliott)

Springtails:

Lepidocyrtus (Lanocyrtus) dubius (Christiansen and Bellinger)

Ground beetles:

Rhadine reyesi (Reddell and Cokendolpher)

Ant-like litter beetles:

Batrisodes (Babnormodes) incisipes (Chandler and Reddell)
Batrisodes (Babnormodes) dentifrons (Chandler and Reddell)
Batrisodes (Babnormodes) fanti (Chandler and Reddell)
Batrisodes (Babnormodes) pekinsi (Chandler and Reddell)
Batrisodes (Babnormodes) feminiclypeus (Chandler and Reddell)
Batrisodes (Babnormodes) gravesi (Chandler and Reddell)
Batrisodes (Babnormodes) wartoni (Chandler and Reddell)

Additionally, five karst dependent species warrant special concern: three stygobitic species (aquifer and spring adapted), one troglobitic species, and one salamander species.

Amphipods:

Stygobromus bifurcatus (Holsinger)
Stygobromus russelli (Holsinger)

Isopods:

Caecidotea reddelli (Steeves)

Silverfish:

Texoreddellia aquilonalis (Espinasa and Giribet)

Salamanders:

Plethodon albagula (Grobman)

Additional species, presently under study, may also prove endemic to Fort Hood:

Centipedes:

Gosibius (Abatobius) new species

Population Estimates

Due to their inaccessibility, rarity, and often secretive nature, population estimates are not available (Reddell and Veni 2008). Moreover, a specific site may need to be surveyed multiple times before occupancy can be determined (Krejca and Weckerly 2008). Thus, reliable population indices are difficult to obtain. Also, long periods of drought and similar conditions affect the ability to consistently detect many of these species' presence.

Cave preserves have been identified and delineated for the aforementioned species and biologically rich caves. Additionally, most karst sites, including those with endemic populations, receive protection and management as “umbrella sites” under the golden-cheeked warbler and black-capped vireo management programs and under the Integrated Cultural Resources Management Plan.

Geographic Distribution

None of the species of concern considered for this plan are known to occur outside of Fort Hood (Reddell and Veni 2008). The primary source of information on the distribution of the species of concern at Fort Hood is a previous report (Reddell *et al.* 2010).

Threats to Survival

Cave invertebrates are typically found in moist caves with constant humidity and temperature (USFWS 1994). Caves occupied by endangered invertebrates in Travis and Williamson Counties, Texas, are small and as shallow as 3 meters. Species associated with these caves were listed primarily to mitigate threats due to increasing urbanization. The largest has only 60 m of passage (Chambers and Jahrsdoerfer 1988). The cave fauna depend on surface water infiltration. If caves become dry during certain periods of the year, the resident fauna may retreat to deeper, inaccessible parts of the system. Trogllobites are entirely dependent upon surface organisms and other trogllobites and trogllophiles for their energy and nutrients (USFWS 1994), specifically cave crickets (*Ceuthophilus spp.* in Texas) (Taylor *et al.* 2005). Fort Hood has numerous cave and karst features, and the associated invertebrates are vulnerable to military and land clearing activities.

Based on proposed species as identified by USFWS (1998), Reddell and Veni (2008) identified the following factors as potential threats to cave fauna:

1) Construction: No construction has occurred outside of the cantonment area; however, this could change. Such activities in karst areas could destroy or lead to the pollution of cave environments.

2) Soil Erosion: Erosion can alter the food chain, impact drainage, or completely fill in and eliminate cave habitat. Fifteen caves containing karst invertebrates are impacted by erosion. Many additional sinks are filled in from erosion.

3) Water Quality: Toxicological studies have not been conducted on waterborne contaminants on the karst invertebrates. However, adverse impacts of a wide variety of organic chemicals, heavy metals, and other contaminants on other organisms suggest probable harmful effects on karst species. Potential sources of contamination include vehicle fuel/oil spills, and residues from explosives and other ordnance.

4) Training Activity: Filling in of cave features by close proximity vehicle traffic represents a likely threat to karst habitat. Also, trash left from troop activity has historically been found in caves and sinks.

5) Predation: Red imported fire ants are abundant on Fort Hood and could pose a threat. Taylor and Phillips (2003) studied six caves on Fort Hood. They reported no findings of mass infestations of caves; however, they did find evidence of foraging trails inside caves.

Refer to Reddell and Veni (2008) for a detailed listing of the above threats. Not identified above, but representing a threat to cave fauna and ecosystems is:

6) woody vegetation clearing/thinning: Removal of vegetation around entrances and over the underlying footprint, leads to erosion fill, fire ant invasion, alteration of microclimate, alteration of meteoric water recharge/nutrient exchange, alteration of cave cricket foraging patterns, and cave cricket population decline. At a minimum, removal is not allowed within 10 m of karst features. For endemic, biologically rich, and

sensitive species sites, preserve delineations and/or feature footprint conservation measures are used to protect the sites.

Slimy Salamander

In addition to the previous 18 species, specimens of the slimy salamander (*Plethodon albagula*) have been collected from caves and springs in the northeast training ranges of Fort Hood. This species is not cave-restricted; however, it is troglophilic (depends upon karst features) and has a very limited geographical range (TAs 20-23, 115, & LF 85). The species is unique because it is all black. Elsewhere in its range, it is black with white mottling. Taylor and Phillips (2003) and Taylor *et al.* (2006) provide data and this species' distribution and morphological measurements on Fort Hood. Taylor and Phillips (2003) failed to show a relationship between the presence/absence of *Plethodon* based on fire ants. However, their results were not conclusive.

Cave Myotis

Nomenclature and Classification

Scientific Name: *Myotis velifer incautus*

Family: Vespertilionidae

Original Description: J. A. Allen 1890

Current Federal Status: Species of Concern

Description

The cave myotis (hereafter velifer) is the largest Texas myotis (100 mm total length) with long forearms (37-47 mm) and dark, dull brown pelage (Barbour and Davis 1969, Fitch *et al.* 1981, Schmidly 1991).

Geographic Distribution and Known Population

Three subspecies have been identified for the species (Barbour and Davis 1969, Hayward 1970, Schmidly 1991):

M. v. velifer occurs from western Arizona/ southeastern California/ southern Nevada south through western Mexico to Honduras.

M. v. magnamolaris occurs in western Oklahoma and the panhandle of Texas.

M. v. incautus occurs from north-central and west Texas south to north-central Mexico.

In central Texas, velifers are abundant in the summer (Schmidly 1991) and rare in the winter (Davis *et al.* 1962). It remains uncertain if central Texas velifers migrate to: cold gypsum caves in north Texas where *M. v. magnamolaris* occurs year around (Patterson 1961, Tinkle and Patterson 1965), or north-central Mexico (Hayward 1970), or undiscovered hibernacula on the Edwards plateau in central Texas (J. Kennedy, Bat Conservation International, personal communication). During a 5-year Fort Hood survey, velifers were the most common bat captured in mist nets (Pekins 2009) and was the second most encountered bat during acoustic surveys (Pekins 2009).

In Texas, out of ca. 4,100 caves listed in the Texas Speleological Survey database, approximately 130 caves (3.2%) are recorded as velifer sites (J. Kennedy, Bat Conservation International, unpublished data). Hibernating velifer populations in Oklahoma caves are as large as 40,000 bats with several as large as 15,000 bats (Loucks and Caire 2007). Prendergast *et al.* (2010) observed that a hibernaculum in Kansas had at least 26,500 velifers. In Texas and Arizona, velifer summer maternity sites can be as large as 15,000 bats (Hayward 1970, Fitch *et al.* 1981, Schmidly 1991); in Oklahoma and Kansas, the maternity sites are as large as 15,000-20,000 bats (Twente 1955a, 1955b). In Bexar County, Texas, estimated summer population in one velifer cave approached 40,000 bats (S. Angelo, unpublished data). In San Saba County, Texas, Pekins estimated at least 18,000 bats at one velifer maternity site and 6,000 bats at another site (C. Pekins, unpublished data, 2010).

Four known roosts occur on Fort Hood: 1) an active maternity roost, with an estimated 20,000 - 25,000 bats during the warm season, 2) two abandoned, but restored roosts, and 3) an unmonitored roost (active?) in a 2 km underground river (Pekins 2010). Additionally, velifers can be found in small groups (10 – 150 individuals) and single bats in other karst sites on Fort Hood during the all seasons (Pekins 2010).

Habitat

Velifers are highly colonial, forming clusters consisting of a few individuals to several thousand, mostly in caves and mine tunnels that provide suitable microclimates for maternity roosts and hibernacula (Barbour and

Davis 1969, Hayward 1970, Fitch *et al.* 1981). Velifer maternity roosts occur in warm sections of caves, mines, and crevices where daily temperature fluctuations seldom occur (Kunz 1973, Humphrey 1975). Roosts also occur in large chambers opening from small passages (warm air traps) (Tinkle and Patterson 1965) and in caves with variable ceiling heights (warm air traps) (Dunnigan and Fitch 1967). In Puebla, Mexico, velifers were observed in caves with “many avons” (ceiling domes (warm air traps)) (Brunet and Medellín 2001). Velifer hibernacula occur in cold sections of caves, mines, and crevices. Tinkle and Patterson (1965), Dunnigan and Fitch (1967), and Buecher and Sidner (2008) observed that velifer hibernacula temperature did not exceed 13° C in the winter. However, Caire and Loucks (2010) report that the Selman Cave System in Oklahoma, a significant velifer hibernaculum, ranged from .6°-17° C (mean 10.7° C) during the winter.

Threats to Survival

Anthropogenic roost disturbance and alteration are the greatest threats and causes for decline for most cave-dwelling bats (Mohr 1976, McCracken 1989). Large populations concentrated in a handful of caves and bats’ low reproductive potential (Barclay and Harder 2003) predispose velifers to rapid population decline should prolonged disturbance or destruction befall key roosts. Even though velifers are the most commonly encountered bat in Texas caves (Reddell 1994), several velifer caves have been abandoned due to human disturbance (Elliott 1994). Velifers are especially sensitive to and intolerant of human presence, despite filtered lights and extremely low noise (personal obs). In Arizona, a velifer maternity colony of 5,000 bats abandoned a roost when increased human recreational use occurred (O’Shea and Vaughan 1999). Light intensity, human voices, and closeness of humans to roosting bats created disturbances for a maternity colony of 1,000 velifers, especially after parturition occurred (Mann *et al.* 2002). Restricting human access at a velifer winter hibernacula in New Mexico, by the placement of bat-friendly gates, have helped maintain a stable bat population (Jagnow 1998). On Fort Hood, the maternity roost is protected by two cupola-style gates that allow bat emergence/entry, but prevent human entry. The other three roosts are protected by terrain and location (live fire region).

In addition to anthropogenic roost disturbance and destruction, a recently emerged threat exists. White-nose syndrome has killed over one million hibernating, cave-dwelling bats from 9 species in 19 states and 3 Canadian

provinces (Blehert *et al.* 2008, Gargas *et al.* 2009, Kunz *et al.* 2009). Velifers are included in the list of affected species (Oklahoma Department of Wildlife Conservation 2010). Thus far, Texas velifers have not been affected by the syndrome. There is no clear understanding why bats are dying during hibernation, only that they have a white fungus (*Geomyces destructans*) growing on the muzzle, ears, and/or wing membranes, and they are emaciated. Current and future research may provide clues to better understand the mechanisms involved and options to reduce and/or eliminate the threat before entire species become extinct.

Texas Horned Lizard

Nomenclature and Classification

Scientific Name: *Phrynosoma cornutum*

Family: Phrynosomatidae

Original Description: Harlan 1825

Current Federal Status: Species of Concern (State-listed: Threatened 1977)

Description

Texas horned lizards (hereafter lizard) is one of three *Phrynosoma* species found in Texas. It is distinguished from other horned lizard species by: two elongated, upward-pointed occipital spines on the the head, two rows of lateral fringed scales, dark dorsal spots edged with cream- or yellow-colored crescents, dark lines going up the face and over the top of the head, and a light-colored midback stripe (Henke and Fair 1998, Sherbrooke 2003). Adults generally measure 68- 114 mm snout-to-vent (Sherbrooke 2003) and weigh 26 - 99 g (Henke and Fair 1998).

Geographic Distribution and Known Population

The lizard occurs throughout Texas, Oklahoma, Kansas, south-central Colorado, New Mexico, and southeastern Arizona and southward into northern and central Mexico (Sherbrooke 2003). They are common throughout most of their range, except in Texas where they have been mostly extirpated in areas of eastern and central Texas and portions of Oklahoma (Sherbrooke 2003). Within central Texas, lizards may occur as small, isolated remnant populations (Henke and Fair 1998).

Three separate lizard surveys have been conducted on Fort Hood. During 1994 - 1996, five lizards were documented on the western portion (Johnson 1997). These sightings were widely scattered across a broad geographic area. During 1998 - 1999, three lizards were documented: one on the western portion, one on the eastern portion, and one on the weapons firing region near the 2001 sightings (Horne 2000). During 2001, eight lizards were documented on the weapons firing region (Webb and Henke 2008). Contrastingly, no lizards were observed during a 2004 - 2008 Texas rat snake (*Elaphe obsoleta lindheimeri*) study on the north-western portion (Sperry and Weatherhead 2009). During surveys in which lizards were observed, one common theme emerged; lizards were widely scattered at low overall densities. In fact, this low density may have contributed to the lack of observations during the rat snake study.

Life History

Lizards are active from March - October, entering hibernation 15 - 30 mm under the soil, rocks, wood, and inside abandoned animal burrows during the cold months (Peslak 1995). Lizards breed from shortly after spring emergence (March) – mid-July (Milne and Milne 1950). Thirteen to forty-five eggs are deposited in excavated burrows, then covered with soil (Henke and Fair 1998). Natural mortality sources for lizards include: predation (mammalian, avian, and reptilian), exposure (lack of suitable cover), starvation, and disease. However, anthropomorphic-caused mortality also exists and accounts for most fatalities (vehicle traffic and collection by humans (Webb and Henke 2008)). Typically, lizards live 2 - 3 years, possibly 5 (Henke and Fair 1998).

Habitat

Lizards occur in a variety of habitats in arid - semiarid landscapes from open desert to grasslands and mostly open shrublands from sea level to

1,800 m elevation (Henke and Fair 1998, Sherbrooke 2003). Soil, a critical component of lizard habitat, varies from pure sand and sandy loam to coarse gravel and patched of exposed bedrock. Lizards prefer sandy loam soils that allow for easy excavation of bedding, nesting, and hibernation sites (Henke and Fair 1998). Soils that are predominantly clay and soils with moisture content >2.5% are avoided by lizards (Fair 1995). Lizards select areas with a soil surface temperature between 24° - 31° C and minimal ground litter allowing ease of movement and escape (Whiting *et al.* 1993, Fair 1995). Lizards select patchy habitat areas with >60% vegetative canopy cover interspersed with bare patches (Henke and Fair 1998). Such openness provides a variety of microhabitats for movement, thermoregulation, and escape cover from predators. Additionally, open habitats provide suitable conditions for harvester ants (*Pogonomyrmex spp.*), the primary prey for lizards (Whitford and Bryant 1979, Henke and Fair 1998). In suitable habitat, scattered rocks and loose litter under woody vegetation provide additional sites for bedding, nesting, hibernation, thermoregulation, and escape cover.

Although the greatest lizard density was documented in only one region of Fort Hood (weapons firing during 2001), there are several regions across the entire installation that likely support lizards. These other regions: look nearly identical to the 2001 locations (mostly open grassland with scattered trees and shrub clumps), occur in similar topological/edaphic settings (narrow to wide valleys and rolling lowlands with loose, moderate - deep soil), and support active harvester ant mounds. That is, potential habitat with appropriate cover, soil, and prey exists in many regions of Fort Hood.

Although appearing similar, different regions have different land disturbance activities. For example, the weapons firing region does not receive military vehicle maneuvers, but receives frequent wildfires, which benefit lizards (Webb and Henke 2008). Contrastingly, the maneuver/bivouac regions receive a lot of vehicle traffic of varying intensity and duration and no frequent wildfires, which may not benefit lizards (Fair and Henke 1998, Webb and Henke 2008). The entire installation is grazed by cattle, which, depending upon the stocking rate, does not benefit lizards (Henke and Fair 1998). Although the entire installation was searched specifically for lizards in 2001, it is possible that since that time lizards have expanded into other areas from their refugia and occur at higher densities, making detection likelihood higher.

However, it is also possible that lizards have declined and occur at even lower densities, making detection likelihood lower. Another possibility is that the lizards have remained stable, making detection likelihood the same.

Threats to Survival

- 1) *Increased ground litter*- impedes lizard movement and harvester ant colony survival. Prescribed fire and wildfire can help reduce litter build-up.
- 2) *Degradation of habitat*, increased patchiness (see Henke and Fair 1998).
- 3) *Broad-cast pesticide use*- directly kills lizards and their prey.
- 4) *Red-imported fire ants (Solenopsis invicta)*- out-compete harvester ant colonies for food and space.
- 5) *Over-collection by humans*- lizards are currently protected by Texas state law (no one may collect, possess, or move lizards without a permit).
- 6) *Livestock overgrazing*- reduces cover needed by lizards for thermoregulation and escape. Degrades soil by compaction and destroys burrows.
- 7) *Road grading*- lizards often use roads and shoulders for thermoregulation and bedding. Grading in habitat during active periods result in direct mortality.
- 8) *Recreational off-road vehicle use*- directly kills lizards and/or degrades habitat by soil compaction and degradation.
- 9) *Soil erosion and compaction*- reduces lizard fossorial ability.

Sprague's pipit

Nomenclature and Classification

Scientific Name: *Anthus spragueii*

Family: Motacillidae

Original Description: Audubon, 1844

Current Federal Status: Candidate

Description

The Sprague's pipit is a small sparrow-sized bird with a thin bill, pale legs, a streaked back and white outer tail feathers. The sexes are alike and adults reach a length of 6.5 in (16.5 cm), and a weight of 23.7-24.0 g. This species was determined to be a candidate for listing under the Endangered Species Act on 15 September 2010.

Geographic Distribution and Known Population

Sprague's Pipits are endemic to native grasslands in southern Canada and the northern Great Plains of Montana and North Dakota and there are historical records from South Dakota and Minnesota. Sprague's pipits winter in grasslands in Texas, New Mexico, Arizona, Louisiana and Mexico.

Sprague's pipits do not breed on Fort Hood but winter on the installation from September to April, with the majority of the sightings occurring from October to March (R. Kostecke and C. Engleman, pers. comm.). On Fort Hood, Sprague's pipits frequent the short grass prairie that is common in the Live Fire area of the installation, as well as other locations on the installation that have characteristics of a short-grass prairie. It is likely that the Sprague's pipit benefits from frequent fires in the Live Fire area that maintain the low growing grasses. This species may also benefit to a certain degree from some military training activities that maintain the preferred habitat characteristics (R. Kostecke and C. Engleman, pers. comm.) as long as training activities do not cause significant degradation of the grassland habitat this species prefers. Fort Hood has been conducting surveys for the Sprague's pipit and will continue these efforts as funding and personnel availability allow.

Habitat

Breeding habitat includes short-grass plains, mixed grass prairie, alkaline meadows, and wet meadows. This species is found in grasslands with mid-height vegetation, including upland mixed-grass prairie, alkaline meadows, and wet meadow zones around alkali and freshwater lakes (Stewart 1975). Habitat during migration and in winter consists of pastures and weedy fields (AOU 1983), including grasslands with dense herbaceous vegetation or grassy agricultural fields.

Threats to Survival

The substantial loss of native grasslands has resulted in population declines of this species. The loss of native grasslands is a result of conversion of breeding habitat to agriculture and human development. In addition, overgrazing by cattle and the establishment of exotic grasses has reduced the quality of available habitat. On the wintering grounds the loss, fragmentation, degradation and conversion of grasslands are additional threats to the species.

Smooth Pimpleback**Nomenclature and Classification**

Scientific Name: *Quadrula houstonensis*

Family: Unionidae

Original Description: Lea, 1859

Current Federal Status: Proposed

Description

The smooth pimpleback is a freshwater river mussel, an aquatic bivalve mollusk, endemic to Texas. This mussel has an external color which is ashy-brown in older specimens and is a yellow-buff to yellow-green in young specimens. The smooth pimple back mussel can reach up to 66mm in length and 59 mm in height (Howells 1996). The outside of its shell is generally smooth and rarely has a few small pustules. The shell has wavy ridges at its tip and its overall shape is nearly round. The shell thickness is moderately thick to thick (Howells 1996).

This species has experienced significant declines in population abundance and distribution over the last 25 years (Howells 2002; Burlakova 2010). The smooth pimpleback was listed as threatened by the State of Texas on November 5th, 2010. In 2008, the U.S. Fish and Wildlife Service was petitioned to list the smooth pimpleback as threatened or endangered under the Endangered Species Act.

Geographic Distribution and Known Population

Smooth pimpleback mussels are endemic to the Brazos and Colorado River drainage of central Texas. This species has also been observed in the Trinity and San Jacinto Rivers of Texas.

The smooth pimpleback mussel's presence and abundance in Coryell County was first documented in 1931 (Strecker 1931). Living populations of smooth pimpleback mussel were found in 2006 at two locations in the Leon River, upstream of Fort Hood in Hamilton County (Howells 2006). Archeological surveys of freshwater shellfish remains on Fort Hood conducted in 2010 uncovered the remains of the smooth pimpleback mussel. This mussel was present in nine of the nineteen rock shelter sites surveyed (Randklev 2011).

In 2011, Fort Hood began conducting surveys for the presence of the smooth pimpleback, along with two other state-listed mussel species. In August 2011, living specimens of the smooth pimpleback mussel were discovered in sections of the Leon River where it borders Fort Hood.

Habitat

The smooth pimpleback prefers mud, sand or fine gravel stream substrate in small to moderate sized rivers with slow to moderate flow rates (Howell 1996). This mussel has been present in water as shallow as three to four

centimeters and can survive in low-flow areas of streams. The smooth pimpleback appears intolerant of shifting sand substrate, dramatic water level fluctuations, and scoured bedrock substrates (Howells 2006). Very little is known about the breeding biology of the smooth pimpleback including the timing of spawning and brooding, glochidia, and fish hosts.

Threats to Survival

Siltation and smothering, habitat destruction, inadequate regulatory measures, and climate change impacts have contributed to the population decline in both distribution and abundance of the smooth pimpleback mussel (Howells 2006). Events such as the 1978 scouring floods, the Leon River severe drought of the 1980s, and a 1993 chemical dumping into the Little Brazos River are example of the types of events which contribute to the decline of this mussel.

Bald Eagle

The bald eagle was previously listed as federally-threatened; however, the species was de-listed on 28 June 2007. Once de-listed, a species is monitored by the USFWS for five years. The bald eagle has been recorded during winters at Belton Lake on or adjacent to Fort Hood (G. Eckrich, personal communication). The bald eagle does not currently nest on the installation although it does nest nearby along the Lampasas River and an apparent pair has been observed on Fort Hood in 2010 and 2011, although at this time, the pair appears too young to reproduce.

Birds of Conservation Concern

In 1988, an amendment to the Fish and Wildlife Conservation Act of 1980 (FWCA), required that the U.S. Fish and Wildlife Service identify those birds that are of conservation concern. Birds of conservation concern are those species of migratory or non-migratory non-game birds that without additional conservation actions are likely to become candidates for listing under the ESA. Aside from those species that are already federally-listed as threatened or endangered, birds of conservation concern represent the highest conservation priorities for the USFWS.

Fort Hood has documented approximately 22 different species that are birds of conservation concern. Some of these species nest on Fort Hood, others winter on the installation, and some are transient species that have been occasionally documented during the migratory season. The following

birds of conservation concern nest on Fort Hood: Bell's vireo, field sparrow, ladder-backed woodpecker, loggerhead shrike, orchard oriole, painted bunting, prothonotary warbler, scissor-tailed flycatcher, and the rufous crowned sparrow.

Conservation Actions: All Federally Listed Species

Objective 1

Regardless of habitat designation on training area maps, the Army will comply with all applicable sections of the Endangered Species Act (1973, as amended) for all training, operations, maintenance, and construction activities conducted on Fort Hood.

Objective Justification

This ESMP does not supersede the legal obligation of the Army and Fort Hood to comply with Federal law as set forth in the Endangered Species Act (1973, as amended).

Conservation Actions

As required by Section 7 of the Endangered Species Act, the Army and Fort Hood will assess the effect of any proposed activity on any listed species or its habitat occurring in the project area. Fort Hood has conducted a biological assessment for the current ongoing mission and the USFWS has issued a Biological Opinion (1 December 2010) that provides Terms and Conditions for the continuance of mission activities on Fort Hood. Fort Hood currently is in compliance with the Terms and Conditions of the 2010 Biological Opinion. Approximately 3,615 ha (8,934 ac) of warbler habitat on Fort Hood is subject to training restrictions under the Fort Hood Endangered Species Training Guidelines due to the presence of listed species and the high quality habitat found in these locations. These areas are designated on Fort Hood Training Area maps. Areas not subject to training restrictions under the Fort Hood Training Guidelines are still subject to all Section 7 compliance requirements and Terms and Conditions of the USFWS 2010 Biological Opinion.

Objective 2

Implement installation fire management and protection policies.

Objective Justification

The objective of Fort Hood fire management policies is to provide a balance among operational flexibility, endangered species habitat management requirements, and prevention of destructive wildfires. One objective of the Fort Hood fire management policy is to reduce downtime for training operations due to excessive fire control activities. Many training-related fires are of low risk to facilities, personnel, or habitats of concern. In these cases a “let-burn” policy is warranted. Also, black-capped vireo habitat requires some level of periodic disturbance to maintain optimal habitat conditions. Periodic fires in these habitats help to maintain these conditions. On the other hand, uncontrolled wildfires can pose a serious risk to range facilities, personnel, and large areas of endangered species habitats, as demonstrated by the extensive wildfires that occurred in February 1996.

Conservation Actions

Implement fire-rating system and control procedures in accordance with Fort Hood OPLAN 8-93 “Operation Brush Fire” and Fort Hood Regulation 350-40.

Monitor effects of fires on endangered species habitat occurring on the installation. Fort Hood will report to the USFWS the potential loss of endangered species habitat due to wildfire within 24 hours of the incident and then follow up with an assessment of the actual effects to endangered species habitat once mapping of the habitat areas affected by wildfire has occurred. Data regarding wildfires that affect endangered species habitat will be included in the annual report to the USFWS.

Coordinate between the Fire Department and Natural Resources Management Branch during the decision to approve/disapprove Range Condition Red waivers.

Emphasize use of preventative prescribed fire to maintain blacklines near habitat areas annually. Employ firebreaks in association with endangered species habitats to reduce fire risk.

Maintain and upgrade fire-fighting capabilities including aerial support, subject to the availability of funds.

Continue to document vegetation changes associated with the February 1996 wildfires every five years and monitor additional warbler and vireo habitat impacted by fires as time allows.

Objective 3

Manage vegetation clearing projects to minimize fire hazard from slash, and avoid impacts to residual stands.

Objective Justification

Vegetation clearing activities are conducted on Fort Hood for military range maintenance and habitat management, and to reduce fire hazard. Vegetation removal potentially can increase erosion rates. The resulting slash from these activities poses a significant fire risk if not disposed of properly. If left in place, slash piles can impact survival of residual live vegetation. Proper disposal of slash is required to avoid these risks.

Conservation Actions

During juniper thinning, HBCCT maneuver corridor project implementation, construction of firebreaks, power line right of ways, roads, or other brush removal projects, slash material will be pulled away from standing live trees, removed from the site and burned or mulched in place. Slash disposal methods will be included in the scope of proposed disposal of slash must be completed in order for the project to be deemed complete and compliance obligations met.

The method of slash disposal will be based on the overall benefit to the species and its habitat, with preference to mulching on site: (i) For all projects that involve brush removal or thinning in habitat for the GCWA or BCVI, primary consideration will be given to mulching slash in place to minimize creation of habitat for Texas rat snakes, reduce the incidence and/or intensity of fire in habitat, and to reduce erosion. Burning may be used when there is minimal or no difference in benefit to the species between methods. (ii) For all brush removal that takes place in non-habitat areas, brush may be burned or mulched. However, any brush piles left remaining in non-habitat areas will be located at least 50 yards from GCWA or BCVI habitat boundaries.

All slash materials will be burned or mulched within one year of the commencement of the project.

As an integral part of project design, maximize the use of preventative measures to minimize soil loss after vegetation removal. Examples include re-seeding with an accepted native herbaceous plant seed mix, deferral of grazing from rehabilitation sites, placement of water bars on slopes, and using waste material in gullies as appropriate.

All vegetation clearing projects will include coordination with NRMB from the planning phase forward in order to minimize or avoid impacts to endangered species and their habitat, and must support overall objectives of the INRMP. Results of coordination will be included in project specific documentation.

Objective 4

Emphasize the use of prescribed burning to support protection and maintenance of endangered species habitat, and support ecosystem management principles.

Objective Justification

Periodic disturbance is an important functional component of most natural systems. Natural disturbance typically supports enhanced biodiversity, nutrient cycling, and habitats for many endangered species and species of concern. In central Texas, fire is the primary natural disturbance regime in upland habitats. During recent historical periods, fire suppression has resulted in juniper encroachment, loss of deciduous scrub habitats, and increases in invasive, non-native grasses and forbs. Prescribed burning provides land managers a tool to more nearly replicate pre-settlement landscape and habitat conditions on Fort Hood in support of endangered species management and ecosystem function.

Conservation Actions

All prescribed burning will occur with approval from the Fort Hood Fire Department and the NRMB with review, oversight, or supervision by NRMB or Fort Hood Fire Department personnel certified and experienced in prescribed burning techniques. Prescribed burning will support the

overall objectives of the INRMP in accordance with the Fort Hood Integrated Wildland Fire Management Plan. All burning will be conducted by qualified individuals whose credentials have been reviewed and approved by the Directorate of Emergency Services, Fort Hood Fire Department.

Develop a habitat regeneration/enhancement plan that is compatible with endangered species management and mission training requirements.

Identify areas suitable for maintenance as black-capped vireo habitat and implement habitat management prescriptions as necessary.

Use prescribed fire to the maximum extent possible to reduce fuel loads near important areas.

Use prescribed fire to maintain prairie sites and to inhibit development of pure juniper stands. Fire should be considered as a low-cost, non-invasive means of avoiding future need for destructive large-scale mechanical clearing projects.

Objective 5

Evaluate factors affecting endangered species productivity, survival, and habitats.

Objective Justification

Several non-specific threats to endangered species populations occur on Fort Hood. These threats include direct and indirect effects due to nest parasitism by brown-headed cowbirds, imported fire ants, and feral hog populations. Control of these species will benefit a broad range of natural resource components on the installation, including endangered species populations. In addition, vegetation management on the installation may have direct and indirect effects to endangered species populations by fragmenting habitat, degrading habitat quality, and possibly affecting foraging opportunities for the warbler and vireo.

Conservation Actions

Investigate and implement species-selective methods, including hot-water injection methods, for control of imported fire ants in endangered species

habitat and near important karst features if funding and personnel staffing levels permit.

Continue to control feral hog population utilizing aerial support and trapping, and evaluate effectiveness of control methods.

Continue to implement installation-wide brown-headed cowbird management program with a management goal of less than 10% annual parasitism.

Investigate the effects of vegetation management on the warbler and vireo as staffing levels and time allow.

Objective 6

Monitor the quality and quantity of available endangered species habitat.

Objective Justification

Incidental take under the Fort Hood Biological Opinion (1 December 2010) is contingent on availability and maintenance of suitable habitat to support viable endangered species populations on the installation. Meeting this objective requires adequate information on the current and future status of habitats on the installation and adequate oversight to ensure compliance with installation regulations on allowable activities within endangered species habitats.

Conservation Actions

Continue use of helicopter over-flights as needed to ensure compliance with training guidelines, monitor effects of training activity in endangered species habitat, and monitor oak wilt centers.

Evaluate habitat trends based on change detection imagery every five years.

Maintain adequate natural resource law enforcement presence to effectively monitor land use, and enforce training guidelines and off-road vehicle restrictions.

Refine mapping efforts to enhance endangered species information management on Fort Hood.

Maintain training area development and maintenance actions in a GIS database to adequately track changes to the species environmental baseline. As projects are completed, habitat areas affected by project implementation will be included in the GIS database and updates to the species environmental baseline will take place annually in December.

Objective 7

Implement *Training Guidelines for Use of Core Endangered Species Habitat*.

Objective Justification

Soldiers performing field training must have access to current maps showing designated golden-cheeked warbler core habitat in order to comply with the associated training restrictions as specified in the USFWS Biological Opinion (Appendix A). Conservation actions to meet this objective will ensure to the extent possible that all soldiers and commanders on Fort Hood have access to current information on the location of golden-cheeked warbler core habitat .

Conservation Actions

Implement *Training Guidelines for Use of Core Endangered Species Habitat* (Appendix C) at two levels. Level 1 applies from July 1 through February 28. Level 2 is more restrictive, and applies from March 1 through June 30.

Provide orientation and training for appropriate personnel on the implementation of the guidelines.

Conservation Actions: Golden-Cheeked Warbler

Objective 1

Implement training restrictions in designated golden-cheeked warbler core habitat in accordance with “Training Guidelines for Use of Core Endangered Species Habitat”.

Objective Justification

Military training in areas occupied by golden-cheeked warblers can destroy or degrade habitat and disturb individuals, potentially resulting in reduced abundance and productivity. These impacts increase the possibility of “take” as defined in the ESA. The 2010 Biological Opinion states that implementation of the Fort Hood Training Guidelines in golden-cheeked warbler habitat will assist in minimizing effects of incidental take related to military training activities. There is currently 3,615 ha (8,934 ac) of golden-cheeked warbler core habitat on the installation. Core habitat areas were selected based on known population distributions, quality and contiguity of habitat, and minimal mission conflicts.

Conservation Actions

Implement Fort Hood Endangered Species Training Guidelines as specified in the 2010 Biological Opinion (Appendix A) for 3,615 (8,934 ac) of golden-cheeked warbler habitat designated as core habitat (Fig. 2).

Provide orientation and training for appropriate personnel on the implementation of the guidelines.

The Fort Hood Natural Resources Management Branch will maintain records and maps of all areas occupied by endangered species, including both non-core and core habitats designated under the Fort Hood Endangered Species Training Guidelines.

“Non-core” habitat areas will remain subject to all other applicable Fort Hood range regulations, in particular regulations governing activities that

could result in permanent alteration to endangered species habitat. An example would be the requirement to submit for approval Excavation Permit #420-X10 prior to initiating any excavation activities on the installation.

Objective 2

Implement a sustainable incidental take limit in accordance with USFWS consultation and best management practices for habitat maintenance during the five-year term of this ESMP.

Objective Justification

The intent of this ESMP is to promote recovery, management, and long-term survival of endangered species on Fort Hood lands in accordance with federal, state, and DOD wildlife laws while allowing operational certainty and the performance of mission essential tasks. Current estimates of available golden-cheeked warbler habitat on Fort Hood meet USFWS goals for the warbler for this recovery unit. Implementation of incidental take limits provides flexibility and certainty for conducting mission essential activities that may result in habitat loss. However, habitat loss is limited so as not to jeopardize the recovery and survival of the warbler and to ensure that suitable habitat is present for the species in all regions of Fort Hood. Habitat “loss” as defined under this ESMP is any permanent or temporary alteration of currently suitable habitat to the extent that it is unsuitable for occupation by breeding adults and/or their offspring.

Conservation Actions

Maintain habitat loss due to construction, wildfire, and training area and range improvements over the next five-year period below the 2,074ha (5,125 ac) limit established under the 2010 Biological Opinion.

Any loss of habitat or nests considered incidental take, no matter how small, will be reported on an annual basis to the installation Commander and to the USFWS as part of the installation’s annual reporting requirement.

Objective 3

Maintain suitable habitat that supports the recovery and long-term survival of the warbler and allows for the implementation of mission essential training requirements.

Objective Justification

Maintaining suitable habitat for the warbler will promote the long-term survival of the species, which is in the interest of the Army and Fort Hood because Federal and Public Trust mandates will be met along with providing sustainable training lands for current and future Soldiers. Based on past consultation experience with the USFWS for the warbler, it has been shown that the more successful the recovery efforts and habitat management on the installation, the fewer the restrictions placed on the military mission and permitting of projects. In addition, should a catastrophic event, such as a wildfire, occur that destroys a significant portion of the species habitat on the installation, maintaining suitable habitat levels will help to mitigate the effects of such a loss. Warbler conservation efforts on Fort Hood also benefit recovery in other recovery units due to dispersal of warblers from Fort Hood to habitat in other recovery units.

Conservation Actions

Maintain suitable habitat in all regions of the installation and maximize and/or maintain connectivity between patches of habitat to the maximum extent practicable.

Monitor, record, and assess habitat conditions on the installation.

As funding and staffing allow, develop and maintain a current map of oak wilt centers, with particular emphasis on training areas where core endangered species habitat occurs.

As funding and staffing allow, identify and prioritize oak wilt centers that threaten, or may potentially threaten, core habitat.

Minimize the potential spread of oak wilt from vegetation management projects by requiring contracting personnel or Army personnel to take appropriate precautionary measures to prevent the spread of oak wilt.

As funding and staffing allow, investigate treatment and/or isolation methods that might be feasible to limit oak wilt effects. Implement appropriate oak wilt control measures based on priority evaluation.

If fungal mats are identified on trees that necessitate removal of that tree during the breeding season, a representative of the Natural Resources Management Branch will be present to ensure that the golden-cheeked warbler is not directly utilizing the tree as a nesting site. Every effort will be taken to avoid or minimize a direct impact to listed species as a result of management for oak wilt.

As funding and staffing allow, investigate the effects of oak wilt on golden-cheeked warbler habitat.

Prohibit the use of motorized off-road recreational vehicles in endangered species habitat.

Design and implement projects such that the effects to endangered species habitat are minimized and avoided as much as possible. Examine potential alternatives to locating a project in endangered species habitat whenever possible. If possible, examine locating project activities in less sensitive/less critical habitat areas (for example, uplands instead of canyons; monocultures instead of mixed forest, etc).

Objective 4

Document golden-cheeked warbler population trend and factors affecting population status. Design and implement new research projects on the ecology of the golden-cheeked warbler.

Objective Justification

Population change is the baseline measure of conservation success and recovery for the population. This measure is necessary to differentiate between normal annual variability and true trends in populations over time. Evaluation of factors affecting populations allows determination of population change due to natural or stochastic processes versus change due to human land use practices. Additional research on the ecology of the species will provide important data that could be used in recovery efforts or provide data that will be beneficial to conservation and management of the species on Fort Hood.

Conservation Actions

Document population trends and assess population status of the golden-cheeked warbler.

Evaluate the relationship between habitat quality and golden-cheeked warbler abundance and productivity.

Continue to allow safe access to training and Live-Fire Areas for golden-cheeked warbler surveys during the period 15 March through 31 July to ensure that population trend studies are maintained. Continue to generate color sequences for range-wide color banding of golden-cheeked warblers through cooperation with the U.S. Geological Survey.

Assist in investigations related to the dispersal patterns of golden-cheeked warblers from Fort Hood to surrounding areas through cooperative studies with other researchers as the opportunity arises.

Design and implement additional research on the golden-cheeked warbler as funding and staffing levels permit. Collaborate with and provide oversight of research conducted by universities, graduate students, and other researchers.

Conduct point count surveys at 428 points annually to obtain numbers of birds detected per location per observer.

Determine numbers of singing males within designated intensive study areas, annually.

Conduct the following activities annually in each of the intensive study areas:

- Band as many individuals as possible with a unique combination of leg bands.
- Locate and monitor active nests to the extent possible.
- Search for returning, banded birds.

Monitor the following demographic and reproductive parameters annually in all intensive study areas:

- Banding status of all birds observed.
- Presence or absence of a female on each male territory.
- Territory size.
- Number of young with each adult.
- For all nests located: number of host and parasite eggs, nestlings, fledglings, and nest fate.
- Distance from banding location to re-sighting location in subsequent years.

Conservation Actions: Black-Capped Vireo

Objective 1

Implement a sustainable incidental take limit in accordance with USFWS consultation and best management practices for habitat maintenance during the five-year term of this ESMP.

Objective Justification

The intent of this ESMP is to promote recovery, management, and long-term survival of endangered species on Fort Hood lands in accordance with federal, state, and DOD wildlife laws while allowing operational certainty and the performance of mission essential tasks. Current estimates of available black-capped vireo habitat on Fort Hood meet USFWS goals for the vireo for this recovery unit. Implementation of incidental take limits provides flexibility and certainty for conducting mission essential activities that may result in habitat loss. However, habitat loss is limited so as not to jeopardize the recovery and survival of the vireo and to ensure that suitable habitat is present for the species in all regions of Fort Hood. Habitat “loss” as defined under this ESMP is any permanent or temporary alteration of currently suitable habitat to the extent that it is unsuitable for occupation by breeding adults and/or their offspring.

Conservation Actions

Maintain habitat loss due to training activities, training area and range construction projects, wildfire, and construction improvements over the next five-year period below the 1,185 ha (2,929 ac) limits established under the 2010 Biological Opinion.

Any loss of habitat or nests considered incidental take, no matter how small, will be reported on an annual basis to the Installation Commander and to the USFWS as part of the installation’s annual reporting requirement.

Objective 2

Maintain sufficient habitat to meet population goal in seral stage suitable for occupation by black-capped vireos.

Objective Justification

Typically, vireos on Fort Hood are observed in early seral habitat resulting from burns or mechanical clearing of vegetation in areas with suitable soils and geologic substrate. Currently, 9,103 ha (22,494 ac) have been identified as suitable vireo habitat. Due to the ephemeral nature of habitat in these areas targeted for habitat management, restoration must be implemented to replace areas where vegetation has succeeded beyond the stage preferred by vireos. This objective maintains at least the current level of vireo habitat on Fort Hood. In addition, should a catastrophic event, such as a wildfire, occur that destroys a significant portion of the species habitat on the installation, maintaining suitable habitat levels will help to mitigate the effects of such a loss. Vireo conservation efforts on Fort Hood also benefits recovery in other recovery units due to dispersal of vireos from Fort Hood to habitat in other recovery units.

Conservation Actions

Identify areas suitable for maintenance as black-capped vireo habitat and implement habitat management prescriptions as necessary.

Develop a habitat regeneration/enhancement plan that is compatible with endangered species management and mission training requirements.

Objective 3

Maintain parasitism of vireo nests by brown-headed cowbirds below an average of 10 percent annually in training areas outside of the Live-Fire Areas during the five-year term of this ESMP.

Objective Justification

Cowbird parasitism reduces reproductive success of black-capped vireos on Fort Hood (Tazik et al. 1992, Hayden et al. 2000). Analyses by Tazik (1991) of the effect of cowbird parasitism on vireo productivity indicate that incidence of cowbird parasitism must be below 25 percent to maintain stable or increasing vireo populations. A target goal of average annual

parasitism below 10 percent was determined because of effectiveness of historical control efforts and to be consistent with thresholds established by the USFWS under other agreements. Since 1992, cowbird control efforts have maintained parasitism levels below 10 percent outside of Live-Fire Areas on Fort Hood except during four years (2007–2010) of the experimental cessation of cowbird control on the western training lands of the installation. Maintaining parasitism levels below an average of 10 percent annually will enhance vireo reproductive success on Fort Hood and support achievement of population objectives. Reducing cowbird parasitism is the only management technique currently available to directly affect reproductive success.

Conservation Actions

Remove a sufficient number of female cowbirds during the peak black-capped vireo breeding months, March–June, to maintain parasitism levels below an annual average of 10 percent for all training areas outside of the Live-Fire Areas for the five-year term of this ESMP. Trap effort will be conducted at levels sufficient to maintain parasitism levels below the 10-percent annual target.

Shooting will be conducted within selected occupied vireo habitats where high levels of cowbird parasitism have been documented despite trapping effort.

Objective 4

Document black-capped vireo population trend and factors affecting population status. Design and implement new research projects on the ecology of the black-capped vireo.

Objective Justification

Population change is the baseline measure of conservation success and recovery for the population. This measure is necessary to differentiate between normal annual variability and true trends in populations over time. Evaluation of factors affecting populations allows the determination of population change due to natural or stochastic processes versus change due to human land use practices.

Conservation Actions

Document population trends and assess population status of the black-capped vireo.

Continue to allow safe access to training and Live-Fire Areas for black-capped vireo surveys during the period 15 March through 31 July. It is important that the integrity of data collected from existing black-capped vireo productivity, predation, and population trend studies is maintained.

Continue to generate color sequences for range-wide color banding of black-capped vireos through cooperation with the U.S. Geological Survey.

Whenever possible, assist in the investigation of the dispersal of black-capped vireos from Fort Hood to surrounding areas through cooperative studies with other researchers. Determine numbers of singing males within each intensive study area, annually.

Design and implement additional research on the black-capped vireo as funding and staffing levels permit. Collaborate with and provide oversight of research conducted by universities, graduate students, and other researchers.

As time permits, visit all known and suspected sites of vireo occupation to document distribution of black-capped vireos on Fort Hood.

Conduct the following actions annually in each intensive study area:

- Monitor all territories in each intensive study area throughout the vireo breeding season.
- Locate and monitor all located nests on monitored territories.
- Band all adults, juveniles, and nestlings to the extent possible.

Monitor the following demographic and reproductive parameters for all monitored territories:

- Banding status of all birds observed.
- Presence or absence of a female on each male territory.

- Territory size.
- Number of young with each adult.
- For all nests located: number of host and parasite eggs, nestlings, fledglings, and nest fate.
- Distance from banding location to re-sighting location in subsequent years.

Conservation Actions: Texabama Croton

Objective 1

Protect known locations from human-related disturbance.

Objective Justification

Protection of known locations of Texabama croton populations from human-related disturbance is a proactive approach to mitigate impacts and possibly prevent listing of species as threatened or endangered. Known populations are in locations where virtually no military training is conducted.

Conservation Actions

No additional action is required at this time. No land use activities that may disturb Texabama croton populations are known to occur in these areas. Natural Resources Management Branch personnel will review protection status for these areas if potential threats occur from future land use activities.

Objective 2

Monitor status and distribution of populations.

Objective Justification

Monitoring Texabama croton population trends will provide managers with information necessary to decide whether additional protection or management actions are required to maintain viable croton populations.

Conservation Actions

Visit known locations annually to visually assess condition of known populations. In addition, Fort Hood will develop and implement an annual monitoring plan for the Texabama croton by 31 December 2011.

Conservation Actions: Cave-adapted Fauna

Objective 1

Protect sensitive cave and karst features from human-related risk factors identified in the 2008 “Management Plan for the Conservation of Rare Karst Species on Fort Hood, Bell and Coryell Counties, Texas.”

Objective Justification

Human activities and changes to surrounding habitats are the greatest threat to cave-adapted fauna. Protection of cave features from these impacts is a proactive approach to mitigate potential impacts and possibly prevent listing of species potentially eligible for threatened or endangered status.

Conservation Actions

Gates have been placed at entrances to caves that have been identified as particularly sensitive and susceptible to human disturbance. The following actions should be followed to construct and maintain gates for sensitive cave and karst features:

- Inspect all current cave gates annually and perform any necessary maintenance.
- Identify any additional cave or karst features susceptible to human disturbance and determine whether gates would alleviate potential problems. Fund and implement construction of additional gates if appropriate.

In the vicinity of cave and karst features where military training increases risk of vegetation destruction and sedimentation, buffer zones should be implemented by placing signs or other barriers at sufficient distance from cave entrances to minimize disturbance.

Place a minimum 10 m buffer (no disturbance zone) around all karst features on GIS shapefiles. The buffer can be adjusted based on the feature type, mapped footprint, and biodiversity, but will never fall below 10 m.

Refine karst fauna area/region size and shape on GIS shapefiles.

Coordinate construction activities such that karst fauna regions/boundaries, buffers, surface nutrients, pollution prevention, and water quantity/quality are maintained.

Objective 2

Locate, map, and conduct biological collections in sensitive cave and karst features on Fort Hood.

Objective Justification

This objective will meet requirement of the ESA to determine presence of listed species and will identify potential for conflicts with mission and land use activities on Fort Hood.

Conservation Actions

Conduct biological investigations in known and newly found cave and karst features if such collections have not previously been performed or are incomplete.

Locate, excavate, survey, and map cave and karst features in areas subject to military training or other land use activities that would potentially result in disturbance of these features.

Monitor the microclimate and species diversity of 10 biologically significant features.

Monitor species diversity at springs.

Objective 3

Update karst management plan including the identification and addition of Plethodon albagula fauna regions.

Objective Justification

Update the comprehensive karst management plan as: new features are studied and mapped, species occurrences are documented, new species are identified, and new threats emerge. Delineate karst fauna region

boundaries for the salamander to reduce the potential listing of this color morph due to threats to its environment or populations.

Conservation Actions

Update the management plan based on known distributions, risk factors, and implications for mission activities.

Prepare an annual report detailing new feature descriptions, measurements, biological investigation results, and maps. Update biota list as species are encountered.

Objective 4

Complete taxonomic evaluation and description of undescribed material collected from Fort Hood caves.

Objective Justification

This work is necessary to identify a new species potentially eligible for listing or species that are currently listed as endangered.

Conservation Actions

Submit taxonomic findings to USFWS for status review.

Objective 5

Continue to conserve, monitor, and manage cave myotis roosts.

Objective Justification

Cave myotis form large colonies in caves that meet certain morphologic and microclimatic conditions. Because such sites are rare on the landscape, they should be conserved, monitored, and managed.

Conservation Actions

Conduct monthly emergence counts at the maternity roost.

Conduct quarterly surveys at abandoned roosts.

Conduct monthly surveys at migration stopover roosts.

Maintain the cupola gates at the maternity roost.

Conduct weekly surface checks at the maternity roost.

Conduct microclimate measurements at all roosts.

Conduct surveillance for White-Nose Syndrome.

Conservation Actions: Other Species

Objective 1

Sprague's pipit: Continue to document and monitor occurrences of this species on Fort Hood.

Objective Justification

This species is a candidate for listing under the ESA. The preferred outcome is to identify and implement necessary management actions to avoid listing of species under the ESA.

Conservation Actions

Presence of Sprague's pipits on the installation is limited to the non-breeding season and observations thus far indicate that training activities likely have minimal effects to this species and may contribute to the maintenance of preferred grassland habitat. In addition, frequent fires in the Live Fire area may also serve to maintain habitat. However, as funds and staffing allow, Fort Hood will continue to monitor and document occurrences of this species, habitat use by the species, potential effects of training and land use to this species, and collaborate on additional research efforts to further knowledge of this species and its wintering habitat on the installation.

Objective 2

Whooping Crane: If whooping cranes are observed, protect from potential disturbance by military training and other land use activities.

Objective Justification

The ESA requires protection from harassment for all listed species. Whooping crane presence on the installation is highly transitory during migration. For this reason, no specific protection plan appears warranted at this time. However, activity of transient individuals should be monitored to prevent potential disturbance from human activity.

Conservation Actions

Monitor activity of whooping cranes while present on the installation.

Notify G3, Range Control, and other appropriate training and operations organizational elements of any potential training disturbance in proximity to observed individuals.

Suspend training activities in proximity to whooping cranes until they have departed installation lands if activities pose a threat to the birds as determined by staff from the Natural Resources branch.

Objective 3

Bald Eagle: Minimize disturbance from low-level helicopter flights and other aviation assets.

Objective Justification

Though the bald eagle is no longer listed under the ESA, populations of this species are still being monitored by the USFWS and this species is also protected under the Bald and Golden Eagle Protection Act. In addition, the bald eagle is listed as a threatened species by the State of Texas. Therefore, efforts should be undertaken to minimize the effects of installation activities to this species to the maximum extent possible. Low-level aircraft flights can disturb wintering populations of this species occurring near Belton Lake.

Conservation Actions

When bald eagles are first observed in autumn, notify the Fort Hood air-space coordinator, and implement the no-fly zone. This zone is situated on and near Belton Lake in parts of Land Groups 2 and 3. Flight restrictions will be lifted when no bald eagles have been observed for a period of two weeks.

Objective 4

Conduct surveys to determine presence and status of other listed, rare, and sensitive species.

Objective Justification

The ESA requires Federal agencies to document the presence of and assess effects of land-use activities on any species occurring on Fort Hood lands that may be eligible or proposed for listing in the future. Documentation of these species' presence and status will meet ESA requirements and is a proactive approach to avoiding project conflicts in the future. The preferred outcome is to identify and implement necessary management actions to avoid listing of species under the ESA.

Conservation Actions

Installation biologists will review species listed in Table 1 annually and will revise and amend as appropriate.

Based on the installation review above, surveys will be initiated as necessary to document presence and status of listed, rare, or sensitive species on the installation.

Results of these surveys will be kept on record by the Fort Hood Natural Resources Management Branch and submitted to the USFWS.

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Appendix F:

Fish Species

Native Fish Species of Fort Hood

SCIENTIFIC NAME:

COMMON NAME:

<i>Ameiurus melas</i>	Black Bullhead
<i>Ameiurus natalis</i>	Yellow Bullhead
<i>Aplodinotus grunniens</i>	Freshwater Drum
<i>Campostoma anamalum</i>	Central Stoneroller
<i>Carpoides carpio</i>	River Carpsucker
<i>Cyprinella lutrensis</i>	Red Shiner
<i>Cyprinella venusta</i>	Blacktail Shiner
<i>Cyprinus carpio</i>	Common Carp
<i>Dorosoma cepedianum</i>	Gizzard Shad
<i>Dorosoma petenense</i>	Threadfin Shad
<i>Etheostoma spectabile</i>	Orangethroat Darter
<i>Fundulus notatus</i>	Blackstripe Topminnow
<i>Gambusia affinis</i>	Mosquitofish
<i>Ictalurus punctatus</i>	Channel Catfish
<i>Lepisosteus osseus</i>	Longnose Gar
<i>Lepomis auritus</i>	Redbreast Sunfish
<i>Lepomis cyanellus</i>	Green Sunfish
<i>Lepomis gulosus</i>	Warmouth
<i>Lepomis humilis</i>	Orangespotted Sunfish
<i>Lepomis macrochirus</i>	Bluegill
<i>Lepomis megalotis</i>	Longear Sunfish
<i>Lepomis microlophus</i>	Redear Sunfish
<i>Lepomis punctatus</i>	Spotted Sunfish
<i>Menidia beryllina</i>	Tidewater Silverside
<i>Micropterus punctulatus</i>	Spotted Bass
<i>Micropterus salmoides</i>	Largemouth Bass
<i>Moxostoma congestum</i>	Gray Redhorse
<i>Notemigonus crysoleucas</i>	Golden Shiner
<i>Notropis buchanani</i>	Ghost Shiner
<i>Percina caprodes</i>	Logperch
<i>Percina carbonaria</i>	Texas Logperch
<i>Percina sciera</i>	Dusky Darter
<i>Pimephales vigilax</i>	Bullhead Minnow

Pomoxis annularis

White Crappie

Pylodictus olivaris

Flathead Catfish

Appendix G: Bird Species

Appendix H: Plant Species

Appendix I: Cave Species

Appendix J:
2011 Biological Opinion (BO)

Appendix K:
Karst Management Plan

Appendix L: Grazing Lease Data

Prescriptions

PRESCRIPTIONS

1.0 *Introduction*

The objective of this section is to present the natural resources management activities that will be implemented in each management unit as a result of this INRMP.

2.0 *Project Priority*

The Office of the Secretary of Defense considers funding for the preparation and implementation of this INRMP, as required by the Sikes Act, a high priority. The reality, however, is that not all of the projects and programs identified in this INRMP will receive immediate funding. Consequently, the programs and projects have been screened and only the high-priority projects are included in this section. The prioritization of the projects is based on need, and need is based on a project's importance in moving the natural resources management program closer to successfully achieving its goal. Projects will be conducted subject to the availability of funding.

The high-priority projects identified by the NRMB, in alphabetical order, are as follows:

- Brown-headed cowbird control
- Bat habitat and roost management
- Carnivore population monitoring
- Cave microclimate monitoring
- Cave survey, mapping, and inventory
- Cave fauna survey and monitoring
- Construct off-site wetland mitigation banks if required
- Construction and maintenance of fire breaks
- Ecosystem plantings
- Endangered species research
- Fire damage abatement projects
- Fisheries management
- Endangered species habitat delineation
- Implementation of karst management plan
- Lake and pond management
- Oak wilt management in endangered species habitat
- Planning Level Surveys
- Prescribed burning for ecosystem management
- Protection and conservation of T&E species: golden-cheeked warblers
- Protection and conservation of T&E species: black-capped vireos
- Repair of eroded and damaged trails
- Salamander habitat (springs and caves) monitoring
- Stream water sampling stations and mitigation
- Survey of Texas horned lizard, as needed
- Training lands management plan
- Wetland surveys
- Wildlife management

3.0 *Management Units*

For ease of allocating resources (staff and funding), Fort Hood's NRMB has divided the installation into functional MUs, which are similar to the grazing MUs. The MUs are listed in Table P-1 below.

Table P-1
Physical Characteristics of Management Units

Region	Land Cover				Streams	Water Bodies		Core Habitat		Non-Core Habitat	
	Bare Ground		Vegetation		Stream Miles	Acres	Percent Area	Acres	Percent Area	Acres	Percent Area
	Acres	Percent	Acres	Percent							
Live-Fire Area	597	1.0	58,893	96.0	252.0	11.4	0.02	0.0	0.0	13,314.8	21.7
North Fort Hood	147	2.5	3,638	62.2	21.0	50.9	0.87	0.0	0.0	233.1	4.0
Northeast	30	0.1	25,592	90.6	78.5	15.5	0.05	6,617.7	23.4	18,103.2	64.1
Northwest	1,112	3.1	34,430	96.2	153.6	69.7	0.19	0.0	0.0	7,387.9	20.6
South	4	0.0	14,045	89.6	65.9	44.8	0.29	0.0	0.0	3,578.0	22.8
Southeast	93	0.4	21,853	93.0	67.9	159.3	0.68	2,944.3	12.5	10,129.0	43.1
Southwest	1,584	5.1	29,371	94.0	177.2	340.4	1.09	0.0	0.0	990.3	3.2
INSTALLATION	3,567		187,822		816.1	692		9,562		53,736.3	

4.0 *Management Unit Goals and Priorities*

4.1 *Live Fire Area*

The live-fire and impact areas do not host much maneuver training and traffic and are limited primarily to vehicles moving to and from the ranges. Access to the impact area is restricted because of danger from direct fire and indirect fire from active ranges and unexploded ordnance.

Goal for Live-Fire Area. Support the military mission, protect endangered species and karst habitats, and maintain ecosystem integrity.

Management Priorities. This MU has the second-largest acreage of non-core endangered species habitat of any MU on the installation. In addition, the MU has 252 miles of streams, including Cowhouse Creek, which empties into Belton Lake, the drinking water supply for Fort Hood and surrounding municipalities. It is necessary to maintain water quality monitoring in Cowhouse Creek as it exits the live-fire area to ensure that the water does not transport contaminants to Belton Lake. Because very little maneuvering of mechanized vehicles occurs in this area, the MU is not subjected to the same degradation as other areas, such as the Northwest and Southwest MUs in the Western Maneuver Area. Although the restricted nature of the area precludes access to a significant portion of the MU, most of the high-priority management activities will be implemented to the extent practical.

4.2 *South*

The South management unit includes West Fort Hood and Land Group 7. West Fort Hood consists of Robert Gray Army Airfield, the Ammunition Supply Point, research and administrative facilities for the Operation Testing Command (OTC), support facilities, and housing for military personnel, which accommodates both families and unaccompanied troops. The South MU is used primarily for small mechanized units and dismounted infantry training and for logistical sites. It is too small and isolated to be used for maneuver training.

Goal for South Fort Hood. Support the military mission, maintain ecosystem integrity, and protect endangered species habitat.

Management Priorities. The low-impact training that occurs in this MU results in minimal degradation of the resources in the training area. Due to the amount of non-core endangered species habitat, habitat management a key activity in this location.

4.3 *Southwest*

The Southwest MU constitutes the southern portion of the Western Maneuver Area. Training in this MU consists of battalion- and brigade-level training, which is conducted year-round. Of all the MUs on the installation, the Southwest MU has the greatest percentage of area receiving significant training

disturbance. Given the level of training and associated disturbance, it is not surprising that the Southwest MU also has the highest number of acres and percentage of bare ground of any management unit.

Goals for Southwest. Support the military mission, increase vegetative cover, minimize erosion and sedimentation, and improve the sustainability of the training area.

Management Priorities. Because of the large amount of bare ground, management activities must focus on stabilizing the soils, increasing the vegetative cover, minimizing erosion, and improving the sustainability of the training area. The Southwest MU also contains many streams and therefore the aquatic habitat, fisheries, and water quality will continue to be at risk from sedimentation until the sediments are stabilized. The endangered species habitat in this MU is non-core habitat and relatively minimal in comparison to other MUs.

4.4 Northwest

The Northwest MU constitutes the northern portion of Fort Hood's Western Maneuver Area, and training in this area is similar to the training that occurs in the Southwest MU. The Northwest MU has the most extensive gully network of all the MUs on the installation. Sediment from severe erosion flows into the various streams of the Cowhouse Creek watershed and eventually settle into Belton Lake.

Goal for the Northwest. Support the military mission, increase vegetative cover, minimize erosion and sedimentation, protect endangered species habitat, and improve the sustainability of the training area.

Management Priorities. This MU ranks second only to the Southwest MU in bare ground. The severe degradation of the vegetative cover has resulted in an extensive gully network that requires significant resources for repair, as well as to prevent further erosion and sediment loading to the streams. A primary focus for this MU is to revegetate the bare areas and to increase the density of the vegetative cover throughout the MU.

This MU contains the largest population of nesting black-capped vireos of all the MUs on the installation. Management activities will focus on maintaining the ecological integrity of the habitat to ensure that Fort Hood continues to achieve its regional recovery goals for golden-cheeked warblers and black-capped vireos.

4.5 North Fort Hood

Activities at North Fort Hood occur primarily during summer training and are similar to those of the main cantonment area. Nearly a third of the management unit is cantonment area; the remaining area consists of deciduous forest and woodlands. The Leon River forms the northern border, and there are potential jurisdictional wetlands along the floodplain.

Goals for North Fort Hood. Support the military mission and maintain the ecological integrity of the area surrounding the cantonment area.

Management Priorities. The North Fort Hood MU receives relatively little disturbance from training and therefore degradation is minimal. Endangered species habitat is found in this area, but it is non-core habitat and represents less than 1 percent of the total non-core endangered species habitat on the installation. The primary focus for management on this MU is to maintain the ecological integrity.

4.6 Northeast

The Northeast MU is heavily vegetated and cross-compartmentalized by terrain features, providing limited value as a mechanized maneuver area. The area is used year-round primarily for wheeled and tracked vehicle maneuvering and for dismounted military police training. The Northeast MU contains a significant amount of core and non-core endangered species habitat. It has restrictive terrain and vegetation, and therefore training is normally conducted on the roads and trails.

Goals for the Northeast. Support the military mission, protect endangered species and karst habitat, and maintain ecosystem integrity.

Management Priorities. Core endangered species habitat is found in two of the MUs on Fort Hood. The Northeast MU contains a majority of the core and a considerable amount of golden-cheeked warbler habitat. Because this area contains core habitat, minimal training restrictions and constraints are enforced in this area during the nesting season. In addition, this MU has the highest known concentration of karst habitat and features compared to any other MU on Fort Hood. Significant effort and use of resources can be expected to be expended to protect these sensitive habitats and the species inhabiting them. In addition, this area will continue to be surveyed for additional caves and the endemic karst/cavernicole species inhabiting them. It is important for Fort Hood to ensure the protection of these areas to minimize the potential for the future listing of the karst species, which would likely result in additional restrictions on training.

A significant portion of this MU is bordered by water, including Belton Lake. As a result, it is important to maintain vegetated watersheds and riparian buffers to protect water quality, aquatic habitat, and biological communities, including fisheries. This is the only MU in which all programmed high-priority projects are scheduled for implementation.

4.7 Southeast

The southeast MU is used year-round for some tracked-vehicle maneuver and dismounted training. This MU is heavily vegetated and contains a significant amount of both core and non-core endangered species habitat, the majority of which is golden-cheeked warbler habitat. The northern border consists of Cowhouse Creek and Belton Lake. The BLORA, Fort Hood's premiere outdoor recreation area, is in this MU.

Goals for Southeast. Support the military mission, protect endangered species and karst habitat, and maintain ecosystem integrity.

Management Priorities. The majority of the habitat is golden-cheeked warbler habitat. As with the Northeast MU, the presence of core habitat results in seasonal training restrictions to protect golden-cheeked warblers and black-capped vireos during the nesting season. The Southeast MU contains some karst habitat, which must be monitored and protected. Surveys for additional caves and species will continue to be conducted in this area.

Cowhouse Creek and Belton Lake compose the northern border of this MU. As with the Northeast MU, it is important to maintain vegetated watersheds and riparian buffers to protect water quality, aquatic habitat, and biological communities, including fisheries.

5.0 Project Summary for Management Units

As noted in Section 2.0, the Fort Hood NRMB has identified a list of projects that are of high priority and must be implemented to ensure that the natural resources management program achieves its goal of maintaining the long-term sustainability of the training lands. Table P-2 indicates which projects are expected to be implemented or to continue to be implemented in each MU.

<p>Table P-2</p> <p>Summary of Projects for Each Management Unit</p>							
Project	Management Unit						
	Live-Fire Area	North Ft. Hood	Northeast	Northwest	South	Southeast	Southwest
Brown-headed cowbird control	•	•	•	•	•	•	•
Cave monitoring	•		•	•	•	•	
Cave survey, mapping and inventory	•		•	•	•	•	
Caves and cave fauna	•		•	•	•	•	
Construction and maintenance of fire breaks	•	•	•	•	•	•	•
Ecosystem plantings	•	•	•	•	•	•	•
Erosion control and revegetation of watersheds	•	•	•	•	•	•	•
Fire damage abatement projects	•	•	•			•	
Fisheries management	•	•	•	•	•	•	•
Habitat delineation	•	•	•	•	•	•	•
Implementation of karst management plan	•		•	•	•	•	
Lake and pond management	•	•	•	•	•	•	•
Planning Level Surveys	•	•	•	•	•	•	•
Protection of T&E species: golden-cheeked warblers	•	•	•	•	•	•	•
Protection of T&E species: black-capped vireo	•	•	•	•	•	•	•
Repair of eroded and damaged trails	•	•	•	•	•	•	•
Stream water sampling stations and mitigation	•		•	•	•	•	
Survey of endemic cave salamander	•		•	•	•	•	
Survey of Texas horned lizard	•	•	•	•	•	•	•
Training lands management plan	•	•	•	•	•	•	•
Vegetation monitoring of fire effects in endangered species habitat	•		•				
Wetland survey	•	•	•	•	•	•	•
Wildlife management	•	•	•	•	•	•	•