Integrated Natural Resources Management Plan
Volunteer Training Site – Smyrna

Tennessee Army National Guard
Nashville, Tennessee

September 2018

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Rutherford County, Tennessee

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Volunteer Training Site - Smyrna
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Signature Page

This Integrated Natural Resources Management Plan (INRMP) meets the requirements for INRMPs listed in the Sikes Act Improvement Amendments (16 U.S.C. 670a et seq), AR 200-1, and the "Executive Summary and Scope" within this plan. It has set appropriate and adequate guidelines for conserving and protecting the natural resources of the Volunteer Training Site at Smyrna.

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AMSL	Above Mean Sea Level
AR	Army Regulations
ARAP	Aquatic Resource Alteration Permit
ARNG	Army National Guard
BMP	Best Management Practice
CEQ	Council for Environmental Quality
CFMO	Construction and Facilities Management Office
DA	Department of Army
DoD	Department of Defense
DoDI	Department of Defense Instruction
EA	Environmental Analysis
EMS	Environmental Management System
ENV	Environmental Office (of the TNARNG)
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FMO	Facilities Maintenance/Engineering Office (of the TNARNG)
FMP	Forest Management Plan
FOB	Forward Operating Base
FONSI	Finding of No Significant Impact
GIS	Geographic Information System
GPS	Global Positioning System
HQ	Headquarters
ICRMP	Integrated Cultural Resources Management Plan
IH	In-house
INRMP	Integrated Natural Resources Management Plan
IPMP	Integrated Pest Management Plan
IPP	Invasive Pest Plant
IRP	Installation Restoration Program
ISO	International Standard Organization
ITAM	Integrated Training Area Management
LCTA	Land Condition Trend Analysis (now RTLA)
METL	Mission Essential Task List
MOA	Memorandum of Agreement
MOSQ	Military Occupational Skill Qualification
MP	Military Police
NCVS	North Carolina Vegetation Survey
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NGB-ARE	National Guard Bureau – Director of Environmental Programs
NGB-ARI	National Guard Bureau – Director of Engineering

NGB-ART	National Guard Bureau – Director of Operations, Training, and Readiness
NOAA	National Oceanic and Atmospheric Administration
NRCS	United States Natural Resources Conservation Service
NRHP	National Register of Historic Places
O&M	Operations and Maintenance
POL	Petroleum, Oil, and Lubricants
POTO	Plans, Operations, and Training Officer (of the TNARNG)
PPK	Projectile Point/Knives
REC	Record of Environmental Consideration
RTE	Rare, Threatened, or Endangered Species
SAIA	Sikes Act Improvement Act of 1997
SAR	Species at Risk
SHPO	State Historic Preservation Office
SITE	Training Site personnel (of the TNARNG)
SJA	Staff Judge Advocate
SMZ	Streamside Management Zone
SOP	Standard Operating Procedure
SPCC	Spill Prevention, Control, and Countermeasure
STEP	Status Tool for Environmental Program
SWPPP	Storm Water Pollution Prevention Plan
TA	Training Area
TAG	The Adjutant General
TCA	Tennessee Code Annotated
TDEC	Tennessee Department of Environment and Conservation
TNANG	Tennessee Air National Guard
TNARNG	Tennessee Army National Guard
TNC	The Nature Conservancy
TNDNH	Tennessee Division of natural Heritage
TN-EPPC	Tennessee Exotic Pest Plant Council
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
UAC	Urban Assault Course
USAF	United States Air Force
USA-CERL	United States Army Corps of Engineers Environmental Research Laboratory
USDA	United States Department of Agriculture
USDC	United States Department of Commerce
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Service
VOC	Volatile Organic Compounds
VTS-S	Volunteer Training Site–Smyrna
WFMP	Wildland Fire Management Plan

EXECUTIVE SUMMARY

This Revised Integrated Natural Resources Management Plan (INRMP), which is required by the Sikes Act, as amended (16 U.S.C. 670a et seq.), has been developed for use by the Tennessee Army National Guard (TNARNG) to provide guidance on the protection of natural resources at the Volunteer Training Site – Smyrna (VTS-S). The original VTS-S INRMP was implemented in 2002-2006. As the natural resources management program developed, it was determined that the original INRMP format was not serviceable. Therefore, a revision of formatting and information was undertaken for the second iteration. This third iteration further modifies the INRMP format for purposes of ease and functionality of use, and will cover the period 2018-2022. This iteration also incorporates additional sections on long-term adaptation to climate change and pollinator management. The United States Fish and Wildlife Service (USFWS) and Tennessee Wildlife Resources Agency (TWRA) were contacted to request their participation and input in revising the INRMP on 11/27/2017.

The primary purpose of natural resources management at VTS-S is to support the military training mission. The purpose of this INRMP is to ensure that natural resource conservation measures and military activities on mission lands are integrated and consistent with responsible stewardship and environmental compliance. This INRMP was prepared in accordance with the Sikes Act, as amended; Army Regulation (AR) 200-1 – Environmental Protection and Enhancement; and Department of Defense Instruction (DoDI) 4715.03 – Environmental Conservation Program.

The National Environmental Policy Act (NEPA) of 1969 dictates that planners of public actions using federal monies, such as those on military installations, shall consider the environmental impacts and effects of "major federal actions." Section 1508.18 in the Council for Environmental Quality (CEQ) regulations lists the adoption of a formal Integrated Natural Resource Management Plan as a major federal action. The NEPA for this document is being tiered off the Environmental Assessment for the first addition of the VTS-S INRMP. A Record of Environmental Consideration (REC) for this revised plan is located in Appendix A. The Finding of No Significant Impact (FNSI) for the original EA can be found in Appendix B. In addition, in accordance with §670a(2) of the Sikes Act, approval of the INRMP has been noted in writing by the U.S. Fish and Wildlife Service and the Tennessee Wildlife Resources Agency (Appendix C).

The goals of this INRMP are:

- To describe the training site and its physical natural resources
- To describe the military mission, potential effects of the mission on natural resources at the training site, and options for resolving conflicts between the military mission and natural resources management
- To show the status of baseline inventories of natural and cultural resources and monitoring requirements for environmental compliance
- To present goals for the management of the site's natural resources and tasks designed to achieve those goals.
- To recommend revegetation and erosion control techniques to maintain stable soils and ensure high-quality water resources and training opportunities

- To provide management guidelines that will be effective in maintaining and improving the sustainability and biological diversity of terrestrial and wetland ecosystems on the training site, support human needs, emphasize public involvement, partnerships and adaptive management

Benefits to the military mission include improved maneuver lands and better distribution of military activities at VTS-S. This plan will enhance mission realism through more options for training as well as more intensive planning of missions. It will also enhance long-range planning efforts at VTS-S. Benefits to the environment include reduced soil erosion and vegetation loss, improvement of water-quality in wetland and riparian ecosystems, and an increase in overall knowledge of the operation of the ecosystems on VTS-S through surveys and monitoring.

This document begins with a description of the subjects: mission and facility details are outlined in Chapter Two, while specifics of the physical environment at VTS-S are presented in Chapter Three. Chapter Four addresses the management goals for VTS-S according to the resource categories specified by the Sikes Act and the projects designed to meet those goals. Chapter Five presents' guidelines intended for management and training activities as they relate to natural resources protection.

The ten Appendices of this document contain supplemental material, including NEPA documentation, additional biological data, and records of the annual review process. Three detailed management plans are included as annexes to this document: the Forest Management Plan, Wildland Fire Management Plan, and the Invasive Pest Plant Control Plan. Additional management plan annexes may be developed for other activities as needed

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CHAPTER 1
GENERAL INFORMATION

1.1 PURPOSE

The Tennessee Army National Guard (TNARNG) maintains the Volunteer Training Site – Smyrna (VTS-S) in Rutherford County, Tennessee, for the purpose of training Tennessee National Guardsmen. The goal of TNARNG land management on this training site is to ensure that there is no net loss of training land resulting from training activities. In addition, the TNARNG hopes to enhance training potential and environmental quality to the greatest extent possible through its management practices. This Integrated Natural Resources Management Plan (INRMP) for VTS-S is the principle guiding document for TNARNG land management activities taking place on the training site. It is a revision of the 2012-2017 VTS-S INRMP, which was revised from the 2001-2006 INRMP. This INRMP will remain in effect until a revision is deemed necessary.

The Sikes Act, Public Law 105-85, "Sikes Act Improvement Act of 1997," (SAIA) November 18, 1997, requires the preparation of an INRMP for those military installations containing significant natural resources and specifies the key information to be included in the Plan. The U.S. Fish and Wildlife Service (USFWS) and the Tennessee Wildlife Resources Agency (TWRA) are required to be cooperators in the process of developing the TNARNG INRMPs. The VTS-S contains 456 ac of forest land which may be subject to timber harvest through the DoD Forestry Reimbursable Program, as well as significant surface water resources as the training site abuts J. Percy Priest Lake and straddles one of the lake's tributaries Stewart Creek.

The SAIA requires a review for operation and effect no less than every five years to keep the INRMP current. Major changes require a revision be conducted while minor changes can be incorporated with an update to the existing INRMP. A revision or update will be used based on the review for operation and effect conducted jointly with the USFWS and the TWRA. The original VTS-S INRMP was implemented in 2002. In years since, the mission requirements of the TNARNG have gradually shifted, creating the need to alter some aspects of the training landscape at VTS-S. This change, in combination with the initiation of a Forest Management Plan in 2004 and the unsatisfactory nature of the original INRMP, drove an internal decision by TNARNG in 2005 to initiate a full revision of the INRMP in coordination with the cooperating agencies. The cooperating agencies were contacted when the revision process was begun and did not object to a full revision, and they have contributed to the development of the new INRMP. Thus, the formal five-year review was conducted in conjunction with the revision process, and the spirit of the interagency cooperative effort was honored. The 2010 review for operation and effect showed the plan was functioning adequately and the plan was updated in 2012. Documentation of this cooperation is included in Appendix C.

This third revision will serve to guide TNARNG activities on the training site until a review finds that significant revision is necessary. The overriding goals of this plan are to minimize impact on training lands, to effectively repair damage caused by training activities, to improve the mission-specific qualities of the training lands, and to protect and enhance the ecosystem value of the training site. This is a living document which will be reviewed annually and updated as needed. Barring earlier need for substantial revision, five years following the date of implementation of this document, the USFWS, TWRA, and TNARNG will coordinate a review for operation and effect to determine whether the INRMP is functioning effectively or whether another large-scale revision is necessary.

Natural resources management is an on-going, long-term process. This and subsequent iterations of the INRMP will serve to shape the direction of that process to support the military mission of the TNARNG, to encourage sustainable management of natural resources, and to ensure compliance with all relevant federal, state, and local laws.

1.2 MANAGEMENT PHILOSOPHY

As stated above, the primary goal of land management at VTS-S is to meet military training needs, now and in the future, while maintaining a healthy ecosystem. To ensure the ability to meet those future needs, there must be a healthy natural system in place across the training site. The goals of training and of environmental protection should not be seen as opposing. Rather, the one, a healthy environment, should support and enhance the other, training potential.

Department of Defense (DoD) Instruction 4715.03 directs that DoD land management incorporate ecosystem management, biodiversity conservation, and multiple use management. The basic principle of ecosystem management is to focus on the health of the total environment – ecosystem composition, structure, and function – rather than individual species. It is management driven by goals and designed to be adaptable: monitoring of results should lead to changes in the process if desired outcomes are not achieved. Biodiversity is short for "biological diversity," and it refers simply to the variety, distribution, and abundance of organisms in an ecosystem. Biodiversity is crucial to the stability and functioning of an ecosystem.

Multiple use management refers to the practice of integrating different purposes and end products into the management scheme for a single piece of property. Under multiple use management, the goal is to obtain such commodities as timber, wildlife, recreation, water quality, and in this case training opportunities from the same land through appropriate and integrated management.

The multiple uses for which the VTS-S is to be managed include: TNARNG training needs, maintenance of native communities and biodiversity, surface and ground water quality, conservation of soil resources, threatened and endangered species protection, and habitat quality. It is the role of this INRMP to integrate the management practices for each of these goals such that all needs can be met on a sustainable basis without compromising the health of the ecosystem or mission requirements.

1.3 RESPONSIBILITIES

1.3.1 National Guard Bureau

The National Guard Bureau is the federal component of DoD through which flow funds and guidance to the TNARNG. Two Divisions at NGB are involved in the management of natural resources: Installations and Environment (ARNG-I&E), and the Training Division (ARNG-TRS).

The Sikes Act Coordinator at ARNG-I&E is responsible for reviewing the INRMP and advising the TNARNG before the state formally submits the plan for public review. ARNG-I&E ensures operational readiness by sustaining environmental quality and promoting the environmental ethic and is also responsible for tracking projects, providing technical assistance, quality assurance and execution of funds. Additionally, ARNG-I&E provides policy guidance and resources to create, sustain, and operate facilities that support the Army National Guard. ARNG-I&E coordinates proposed construction projects with

Operations/Training and provides design and construction support, as well as environmental management that is directly related to property maintenance (e.g., grounds maintenance, pest control).

ARNG-TRS is responsible for training and training site support to include sustainable range management. The Integrated Training Area Management (ITAM) program is run by Operations/Training, but must be coordinated with the Environmental and Engineering directorates to ensure methods and results are environmentally sound and meet military needs

1.3.2 TNARNG

The Adjutant General (TAG) of the TNARNG is directly responsible for the operation and maintenance of VTS-S, which includes implementation of this INRMP. TAG ensures that all installation land users are aware of and comply with procedures, requirements, or applicable laws and regulations that accomplish the objectives of the INRMP. TAG also ensures coordination of projects and construction between environmental, training, and engineering staffs.

TAG has an Environmental (ENV) office to provide professional expertise in the environmental arena for VTS-S and all other TNARNG properties. The conservation branch of ENV is responsible for natural and cultural resources. Natural resources, including flora, fauna, forest management, threatened and endangered species protection, riparian areas, wetlands, soils, and other features, are the focus of this plan. Cultural resources such as archaeology, historical buildings, artifact curation, and American Indian consultation are covered by the Integrated Cultural Resources Management Plan (ICRMP). The compliance branch of ENV handles the legal requirements for managing hazardous materials and waste, drinking water quality, air quality, pollution prevention, and similar tasks. The NEPA process for TNARNG is also coordinated by a branch of the ENV office. Overall, ENV is responsible for characterizing the physical and biological features of TNARNG lands, recommending appropriate management for those features, identifying compliance needs, and advising TNARNG on the best ways to comply with federal and state environmental laws and regulations. The Environmental Office also provides technical assistance to the training site personnel including: developing projects, securing permits, conducting field studies, providing Environmental Awareness materials, locating and mapping natural and cultural resources, and developing and revising management plans, to include the INRMP.

The Plans, Operations and Training Officer (POTO) has the primary responsibility of scheduling military training and ensuring safety of all personnel while training exercises are being conducted. The POTO conducts contingency planning and preparation to provide timely and appropriate military support to meet required Federal, State, and community missions. The POTO is responsible for working with the environmental office to develop a baseline of current and projected training requirements and training lands/facilities for the training site; assisting the Environmental office in determining carrying capacity for the training site by providing military usage and training data; and planning for land use based on accomplishing training requirements while minimizing negative environmental effects.

The Training Site Operations Staff (SITE) is made up of the Training Site Manager, Range Control, and civilian personnel, who work with the Environmental office to implement this plan and assure its success. The Training Site Operations Staff is familiar with all aspects of the training site, including training scheduling (and conflicts), locations of training facilities, impairments or problems with human-made structures or natural functions, and needs for improvement or maintenance of the training land. The Training Site Personnel and TNARNG Environmental staff will ensure that all INRMP and ICRMP projects are identified and executed in accordance with all laws and regulations.

The statewide Facilities Management/Engineering Office (FMO) provides a full range of financial and engineering disciplines for all facilities under the jurisdiction of the Military Department of Tennessee, including VTS-S. The FMO is responsible for master planning and ensuring that all construction projects comply with environmental regulations by consulting with the Environmental office prior to any construction by TNARNG Engineers. The FMO also provides necessary assistance with design of erosion control projects.

The Staff Judge Advocate (SJA) advises the TAG, POTO, FMO, and ENV on laws and regulations that affect training land use and environmental compliance. The joint effort of TAG, Chief of Staff, POTO, Training Site, FMO, and Environmental Office make the INRMP a living document that is updated annually. The Conservation Branch will conduct yearly meetings with the training site manager and staff, the Training Site Commander, POTO, and FMO on proposed projects and plans for the training site. Coordination for the meeting will be the responsibility of the Environmental office.

1.4 RELEVANT ENVIRONMENTAL REGULATIONS

Natural resources management at VTS-S is subject to a variety of environmental regulations, as referenced in Appendix E. In addition to state and federal law, TNARNG must abide by DoD and Army policy in its handling of the training site. Copies of relevant laws and regulations are being compiled in the TNARNG Environmental library to be more readily available for review by all personnel involved in natural resources management.

1.5 ENVIRONMENTAL REVIEW (NEPA COMPLIANCE)

The National Environmental Policy Act (NEPA) was created to identify environmental concerns with human activities and resolve them to the best degree possible at early stages of project development. The levels of NEPA are recognized:

1. If the proposed action meets a categorical exclusion in AR 200-2, a Record of Environmental Consideration document is prepared for the project, and the project may proceed as planned. These are the most commonly prepared documents.

2. An Environmental Assessment (EA) may be required when the conditions for a categorical exclusion are not met. This often happens when extensive new military exercises, major construction, or land acquisition is planned; when the planned action involves a large area, or when wetlands or endangered species may be involved. A Finding of No Significant Impact is required for the action to proceed as planned. Environmental Assessments are comprehensive documents that describe a proposed action and the alternatives to the action. A 30-day review period is provided for public comment.

3. If more study is needed or a Finding of No Significant Impact cannot be prepared, an Environmental Impact Statement must be written. These can be lengthy documents that require significant time to prepare.

The TNARNG uses NEPA to ensure its activities are properly planned, coordinated and documented. The TNARNG provides NEPA documentation for proposed unit projects at VTS-S that are beyond the existing level of documentation developed by the TNARNG for the training site. This additional NEPA documentation can then be used for identification of potential problems or impacts on the natural resources of the VTS-S.

An Environmental Assessment was completed for the implementation of the original iteration of the INRMP for the VTS-Smyrna (2001). Substantive changes have been minimal from that document, and so the NEPA review for the revised INRMP was a Record of Environmental Consideration tiered off the original EA. This Record and the original Finding of No Significant Impact (FNSI) are included in Appendices A and B.

1.6 IMPLEMENTATION AND REVISION

The original VTS-S INRMP was implemented in 2002. During the first years of implementation, it became apparent that the format and content of the original INRMP were not conducive to applied management and that a thorough revision of the document would be required to bring the structure and project lists more in line with actual management practices and to more accurately reflect current training needs at VTS-S. In 2006, USFWS and TWRA concurred with the need for a revision and contributed to the new version. The document was updated with the concurrence and contributions of both cooperating agencies in 2012. The 2017 review for operation and effect of the document failed to identify any major changes in training site use or significant changes in management. This version is therefore only being updated to improve the formatting to be more functional in management use and update some projects. Both cooperating agencies reviewed and contributed to this 2018 iteration (see documentation in Appendix C), thus satisfying the requirement for a joint review.

This INRMP is living document and will remain effective until a significant revision is deemed necessary. It was developed in cooperation with the USFWS Cookeville Field Office and the TWRA. Those agencies have approved the document. It was subjected to public review in 2006 to satisfy the Sikes Act requirements. Public comments were reviewed by the cooperating agencies and incorporated into the final document where appropriate. Public comments are recorded in Appendix D. This iteration of the document does not require public review, as it is merely an update.

During the lifetime of this INRMP, it is the responsibility of the TNARNG Environmental Office to work with the cooperating agencies to review it annually and update it to stay in step with military mission requirements and to maintain compliance with all applicable laws. USFWS, TWRA, Training Site personnel, and the Environmental Office will review the accomplishments for the year and address any issues. Documentation of this review will be maintained in Appendix J. Minor changes will be incorporated when needed into the existing document with agreement of the primary cooperators. In the event of a significant change to management practices, military use, or law, a complete revision may be deemed necessary, requiring collaboration with USFWS and TWRA to produce a new, signed version of the INRMP. Otherwise, five years following implementation of this document a full scale review for operation and effect will occur in accordance with the SAIA. A revision or update at that time will be used based on this review effort conducted jointly with the USFWS and the TWRA.

Implementation of the INRMP will be realized through the accomplishment of specific goals and objectives as measured by the completion of the projects identified in each section of this plan. Responsibility for implementation of goals and objectives has been identified and assigned to each project throughout this document. It should be noted that project implementation dates are estimated and are subject to change depending upon funding and staffing availability. The implementation schedule in Appendix K, Table K-1, will provide a basis for monitoring and evaluating accomplishments towards reaching the goals. Projects identified in this Plan are reflected in the Status Tool for Environmental Program (STEP). Funding for these projects is programmed seven years out under this system.

1.6.1 Personnel

Essential to plan implementation is a balanced team of trained professionals and technical staff. Staffing sources for the natural resources program at VTS-S include:

- Permanent Staff
  - VTS-S Training Site Manager
  - VTS-S Range Officer
  - VTS-S Training/Operations NCO
  - Training Technician/Range Facility Management Support Systems (RFMSS) Operator
  - Five state-funded maintenance workers
  - Environmental Branch Personnel
    - TNARNG Environmental Program Manager
    - Natural Resources Manager
    - Contract Biologist
    - Cultural Resources Manager

- Part-time Staff
  - Training Site Detachment (4 people per weekend)

- Troop Labor during Annual or Drill Training provides benefits to the training site as well as to the troops themselves. Examples of projects executed using troop labor in the past are road leveling and grading, spreading of gravel, and hardened bivouac site construction.

1.6.2 Outside Assistance

Because it is most probable that TNARNG will not be able to hire the specialized expertise needed to achieve some of the projects within this INRMP, considerable expertise from universities, agencies, and contractors will be required to accomplish the tasks. Specific needs from other organizations external to TNARNG are indicated throughout this plan.

Agencies and organizations which may provide substantial support to TNARNG in carrying out this INRMP include:

- Tennessee Department of Environment and Conservation
- Tennessee Wildlife Resources Agency
- Tennessee Division of Forestry
- U.S. Fish and Wildlife Service, Cookeville Field Office
- U.S. Forest Service
- Natural Resources Conservation Service, Murfreesboro Office
- Tennessee State Historic Preservation Office

Universities are a key source of scientific expertise. TNARNG does not currently have any Memoranda of Understanding with local schools but is working to establish relationships with:

- University of Tennessee at Knoxville
- Middle Tennessee State University
- Tennessee Technological University

Many of the projects identified in this plan will require expertise and time beyond that available within the permanent TNARNG staff. Such projects will be contracted out to appropriate

organizations or corporations and overseen by TNARNG Environmental Office Staff.

1.6.3 Training

Training received by TNARNG personnel and others participating in the management of natural resources at the training site should address practical job-oriented information, legal compliance requirements, applicable DoD/Department of Army (DA) regulations, pertinent State and local laws, and current scientific and professional standards as related to the conservation of natural resources. The following annual workshops, professional conferences, and classes are excellent means of obtaining interdisciplinary training for natural resources managers:

- NGB Conservation Workshop
- Sustainable Range Program Workshop
- Land Rehabilitation and Maintenance Conference
- Colorado State University-Center for Ecological Management of Military Lands RTLA Training
- Pesticide Application and Licensing through Tennessee Department of Agriculture
- National Military Fish and Wildlife Association Conference
- U.S. Army Corps of Engineers Wetlands Delineation Courses
- Prescribed Fire Management Course offered by The Nature Conservancy
- Locally available training through the Cooperative Extension Service, universities, professional and trade organizations, state government, and commercial businesses

1.6.4 Funding

Implementation of this INRMP is subject to the availability of annual funding. The following discussion of funding options is not a complete listing of funding sources. Funding sources are continuously changing and the individual focus, restrictions, and requirements of funding sources are volatile.

In 2005, DA created the Sustainable Range/Installations Environmental Activities Matrix to realign and clarify funding responsibilities for environmental requirements on ranges and facilities to avoid redundancy and gaps. The matrix designates that Environmental is the primary funding source for cultural resources, wetlands, endangered species, and all environmental plans. Installations are the primary funding source for soils issues (erosion), pest management, and invasive species control. Prescribed burning is a shared responsibility: Environmental funds cover planning and burning for ecosystem management and endangered species protection/management. Installations are responsible for wildfire prevention, response, and control, including fire break maintenance.

Other funding sources may be dictated by circumstance. Training funds are utilized to address issues (such as erosion) created by training activities and for range management actions designed to improve training opportunities. Planning, environmental review, and any necessary mitigation required for MILCON projects will be funded through the construction program.

<u>Operations and Maintenance Environmental Funds:</u>
Environmental funds are a special category of Operations and Maintenance (O&M) funds and are controlled by the Status Tool for Environmental Program (STEP) budget process. They are special in that they are restricted by the DoD solely for environmental purposes, but they are still subject to restrictions of O&M funds. Compliance with appropriate laws and regulations is the key to securing environmental funding. The program heavily favors funding high priority projects with a goal of achieving compliance with federal or state laws, especially if non-compliances are backed by Notices

of Violation or other enforcement agency action.

Agriculture, Forestry, and Hunting Permit Funds:
The forestry program at VTS-S is supported by the DoD Forestry Reimbursable Program. Income from the sale of forest products is divided: the United State Army Corp of Engineers (USACE) is reimbursed for expenses accumulated in conducting the sale, 40% of the remainder is provided to the state treasury for county schools and roads, and 60% is deposited into the DoD Forestry Account. Funds from the account can be requested each year for projects directly related to forest management. Such activities that can be reimbursed include timber management, reforestation, timber stand improvement, inventories, fire protection, construction and maintenance of timber area access roads, purchase of forestry equipment, disease and insect control, planning (including compliance with laws), marking, inspections, sales preparations, personnel training, and sales.

There are no agricultural outleases at VTS-S, so funding established for the Agricultural and Grazing Outlease program is not accessed for management at the training site. Likewise, there is no hunting program on the site, and so there is no funding available from hunting permit fees for wildlife management.

Other Funding Sources:
The Legacy Resource Management Program provides assistance to DoD efforts to preserve natural and cultural resources on federal lands. Legacy projects could include regional ecosystem management initiatives, habitat preservation efforts, archaeological investigations, invasive species control, and/or flora or fauna surveys. Legacy funds are awarded on the basis of project proposals submitted to the program.

National Public Lands Day is an event that occurs once a year when volunteers come together to improve the country's largest natural resource – our public lands. These volunteers gather on a Saturday every September to help improve the public lands they use for recreation, education, and enjoyment. Consult the National Public Lands Day website for more information at http://www.npld.com and follow the link to the DoD contact listed on the Federal Agency Working Group page.

Pulling Together Initiative (PTI) provides a means for federal agencies to partner with state and local agencies, private landowners, and other interested parties in developing long-term weed management projects within the scope of an integrated pest management strategy. PTI's goals are: 1) to prevent, manage, or eradicate invasive and noxious plants through a coordinated program of public/private partnerships; and 2) to increase public awareness of the adverse impacts of invasive and noxious plants. Projects that benefit multiple species, achieve a variety of resource management objectives, and/or lead to revised management practices that reduce the causes of habitat degradation are sought. A special emphasis is placed on larger projects that demonstrate a landscape-level approach and produce lasting, broad-based results on the ground. Consult the PTI website link at http://www.dodlegacy.org/legacy/intro/guidelines.aspx for information on current grant proposal criteria.

The Federal Domestic Assistance Program 15.608 (Fish and Wildlife Management Assistance) provides technical information, advice, and assistance to Federal and State agencies and Native Americans on the conservation and management of fish and wildlife resources. Projects for grant funding must be submitted to the Regional Director of the USFWS. Cooperative programs with the State conservation agencies and military installations have included joint studies of fishery and wildlife problems of major watersheds, large reservoirs, or streams. Through the Sikes Act, the Service has established a Memorandum of Understanding with the DoD whereby fish and wildlife values are considered on

military installations.

The DoD administers the grant program "Streamside Forests: Lifelines to Clean Water," a competitive grant program designed to help children and others learn about protecting resources by working with installation staff to help restore a streamside ecosystem in their own community. The DoD provides funds up to $5,000 to military installations working in partnership with local school and/or civic organizations to purchase locally native plant material for small streamside restoration projects.

1.6.5 Priorities and Scheduling

The Environmental Quality Conservation Compliance Classes define funding priority with regard to O&M funds. All projects in classes 0, I, and II shall be funded consistent with timely execution to meet future deadlines (DODI 4715.03). The four project classes are:

Class 0: Recurring Natural and Cultural Resources Conservation Management Requirements – includes projects and activities needed to cover the recurring administrative, personnel, and other costs that are necessary to meet applicable compliance requirements (Federal and State laws, regulations, Presidential Executive Orders, and DoD policies) or which are in direct support of the military mission. Examples of recurring costs include:

- Manpower, training, and supplies
- Hazardous waste disposal
- Operating recycling activities
- Permits and fees
- Testing, monitoring, and/or sampling and analysis
- Reporting and record keeping
- Maintenance of environmental conservation equipment
- Compliance self-assessments

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

- Environmental analyses, monitoring, and studies required to assess and mitigate potential effects of the military mission on conservation resources
- Planning documents
- Baseline inventories and surveys of natural and cultural resources
- Biological assessments, surveys, or habitat protection for a specific listed species
- Mitigation to meet existing regulatory permit conditions or written agreements
- Wetlands delineation
- Efforts to achieve compliance with requirements that have deadlines that have already passed
- Initial documenting and cataloging of archaeological materials

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

- Compliance with future requirements that have deadlines
- Conservation and Geographic Information System mapping to be in compliance

- Efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives
- Wetlands enhancement, in order to achieve the Executive Order for "no net loss" or to achieve enhancement of existing degraded wetlands
- Environmental awareness and education programs for troops and the public

Class III: Enhancement actions, beyond compliance – includes those projects and activities that enhance conservation resources or the integrity of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required under regulation or Executive Order and are not of an immediate nature. Examples include:

- Participation in "National Public Lands Day", an annual event where volunteers unite to improve resources on public lands
- Community outreach activities, such as "Earth Day" and "Historic Preservation Week"
- Educational and public awareness projects, such as interpretive displays, oral histories, "Watchable Wildlife" area, nature trails, wildlife checklists, and conservation teaching materials
- Restoration or enhancement of cultural or natural resources when no specific compliance requirement dictates a course or timing of action
- Management and execution of volunteer and partnership program

CHAPTER 2
TRAINING SITE OVERVIEW

2.1 LOCATION AND REGIONAL CHARACTER

2.1.1 Location, Size, General Description

The 856.69-acre VTS-S is located in Rutherford County, Tennessee, and is located partially within the city limits of the town of Smyrna, approximately 22 miles southeast of Nashville, Tennessee (Figure 2.1). Main access to the training site is provided by Sam Ridley Parkway, which is easily accessible via U.S. Highway 41-70S, Interstate 24, and State Route 840. The Smyrna/Rutherford County Regional Airport is found to the west of VTS-S. The perennial waters of Stewart Creek and J. Percy Priest Lake occupy over 200 acres of the site.

2.1.2 Property Ownership

The training site consists of federally-, state-, and county-owned property. The Tennessee Army National Guard (TNARNG) is licensed to use 709.57 acres from the Nashville District and 137.15 acres from the Mobile District of the United States Army Corps of Engineers (USACE). Of significance on these properties is the USACE-established "508 line", which indicates portions of land less than 508 feet above sea level surrounding the J. Percy Priest Reservoir. Restrictions related to the 508 line as stated by a Memorandum dated October 26, 2004, issued to the TNARNG by the USACE's Mobile District are as follows:

> The premises are subject to a flowage easement reserved by the Nashville District for all areas below Elevation 508 Mean Sea Level. The easement is for continued operations of J. Percy Priest project for flood control, hydroelectric power production, and recreation and provides the Corps the right to flood, the right to prohibit structures for human habitation, and that the placement or construction of any other structures requires the written permission of the Nashville District Engineer. Future construction requests by the TNG [TNARNG] in areas below the 508 contour will require an offset of fill in accordance with the Corps' fill policy. All building requests will require all first floor elevations to be constructed above Elevation 508. All construction plans below Elevation 508 must receive prior written approval by the Nashville District Engineer before construction may be initiated by the TNG [TNARNG].

Areas excluded from the Nashville District USACE license include Cannon Cemetery, located in Training Area (TA) 6 (see Figure 2.4); the former sewage treatment pond (and right of way thereto) in TA2; and Volunteer Park, a softball field complex located in the eastern portion of the Cantonment Area. While not specified in the license agreement, TNARNG has informally agreed not to use TA3 for training until mitigation options are implemented, due to the possibility of hazards remaining as a result of previous DoD landfill use. TNARNG plans to further investigate the terms of the license to determine what activities, if any, are allowed in this area.

The state-owned portion of VTS-S consists of 10.11 acres and is located within the Cantonment area. Additionally, on the western border of the training site, adjacent to airport property, the

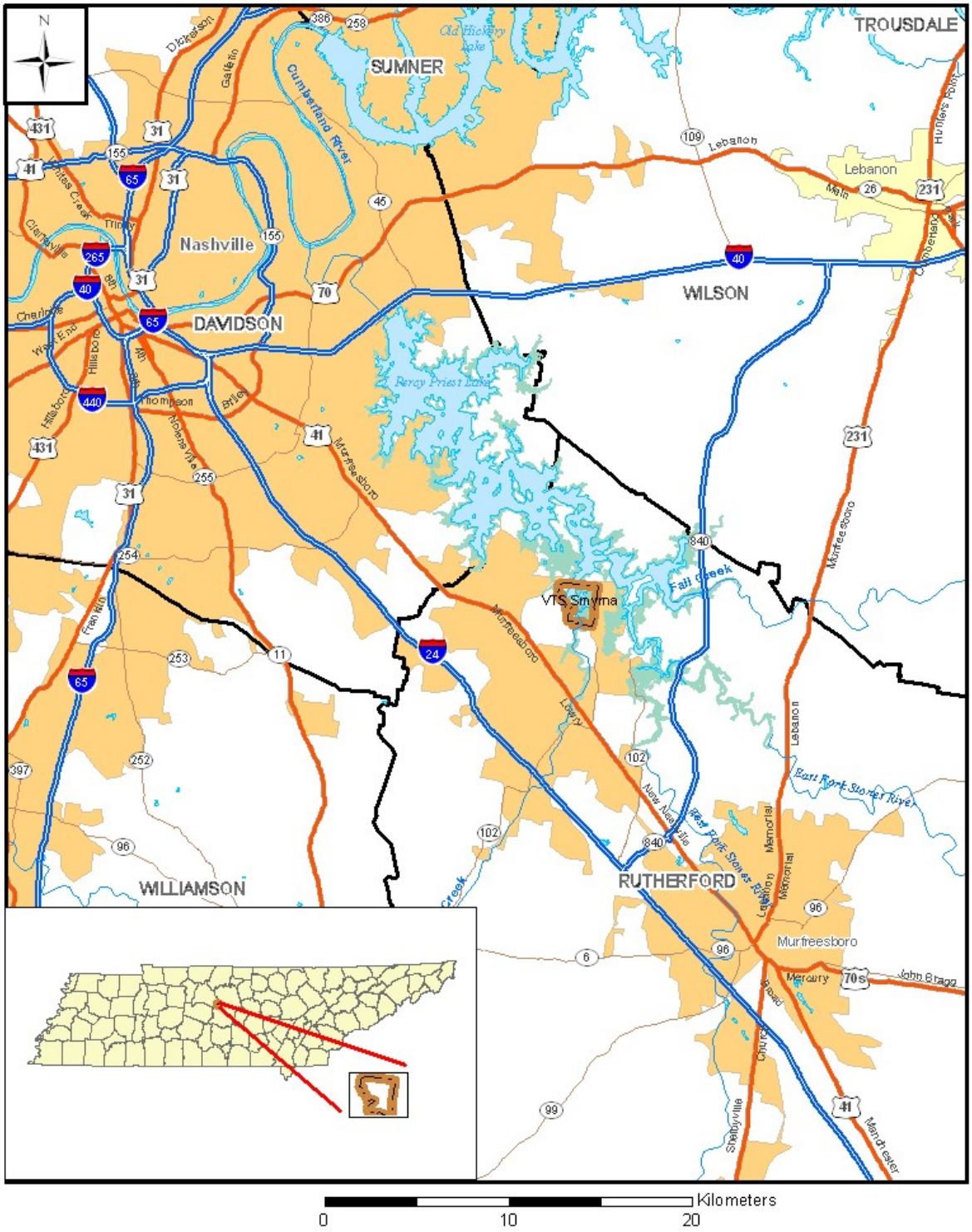

Figure 2.1: Location of the Volunteer Training Site – Smyrna

Smyrna/Rutherford County Airport Authority and the TNARNG have developed a joint use agreement for approximately 11 acres. This parcel of land contains an airplane hangar and surrounding parking areas.

2.1.3 Neighboring Land Ownership and Encroachment

Much of the western boundary of VTS-S lies adjacent to the Smyrna/Rutherford County Regional Airport (Figure 2.2). This facility covers over 1700 acres and serves as the reliever airport for Nashville International Airport, which is located twelve miles northeast of the site.

Smyrna Municipal Golf Course, located just south of the airport, is a municipal facility of the Town of Smyrna and boasts an 18-hole regulation golf course with a full practice facility.

Properties south and southeast of the training site are occupied by a combination of Rutherford County facilities and privately-owned residences and industrial businesses. Hales Camp is a large trailer park located just southeast of VTS-S. Bordering the site's eastern boundary, along Weakley Road, recent development has produced an area of densely-populated subdivisions, condominiums, and apartment complexes.

Volunteer Park is a 15 acre softball field and recreation area located within the boundaries of the training site on the northeastern corner of 8th Street and E Street. While the park is surrounded on all sides by VTS-S, the land on which it is located is excluded from the USACE license agreement with the TNARNG. The park is managed by the Town of Smyrna Parks and Recreation Department.

The United States Corp of Engineers owns and manages most of the property adjacent to the northern and northwestern borders of VTS-S, including J. Percy Priest Lake and a Wildlife Management Area Unit located on the lake's western shore, north of the training site. A large portion of the training site is located within the floodplain of the lake and falls at or below the 508 line, previously defined in Section 2.1.2; portions under 508 feet above sea level are under the jurisdiction of the USACE as relates to flood control measures.

2.1.4 Demographics

Total resident population for Rutherford County, in which VTS-S is located, is 308,251. (Table 2.1). Rutherford County's unemployment rate is lower than the state and national averages. Median household income is substantially greater than the state average and slightly higher than the United States average.

Table 2.1: Selected demographic data for Rutherford County, Tennessee

	Total Resident Population (estimate)*	Median Household Income, 2011-2015 (estimate)*	% Persons Below the Poverty Line (estimate)*	% Unemployment Rate**
Rutherford	308,251	$56,219	11.1 %	3.8%
Tennessee	6,651,194	$45,219	16.7 %	4.8%
United States	323,127,513	$53,889	13.5 %	4.9%

*U.S. Census Bureau (2016) **TN Division of Employment Security (2016)

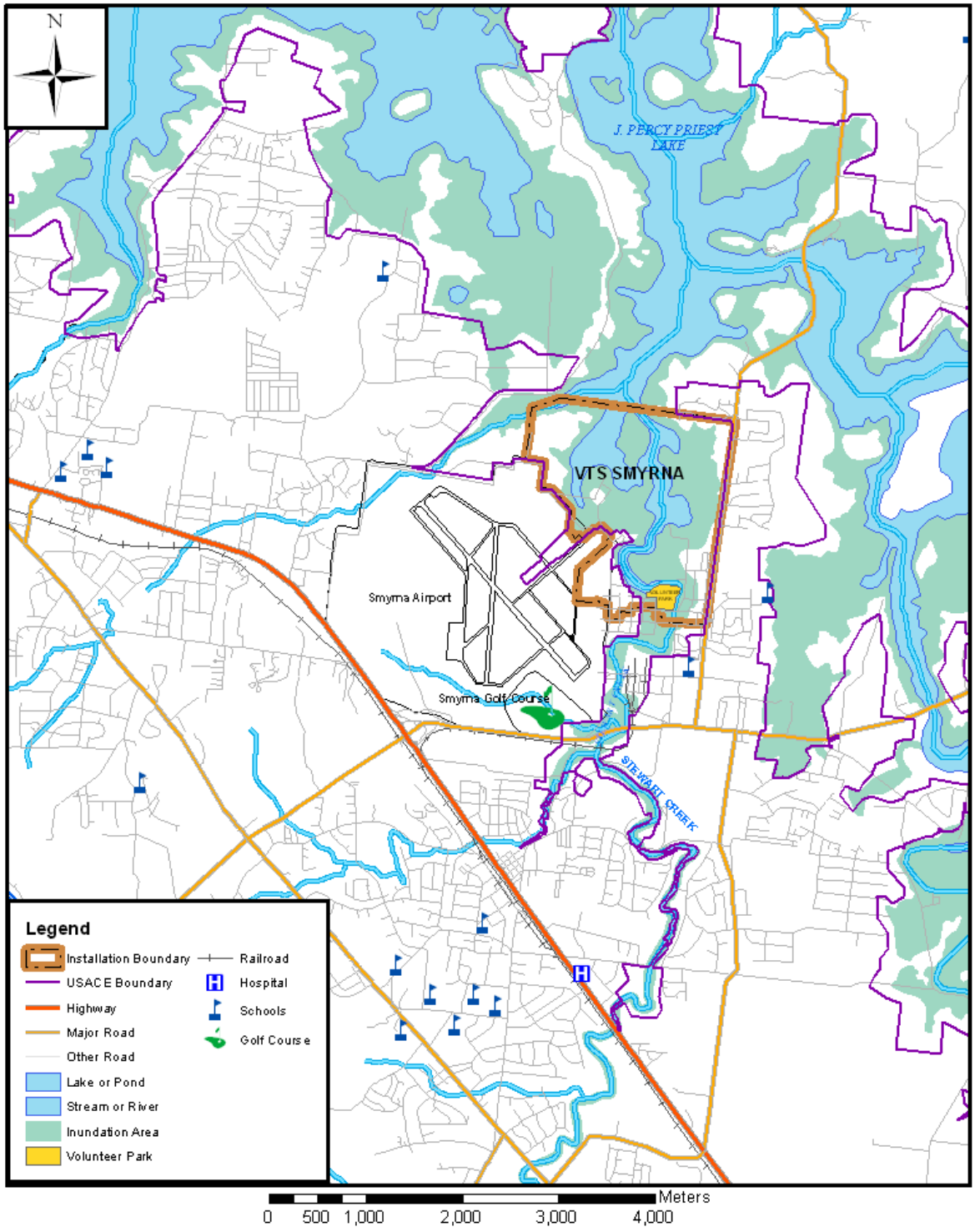

Figure 2.2: Local surroundings of VTS-Smyrna

2.1.5 Nearby Natural Areas

Nearly 13,000 acres of natural areas are located within a 15 mile radius of VTS-S. Many of these locations support habitats representative of the conditions that were likely found on the training site prior to the human disturbances of recent centuries. Appendix G contains descriptions of these sites, which include the following:

- Cedars of Lebanon State Forest
- Long Hunter State Park
- Couchville Cedar Glade State Natural Area
- Elsie Quarterman Cedar Glade State Natural Area
- Fate Sanders Barrens State Natural Area
- Gattinger's Cedar Glade State Natural Area
- Mount View Cedar Glade State Natural Area
- Stones River Cedar Glade State Natural Area
- Sunnybell Cedar Glade State Natural Area
- Vesta Cedar Glade State Natural Area
- Vine Cedar Glade State Natural Area
- Walterhill Flood Plain State Natural Area

The largest of these are Cedars of Lebanon State Forest and Long Hunter State Park, which cover 9,420 and 2,400 acres, respectively. Most of the remaining natural areas are found on less than 200 acres and serve to protect and preserve naturally occurring limestone cedar glade communities. Cedar glades are found in open clearings and are composed of plant communities which thrive in dry, shallow, limestone-based soils. Many rare and sensitive species are endemic to cedar glades such as Tennessee coneflower (*Echinacea tennesseensis*) and Pyne's ground plum (*Astralagus bibullatus*) (see Table 3.5 for additional rare species found in local cedar glades). The Inner Central Basin, in which VTS-S is located, has the highest concentration of endemic plants throughout the range of the limestone cedar glade habitat (Quarterman 1989).

In addition to the natural areas listed above, there are approximately 10,000 acres of J. Percy Priest Reservoir-related recreation areas on USACE properties adjoining the lake near VTS-S. These sites contain picnic areas, boat ramps, campgrounds, numerous trails, and other attractions (USACE 2006).

2.2 INSTALLATION HISTORY

The training site is located in the close vicinity of transportation corridors that played significant roles in both the economic development of middle Tennessee and, later, the Civil War, including Stones River, Stewart Creek, Old Jefferson Pike, Murfreesboro Pike (known today as Old Nashville Highway), and the Nashville and Chattanooga (N&C) Railroad. The land in and around VTS-S was settled in the late 1790s, not long after the settlement of Nashville. In 2001, a historic building survey was prepared by Science Applications International Corporation (SAIC) and TRC Garrow Associates, Inc. (Cleveland et al. 2001). Much of the following history is derived from this report.

In 1804, a settlement was established at Jefferson, several miles east of the VTS-S. Remnants of an old road, possibly an early alignment of Jefferson Pike, run east to west across the site through Training Areas 2 and 6. The reservoir now floods portions of the old Pike. Murfreesboro replaced Jefferson as the Rutherford County Seat in 1812. The construction of Murfreesboro Pike, in 1831, and of the N&C Railroad, completed in 1851, greatly increased passenger and freight traffic through the area (Goodspeed Publishing Company 1887).

During the Civil War, the Stewart Creek area served as the site of several strategic military maneuvers preceding and accompanying the brief but bloody Battle of Stones River which occurred just northwest of Murfreesboro, in the winter of 1862-63. The Battle of Stones River was an extremely important event in the war as it marked the beginning of Union occupation of middle Tennessee.

A large cemetery, Cannon Cemetery, can be found in the northwestern portion of the property (see Figure 2.4) and is evidence of the Stewart Creek community, which is mentioned frequently in historical journals (Stanyard and Lane 1999). Approximately 200 gravestones are visible; many more cannot be seen as the graves have caved-in. The cemetery includes the grave of Robert Weakley, who was a Revolutionary War soldier, prominent land speculator, and judge. It is thought that VTS-S contains a large portion of what was Weakley's plantation. An 1878 map of Rutherford County shows three Weakley farmsteads located on what is now VTS-S on either side of Stewart Creek, all within Training Areas 2 and 6 (Cleveland et al. 2001).

In 1941, upon United States entry into World War II, Smyrna Army-Air Base was established to provide transition training to bomber pilots in the B-24 Liberator and the B-17 Flying Fortress. Construction on the site began in March of 1942, and the facility opened to troops on July 1 of that year. In the years immediately following the war's end, base activities were reduced, and in July 1947 the base was deactivated.

In August 1948, the base was reopened with the arrival of the 314th Troop Carrier Wing from Texas. The base was renamed Sewart Air Force Base (AFB) on March 25, 1950 after Major Alan J. Sewart, who was killed in aerial combat during World War II. In 1955, the 516th Troop Carrier was activated at Sewart AFB. It was the only helicopter group in the Air Force at that time. When C-130's were moved to the base in November 1955, it became the most versatile troop carrier base in the United States for several years (Stanyard and Lane 1999).

During the 1950s and 1960s, the military personnel and dependents stationed at the facility exceeded 10,000 persons. The 2,400-acre facility was also a significant source of employment as many civilian jobs were available on the installation. In 1965, it was announced that the Sewart AFB would be phased out over a 4.5-year period and would be completely closed by July 1970. The closure coincided with the acquisition of lands for the J. Percy Priest Dam and Reservoir by the USACE Nashville District and resulted in a severe economic blow to the local community (Town of Smyrna 2001). An aerial photograph from the USACE taken in 1963 shows that most of the site was treeless and still being actively farmed (Figure 2.3).

When the Sewart AFB closed, the USACE retained a portion of the former installation, including the Cantonment area, and the National Airport Authority retained the airfield. In 1970, the TNARNG obtained a license from the Nashville USACE to utilize 780.55 acres for education of troops and various field training purposes on a continual basis. The TNARNG is accountable to the Nashville District of the USACE for activities within the licensed area. Activities within the training site cannot conflict with the USACE operations on J. Percy Priest Lake. The remaining 67.05 acres under license from the USACE are administered by the Mobile District. Another portion of the former Sewart AFB was transferred to the State of Tennessee for operation of the Tennessee Rehabilitation Center.

Figure 2.3: Aerial photograph of Sewart Air Force Base prior to the creation of the J. Percy Priest Dam and Reservoir (November 11, 1963). (Courtesy of USACE, Nashville District). Current boundaries of VTS-Smyrna have been outlined

Under TNARNG management, the site has been called Smyrna Training Site, Grubbs/Kyle Training Center, and most recently, Volunteer Training Site-Smyrna. The site was dedicated as the Grubbs/Kyle Training Center in 1984, in memory of two members of the TNARNG. Captain Douglas Grubbs, of Nashville, was killed during a training mission in 1954; Major Sam Kyle, a native of Lebanon, TN, was killed in 1984, when his helicopter crashed while he was participating in a search for prison escapees (Lose and Associates 1994).

Portions of Sewart AFB, not licensed to the TNARNG, were either sold or transferred to various entities. The majority of the remaining area was the airfield, which was transferred to the Metropolitan Nashville Airport Authority. The airfield has subsequently been transferred to Rutherford County and the Town of Smyrna and is currently operated by the Rutherford County/Smyrna Airport Authority (Town of Smyrna 2001).

The remaining portions have been sold and are now privately owned. The city of Smyrna previously had a license for a large parcel of land in TA2 for sewage treatment purposes. The only residual signs of the treatment plant are access roads and a large, perennial pond (Figure 2.4). Several DoD-related landfills are located on what is now known as TA 3. These areas of the training site are currently off-limits to all training. Future reclamation of these portions of the training site is being investigated. See Section 4.2.3 for additional discussion of reclamation and mitigation efforts.

2.3 MILITARY MISSION

The TNARNG serves both state and federal missions. Both state and federal funding are provided to ensure that the Tennessee Army National Guard is constantly ready to support any mission or need requiring military personnel and equipment. When called by the Governor, the state mission supports civil authorities in the protection of life and property and the preservation of peace, order, and public safety. When called by the President in times of war and national emergency, the federal mission provides trained and equipped personnel and units capable of rapid deployment.

The VTS-Smyrna mission statement is to provide state of the art training facilities in support of total force training requirements to sustain operational readiness and exceed mission requirements. Training needs are subject to change as mission requirements dictate.

2.4 FACILITIES

VTS-S contains an extensively developed cantonment area, covering approximately 170 acres. Cantonment facilities are housed in nearly 60 buildings and include the following:

- Site headquarters
- Administrative offices
- Classroom and meeting facilities
- Two armories
- Combined Support Maintenance Shop #1
- Facilities Maintenance Shop #16
- Regional Training Institute
- Simulation Training Center
- Multiple barracks and paid lodging with a combined total bed capacity of 497
- Miscellaneous installation support facilities (e.g., billeting, dining hall, post exchange)

Approximately 451 acres at VTS-S are available for field training. Another 163 to 200 acres are seasonally inundated by J. Percy Priest Lake; these portions of the installation are not considered available for training use. Areas excluded from the USACE license include the former sewage treatment pond in TA2, Volunteer Park, located in the Cantonment Area, and Cannon Cemetery in TA6. Training Area 3, formerly used as a landfill, is currently off limits to training and 23 acres in the northeastern corner of the training site, in TA2, is available to foot traffic due to the presence of numerous potentially hazardous sinkholes.

Maneuver training areas available for squad, platoon, and company field exercises are described in Table 2.2 and shown in Figure 2.4.

Table 2.2 Current training area uses

Training Area	Area (acres)	Types of training conducted and training area descriptions
1	10	Parade field with bleachers and a PT track.
2	262	Used for dismounted training maneuvers. Contains LANDNAV course. Plan to thin cedar forests, improve maneuver trails, and use for wheeled and tracked training. Off limits to vehicles until maneuver trail network completed. The northeast corner of TA2 contains numerous unmarked sinkholes and is off limits to vehicular traffic (boundary to be defined and clearly marked). The former sewage treatment pond is located in the southern portion of TA2. Approximately 6.3 acres, including the sludge pond and adjoining access roads are excluded from the license as issued by the USACE to the TNARNG and are off limits to all training until further notice. Continued use and development for Bradley training to be determined.
3	72	Currently unused. Site of Sewart AFB landfills. This portion of the training site is currently off-limits to all training. Investigating restoration through Formerly Used Defense Sites (FUDs) funding.
4	54	Used for wheeled vehicle and dismounted maneuvers and Bradley driver training. Contains several bivouac sites and a POW/detainee training facility.
5	55	Used for wheeled vehicle and dismounted maneuvers and contains a boat ramp.
6	116	Used for wheeled vehicle and dismounted maneuvers such as training for Bradley drivers, night driving, and rail loading. Contains small arms firing range, an M203 grenade launcher range, a hand grenade course, an Assault Vehicle Launch Bridge, and bivouac sites. Cannon Cemetery is located in the northern portion of TA 6. The cemetery is in need of maintenance and repair due to damage from a 2010 flood.
Bldg. 425		Contains several classrooms used for a variety of classroom and simulation training activities.

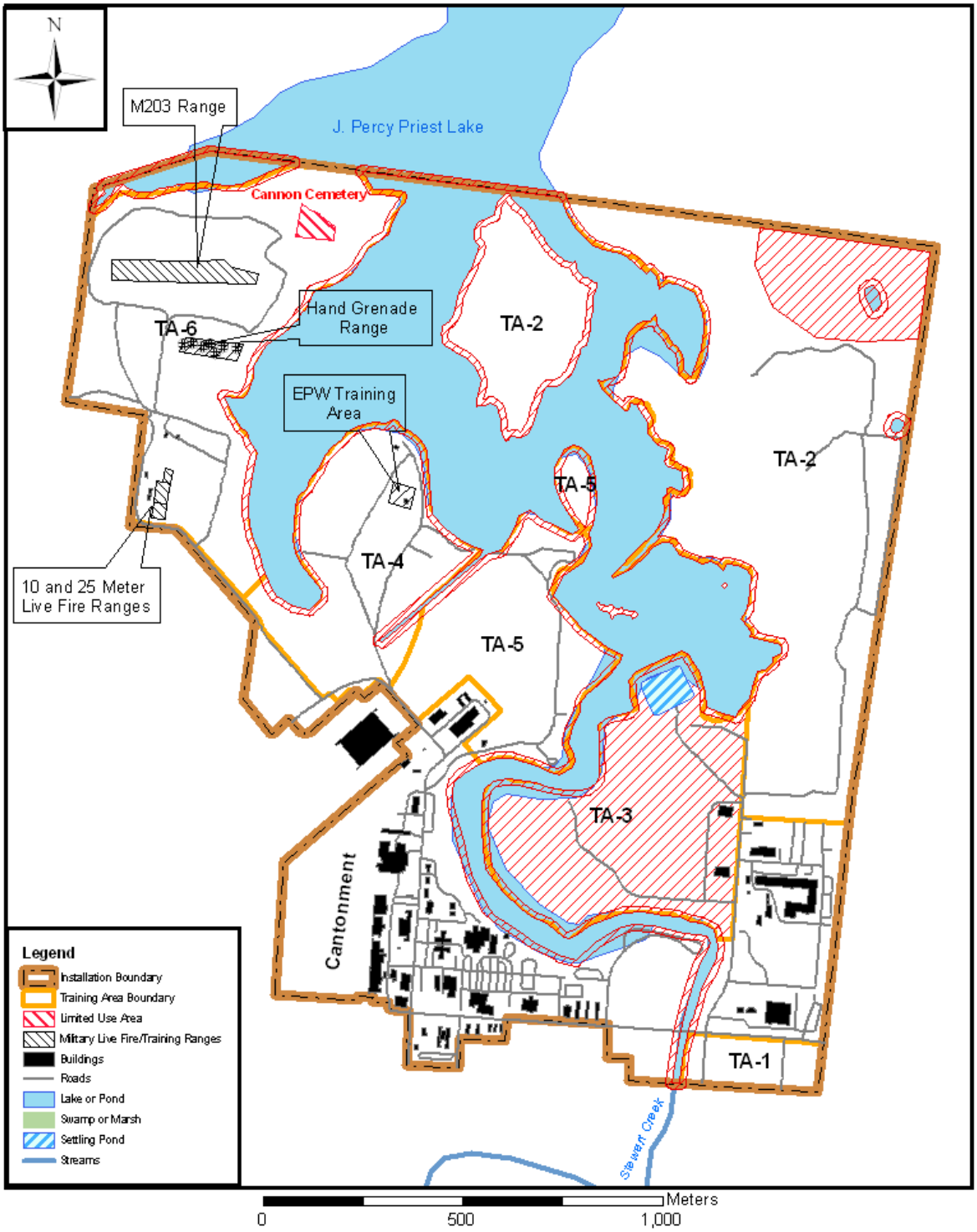

Figure 2.4: VTS-Smyrna Training Areas and Facilities

The three active berm and baffle ranges in Training Area 6 include the following:

- 25-meter Berm and Baffle Range: M-16A1, M-16A2 and M193; targets are paper silhouettes on wooden frames; 24 firing points in TA 6.
- 25-meter Berm and Baffle Range: 0.22 cal., 0.28 cal., 0.45 cal., and 9mm rounds; targets are paper silhouettes on wooden frames; 24 firing points in TA 6.
- 10-meter Berm and Baffle Range: M60/SAW and 7.62/5.56mm rounds; targets are paper silhouettes on wooden frames; 10 firing points in TA 6.

Weapon usage on these ranges may become restricted when the 5.56mm M855 ball and the 7.62mm M80 are replaced by the 5.56mm M855A1 and 7.62mm M80A1 Enhanced Performance Rounds (EPR). Ricochet study is planned to evaluate and provide necessary upgrade guidance for long term future use.

2.5 TRAINING SITE UTILIZATION

The VTS-S is the primary training facility for TNARNG units within 100 miles of the training site. The primary TNARNG/TNANG user units are:

117th RTI	2-104th Co CD1
107 AVNE	473rd HHP QM
1-115FA A	568th PSB
1-230th ACR HHC	301 Troop Command
278th ACR HHT	118th SFS SQD
168th MP HHD	

In addition, a variety of non-National Guard organizations use the training site, including: the 100th Division and the 304th MP unit, both of which are Army Reserve units; 3-BCT 101st Airborne, a U.S. Army unit; as well as local gun clubs, ROTC groups, and local law enforcement units. The types of training on VTS-S in the immediate future are expected to be similar to previous years, as described below.

In recent years, use of classroom training and virtual simulation equipment at VTS-S have enhanced and expanded traditional training capabilities of the site by broadening the types of training that may be accomplished, substantially increasing training safety and reducing training costs. Approximately sixty percent of all training at VTS-S takes place either in classrooms or in virtual training facilities.

Use of ranges and training area facilities is coordinated through the RFMSS Scheduler at VTS-S prior to training dates. Units request training areas based their mission requirements. Before training in the field, using units' Range Officers in Charge (OIC) and Safety Officers must review the VTS-S SOP and attend a safety briefing at VTS-S Headquarters. Approximately twenty-five to thirty percent of training use at VTS-S occurs on the small arms firing ranges in TA6.

Field training exercises at VTS-S compose ten to fifteen percent of overall usage at VTS-S and involve a wide variety of activities such as tracked and wheeled vehicle operations on all military-developed roads and major trails, mounted and dismounted maneuvers, field bivouacking, mine field detection, land navigation, aviation sling load training, and weapons firing. Field exercises take place primarily in TAs 4, 5, and 6. Live fire may only occur on designated ranges within the Range Complex in TA6.

The Training Site License anticipates that no more than six tracked and 25 wheeled vehicles will be maneuvered on the training site and that a maximum of 400 troops will be in the area at a given time. If force structure changes the license will need to be reevaluated and revised in coordination with the USACE, Nashville District.

Total annual VTS-S training utilization during Training Years (TYs) 2007-2016 is summarized in Figure 2.5. Average monthly distribution of training activity during TYs 2007-2016 is presented in Figure 2.6. Monthly training use by four user groups (TNARNG/TNANG, Other Military, Civilian, and Undefined) for TYs 2007-2016 is presented in Table 2.3. Mean total annual training site usage for TYs 2007-2016 was approximately 86,508 man-days per year.

Training site utilization data from TYs 2007-2016 shows that 56% of all training occurs during the spring and summer months between April and September. December is historically the slowest month of the year for training and averages approximately 4% of all annual training at VTS-S.

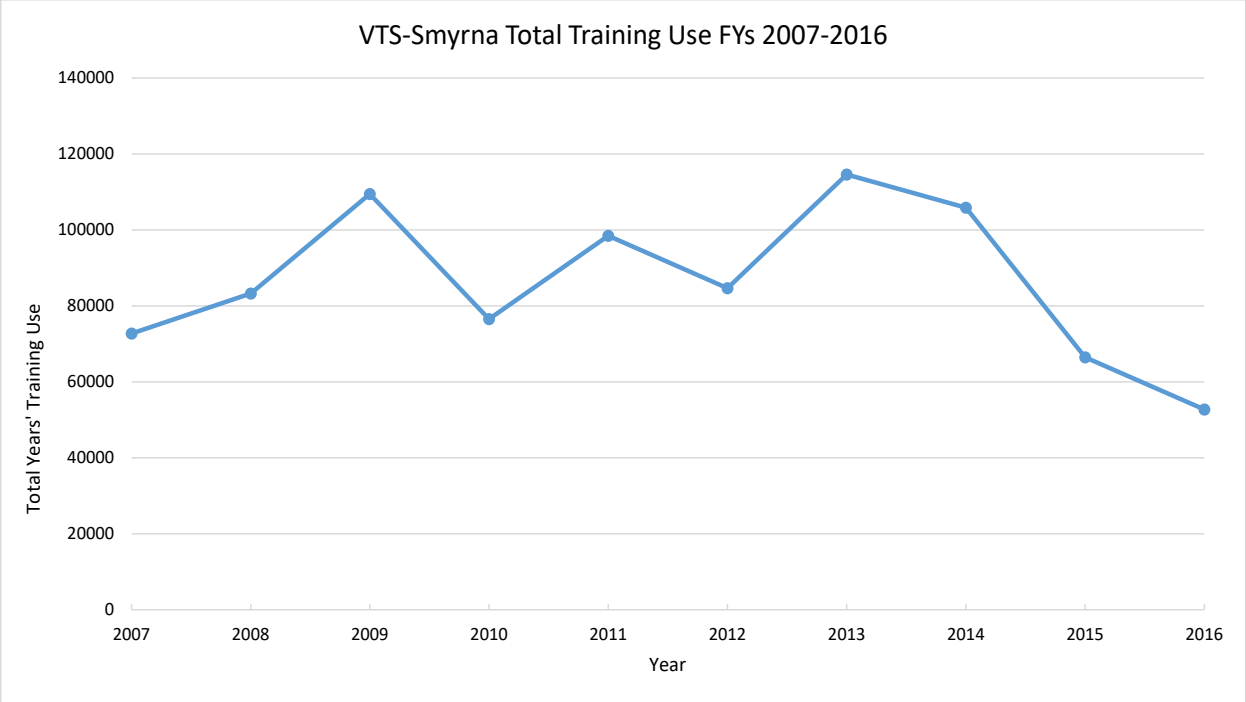

Figure 2.5: Total yearly VTS-Smyrna training use for TYs 2007-2016, from RFMSS data.

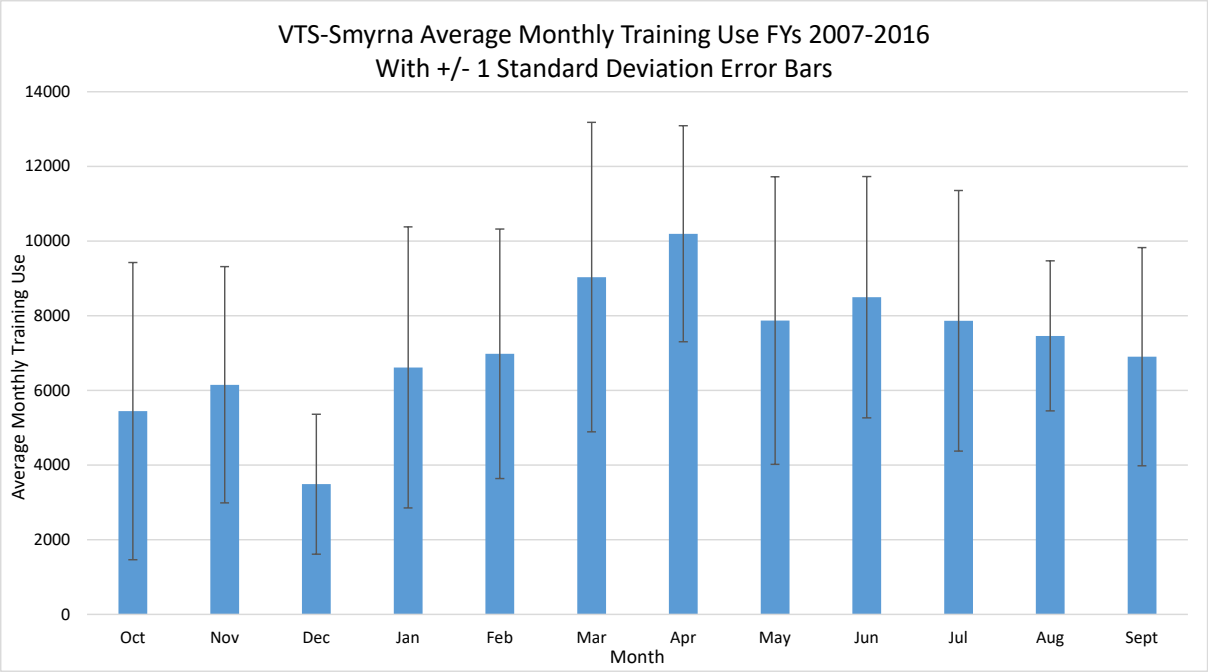

Figure 2.6: Monthly trends in total man-day usage at VTS-S, TY 2007-2016

Table 2.3: Training site utilization by National Guard, other military, and civilian users, TYs 2007-2016.

TY2007	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TNARNG/TNANG	2015	1945	1178	1867	2497	6055	9208	3601	6895	10490	6854	6502	59107
Other Military	149	1868	402	374	598	755	617	162	177	295	801	293	6491
Civilian	550	344	143	299	252	527	496	1924	244	1521	288	476	7064
Undefined	0	0	0	0	0	0	0	0	0	0	100	0	100
TOTALS	2714	4157	1723	2540	3347	7337	10321	5687	7316	12306	8043	7271	72762
TY2008	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	2444	3724	1448	3585	2965	2785	11042	12455	7050	7294	6649	7919	69360
Other Military	141	269	392	576	38	170	396	588	202	61	586	796	4215
Civilian	431	430	73	640	300	1106	581	691	462	1557	1323	2150	9744
Undefined	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	3016	4423	1913	4801	3303	4061	12019	13734	7714	8912	8558	10865	83319
TY2009	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	2629	5094	4658	13211	10891	8228	11303	11272	5842	9216	7157	3701	93202
Other Military	85	30	30	30	210	733	225	268	135	336	714	446	3242
Civilian	417	697	267	551	402	1502	917	607	2720	2352	1536	979	12947
Undefined	0	0	0	0	0	0	0	0	0	0	0	100	100
TOTALS	3131	5821	4955	13792	11503	10463	12445	12147	8697	11904	9407	5226	109491
TY2010	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	13594	11759	4350	7731	2520	3142	2460	3731	1756	482	2740	8495	62760
Other Military	56	774	38	152	165	134	650	114	218	24	276	1691	4292
Civilian	1398	1098	1212	718	612	870	523	0	453	956	481	1119	9440
Undefined	0	0	0	0	0	0	0	0	50	0	0	0	50
TOTALS	15048	13631	5600	8601	3297	4146	3633	3845	2477	1462	3497	11305	76542
TY2011	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	7556	4833	3898	6041	7673	10349	10537	8151	6590	7927	8668	4577	86800
Other Military	264	797	111	176	484	106	499	204	180	84	474	562	3941
Civilian	432	212	436	498	537	625	345	208	2057	1109	216	797	7472
Undefined	0	0	290	0	0	0	0	0	0	0	0	0	290
TOTALS	8252	5842	4735	6715	8694	11080	11381	8563	8827	9120	9358	5936	98503

Table 2.3, continued:

TY2012	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TNARNG/TNANG	3283	3383	1766	5781	8887	9021	6641	4579	9078	6520	7401	4505	70845
Other Military	306	585	223	186	576	264	225	112	412	82	52	278	3301
Civilian	404	435	1302	1217	334	834	334	931	1710	1250	491	413	9655
Undefined	0	0	0	0	0	0	0	0	0	864	0	0	864
TOTALS	3993	4403	3291	7184	9797	10119	7200	5622	11200	8716	7944	5196	84665
TY2013	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	7348	7225	2134	6363	9401	11517	12533	10569	13033	8329	7984	9774	106210
Other Military	82	42	513	274	41	367	273	273	199	1142	835	494	4535
Civilian	225	262	260	185	200	140	380	355	180	981	274	130	3572
Undefined	0	0	0	0	292	0	0	0	0	0	0	3	295
TOTALS	7655	7529	2907	6822	9934	12024	13186	11197	13412	10452	9093	10401	114612
TY2014	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	4396	7915	5519	10171	9482	12859	8985	10047	10787	5537	6827	2484	95009
Other Military	65	587	32	132	520	516	267	153	354	144	36	1737	4543
Civilian	352	166	323	365	184	284	930	361	1076	20	506	911	5478
Undefined	96	0	772	0	0	0	0	0	0	0	0	0	868
TOTALS	4909	8668	6646	10668	10186	13659	10182	10561	12217	5701	7369	5132	105898
TY2015	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	3679	4080	1467	1568	5143	13143	10579	2805	7224	1818	3348	1892	56746
Other Military	94	44	12	0	5	29	192	60	203	920	790	796	3145
Civilian	333	332	111	0	254	479	1414	170	316	1217	129	419	5174
Undefined	0	0	12	0	150	792	0	48	0	125	320	0	1447
TOTALS	4106	4456	1602	1568	5552	14443	12185	3083	7743	4080	4587	3107	66512
TY2016	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	1096	2413	1362	3207	3936	2068	9265	1427	3196	5356	5013	3454	41793
Other Military	20	80	10	0	90	240	96	2514	84	507	824	448	4913
Civilian	500	89	74	0	60	653	27	301	2100	130	90	310	4334
Undefined	0	0	72	260	100	60	11	20	0	8	810	396	1737
TOTALS	0616	2582	1518	3467	4186	3021	9399	4262	5380	6001	6737	4608	52777

2.6 EFFECTS OF TRAINING ON NATURAL RESOURCES

Military training can have both negative effects on and positive benefits to natural resources. Maneuver damage is by far the largest negative effect on the natural resources at VTS-S. Maneuvering heavy tracked and wheeled vehicles across even the best-suited landscapes can cause damage to vegetation and soils. For this reason, soils at the VTS-S require timely land rehabilitation efforts at appropriate intervals. Vegetation as well as soils can be damaged by regular use on areas such as trails, bivouac sites, and firing points. In addition, vehicles can be a source of invasive species propagules when relocated from other regions. Wildlife populations can also be harmed by field equipment training, small arms firing, or by mission-related wildfires.

The impact level of typical TNARNG training activities is given in Table 2.4. "Low" impact activities are those which generally will not disturb the vegetation or soil and will require no rehabilitation. "Medium" impact activities may cause some disturbance or change which may require minor rehabilitation or which may recover over time without aid. "High" impact activities typically cause significant change to the soils or vegetation of the area which will require timely attention to avoid or minimize long-term alteration of existing conditions. Some training activities may be conducted at different levels of disturbance.

Table 2.4: Military training and land use activities that may cause soil or vegetation disturbance. (Activities grayed out are not conducted on VTS-S).

Training Activities	Low Impact	Medium Impact	High Impact
Small unit infantry tactics	X		
Reconnaissance	X		
Terrain/map analysis	X		
Escape and evasion	X		
Infiltration	X		
Land navigation	X		
Patrolling	X		
Nuclear, Biological, Chemical training with simulated agents	X	X	X
Engineer reconnaissance	X		
Tactical bivouac occupation/displacement		X	X
Cold weather operations	X	X	X
Cover and concealment		X	
Field fortifications		X	X
Install/clear minefields			X
Construct obstacles			X
Breaching and clearing operations			X
Construct and maintain main supply routes	X	X	
Demolition training			X
Nonstandard fixed bridges		X	
Bridging and rafting operations		X	
Fording operations		X	
Mobility and countermobility			X
Weapons qualifications/familiarization		X	
Mechanized maneuvers (tracked)			X
Mechanized maneuvers (wheeled)			X
Artillery training (setup and firing)			X
Direct fire			X
Aerial operations	X		

Five basic management techniques can be used to minimize military training effects to the soil and vegetation resources: (1) limit total use; (2) redistribute use; (3) modify kinds of uses; (4) alter the behavior of use; and (5) manipulate the natural resources for increased durability. These will be discussed throughout the management plan. One example of modifying the kind of use is the use of simulators and simulations at VTS-S. Various high-technology methods have been implemented at VTS- S to provide for increased safety, better use of available space, and reduced effects of noise on natural resources by eliminating the need for live-fire in certain situations. Expanded use of simulators and better equipment can reduce maneuver damage to land and soils, while improving training realism.

Vehicle maneuvers, tracked and wheeled, have the potential to cause the greatest military related impact to the VTS-S ecosystem. Vehicles used by TNARNG range from High Mobility Multipurpose Wheeled Vehicles (HMMWVs) to Abrams tanks. Military vehicle training may involve single vehicle maneuvers up to platoon or squadron-sized elements. Soil compaction and erosion are the most probable results of vehicle maneuvers. Appropriate planning (e.g., avoiding steep slopes, highly erodible soil types, and wet soils) and preparation (gravelling of tank trails, etc.) can mitigate much substrate damage. Immediate repair of any damaged areas after training maneuvers ensures no net loss of training area.

Invasive pest plants (IPP) are one of the most immediate threats to native ecosystems in the southeastern U.S. These exotic species can reproduce prolifically and spread rampantly throughout an ecosystem, causing significant disruption to the natural system. They can be easily transported into new areas in the mud on vehicles. To minimize this threat, vehicles arriving at VTS-S must be washed thoroughly before entering the VTS-S training area.

Bivouacking has impacts similar to civilian campgrounds. Soil compaction and trampling of vegetation increase runoff rates and may lead to higher erosion. There may also be a change in vegetation composition to more damage and disturbance tolerant species. During wet conditions, vehicles may create ruts if pulled off-road. Rotation of sites and careful site selection can minimize the damage caused by bivouacking.

The greatest positive effect of the TNARNG mission on natural resources is the military presence. TNARNG land managers have instituted good land use practices such as reducing erosion and negative impacts on stream crossings and wetlands. Landscape disturbances (for example, agricultural tillage, reduction of forest and wildlife habitat for development, and much recreational vehicle damage) are avoided on VTS-S, so that natural communities are relatively undisturbed and are left to return to their natural compositions. After training, the land is evaluated by training site personnel for any damage. If repair is needed, it is initiated at that time to ensure minimal erosion or loss of training land is occurring. If impacts are substantial, training is rotated to another site until the first area has recovered and can be used again.

2.7 NATURAL RESOURCES NEEDED TO SUPPORT MILITARY MISSION

Due to the variety of units that utilize VTS-S, multiple environmental conditions are needed for training:

- Open woodland areas for bivouac
- Open fields for practice ranges and other training
- Wooded maneuver areas for foot and vehicle traffic
- Road networks for convoy training
- Pull-off points along roads
- Firing ranges
- Diverse, wooded terrain for land navigation course

According to the Training Site Manager, the current site conditions meet most training needs at VTS-S. The small size of the facility is its major limiting factor. However, some modifications to existing conditions will improve training opportunities.

The VTS-S boundary is ill-defined in many areas and accidental and/or purposeful trespass occurs regularly, posing a hazard to both training site users and the trespasser. Clearing of the fenceline and boundary will clarify the demarcation. Addition of a perimeter trail will further define the boundary, function as a firebreak, and provide access to the edges of the site for security and safety purposes.

Training Area 2 is a dense, largely unusable thicket of eastern red cedar. Reclamation of the old roadways in this area will provide training opportunities for the Bradley Training School, as well as creating a network of maintainable fire breaks.

The forest cover in TA 2 should be thinned to make off-road dismounted use of the area feasible. Thinning will also improve forest health and encourage a more diverse species assemblage. At the time that general thinning is conducted in this training area, one or two small (approximately 1 acre) sites will be cleared to provide platoon assembly areas. See Annex 1 (Forest Management Plan) for more details about planned timber harvests.

To achieve the currently desired missionscape, the VTS-Smyrna needs a cleared boundary fenceline and perimeter road, additional Bradley trails, thinning of the overstory and additional small clearings in TA 2. With these additions and modifications, the overall landscape of the VTS-Smyrna should continue to meet TNARNG training needs. Any significant change in mission will require that the missionscape be reexamined.

2.8 NATURAL RESOURCES CONSTRAINTS ON MISSION/MISSION PLANNING

Certain features of the natural environment represent constraints or potential limitations on training activities. Most significant at VTS-S are water quality, noise and encroachment issues, invasive species, and forest management activities. The challenge is to protect sensitive resources, or to promote their control in the case of invasive species, while still ensuring the full range of military training required by the mission.

Many sensitive areas can be identified prior to any training activity and incorporated into the ambiance of the activity in the form of safety, off-limits, or contaminated areas. This allows protection of the environment in conjunction with more realistic training scenarios.

2.8.1 Water quality

While the J. Percy Priest Reservoir (Figure 2.4) is used primarily to control flooding and to provide hydroelectric power, the reservoir system is widely used for recreation (e.g., fishing, boating, swimming, and camping), as well as a source of drinking water. As the current storm water drainage system directs all cantonment-originating runoff and most training area runoff directly to Stewart Creek, which flows directly into J. Percy Priest Lake, it is important that the users of VTS-S take every reasonable precautionpossible to minimize contamination of this large, municipal water source in order to comply with water quality regulations set forth by the State of Tennessee.

Materials used and stored at VTS-S, as well as at the neighboring airport and the former Sewart AFB,

includes several types of fuels and oils, transmission fluids, antifreeze, various solvents, and many other hazardous materials. In addition to these chemical contaminants, erosion of soils found at VTS-S poses a serious threat to surrounding surface waters. Siltation is the primary cause of impairment for waterways in Tennessee (Price and Karesh 2002), including 303(d) listed portions of Stewart Creek and surrounding tributaries. Sedimentation of eroded materials into Stewart Creek and J. Percy Priest Lake destroys valuable wildlife habitat, reduces the intended storage volume of the reservoir, decreases water visibility, and increases water filtration costs.

2.8.2 Noise and Encroachment Issues

While VTS-S is located near relatively high populated areas, there have been no significant noise complaints at VTS-S to date. This is due primarily to the fact that the small arms range at the training site neighbors the Smyrna/Rutherford County Regional Airport, a facility with substantially greater noise concerns. The one exception to this is the presence of an approximately 135 acre research farm, managed by the Tennessee Wildlife Resources Agency located immediately west of the M203 range and northwest of the training site's small arms range. However, as this farm has no live-in residents and apparently houses office and storage only, noise complaints are not expected to become a problem.

Additional future encroachment issues at VTS-S are minimal due to the fact that nearly all surrounding land has either already been developed or is contained within the USACE-managed J. Percy Priest Lake and Wildlife Management Area.

2.8.3 Invasive Species

Large populations of several invasive species are found throughout VTS-S (see Chapter 3 and Annex 3). Most problematic of these are the extensive stands of common privet (*Ligustrum* spp.). Privet is found across the training site, in many places forming a dense understory layer that is difficult to traverse on foot and impossible to maneuver a vehicle through. Autumn olive (*Elaeagnus umbellata*), silverthorn olive (*E. pungens*), and multiflora rose (*Rosa multiflora*) also pose serious threats to native communities and impede maneuver capabilities on training areas. These shrubs form large clumps which are dense, thorny, and difficult to navigate through. Control of these and other invasive pest plants is necessary to avoid deterioration of existing training areas.

2.8.4 Forest Management

Active management of natural areas on the training site is required in order to support the training requirements of TNARNG users. The forests of VTS-S, especially the dense red cedar stands in TA2, need to be thinned to both increase available area for training maneuvers and to improve the overall health of the site's forest ecosystems. A Forest Management Plan was developed for VTS-S in 2006 (Thompson Engineering et al.; Annex A), providing a forest inventory as well as forest management prescriptions for each of the six training areas. Timber harvesting activities will be implemented as needed in accordance with the plan in Annex A.

2.9 GEOGRAPHIC INFORMATION SYSTEM (GIS) ASSETS

TNARNG supports a Geographical Information (GIS) Branch which is responsible for all GPS/GIS activities in support of the CFMO-Environmental Office mission. The TNARNG CFMO GIS Branch provides secondary support of the ITAM mission as it applies to the Environmental activities. The GIS Branch provides mapping, data mining, data storage/retrieval, statistical analysis, and data modeling. As well as all data collection via GPS, surveying and research. In addition to required GIS/GPS

functions the GIS Branch all provides first line Information Technology support, database development and web based publishing. Geospatial data must meet federal, DOD, Army, and NGB standards, including Federal Geographic Data Committee (FGDC) and Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE). All TNARNG sponsored projects will be incorporated into the TNARNG integrated Geodatabase in support of all Training Site facilities, maintained by the GIS Branch.

The GIS database includes all facilities data, ITAM data, facilities and environmental data, including but not limited to: roads, structures, infrastructure, fencing, utilities, cultural resources, and natural resources, conservation, compliance as well as topographic maps, digital elevation models (DEM), TINs, and aerial photographic coverage of all sites. All environmental projects include gathering of GIS data for inclusion within the system. Additional needs are programmed into the STEP system as they become apparent.

CHAPTER 3
PHYSICAL AND BIOTIC ENVIRONMENT

3.1 CLIMATE

Tennessee lies within the hot continental division of the humid temperate domain (Bailey 1996) and is characterized by relatively mild winters, warm summers, and generally abundant rainfall. Rutherford County, like the rest of Tennessee, is influenced by air masses from the Gulf of Mexico and is located far enough north to be frequently traversed by cold air masses from northern regions. Consequently, the county experiences large seasonal and even daily variations in temperature and humidity (True et al. 1977).

Temperature: The average annual temperature for 1970-2015 in Middle Tennessee was 58.3ºF. July is the warmest month with an average maximum temperature of 88.9°F and a minimum average temperature of 66.7 ºF. January is the coldest month, with an average maximum temperature of 46.9ºF and an average minimum temperature of 26.8ºF. (National Oceanic and Atmospheric Administration's National Climatic Data Center (2017)) The length of the growing season is linked to climate and topography. The average growing season in Rutherford County is 193 days (6.3 months). Mean spring (March through May) temperature is 58.1°F, with average daily temperatures of 48.3°F in March and 66.3°F in May. Fall (September through November) temperatures are slightly higher than spring temperatures, with a mean temperature of 59.4°F.

Precipitation: Normal annual precipitation measured during the years 1970-2015 for Middle Tennessee averaged 54.3 inches. Annual snowfall (usually between the months of November and March) average is 4 inches. Over most of the state, the greatest precipitation occurs in winter and early spring; fall tends to be the driest season for the state. Severe storms have been relatively infrequent in Rutherford County; however, tornados have been reported in the county. The area is too far inland to experience much damage from tropical storms. Hailstorms occur about twice a year, mostly in the spring. Heavy snowstorms are infrequent; snow in winter seldom persists for more than a few days. (NOAA, 2017.)

Relative Humidity: Throughout most days, relative humidity varies inversely with temperature and is, therefore, highest early in the morning and lowest late in the afternoon. The annual relative humidity average ranges from 53 percent in the afternoon to 84 percent in the morning. An annual variation of relative humidity also occurs; the average daily values are higher in winter and lower in spring (True et al. 1977).

Wind: The prevailing winds are southerly; however, the wind changes direction frequently. The average wind speed is about six miles per hour. Winds are usually lighter early in the morning and stronger early in the afternoon (True et al. 1977).

3.2 PHYSIOGRAPHY AND TOPOGRAPHY

Rutherford County lies within the physiographic region known as the Central Basin of Tennessee. The topography of this portion of the Central Basin is characterized by gently rolling to nearly level lands with elevations ranging from 490 to 1,352 feet above mean sea level (True et al. 1977). Land surface elevations at VTS-S generally fall between 490 and 550 feet. Site topography is generally flat to gently rolling and slopes

from west to east toward Stewart Creek (Figure 3.1).

Karst topography is prevalent over much of the Central Basin, especially within the Inner Basin. Caves and sinkholes, cavities formed when groundwater dissolves portions of limestone bedrock, are two typical features of karst terrain. Six caves lie within six miles of VTS-S, most of which occur in Ridley Limestone, the formation underlying most of the training site; however, no caves are known to exist at VTS-S. A number of sinkholes are present on the grounds, with concentrations in the northeast corner of the site in Training Area 2 (TA 2). A survey of karst features on VTS-S was conducted in 2005 (Dynamic Solutions, LLC) that found eight discernable sinkholes, all of which were located in TA 2 (Figure 3.2). Of these eight, at least two represent immediate hazards to those traveling off-road in that portion of TA 2 as they have vertical openings at ground level. All documented sinkholes were marked with bright flagging and warning signs. There is potential for existing sinkholes to expand or for more sinkholes to develop as cavities created by karst activity may collapse suddenly creating visible sinkholes; therefore, monitoring of karst features should be done on a regularly scheduled basis at VTS-S.

3.3 GEOLOGY

3.3.1 Geologic Formations

The inner basin of the Central Basin is dominated by limestone formations of Ordovician age, including the formations composing the Stones River Group which are the Carters, Lebanon, Ridley, Pierce, and Murfreesboro Formations. All five of these formations are represented at VTS-S (Table 3.1).

Table 3.1 Geologic Formations of the Stones River Group

Formation	Characteristics
Carters Limestone	Fine-grained, yellowish brown limestone; thin-bedded in upper part; thicker bedded and slightly cherty with scattered mottling of magnesian limestone in lower part. Contains thin bentonite beds. Thickness 500 to 100 feet.
Lebanon Limestone	Thin-bedded, grey limestone with calcareous shale partings. Thickness 80 to 100 feet.
Ridley Limestone	Thick-bedded, brownish grey limestone, fine grained with minor mottling of magnesian limestone; slightly cherty. Thickness 90 to 150 feet.
Pierce Limestone	Grey, thin-bedded limestone with shale partings. Thickness up to 25 feet.
Murfreesboro Limestone	Thick-bedded, dark grey, fine-grained limestone; somewhat cherty in upper part. Maximum exposed thickness 70 feet.

(From Hardeman 1966)

3.3.2 Seismicity

The VTS-S is located in the outer periphery of the New Madrid Seismic Zone (NMSZ), the most seismically active zone east of the Rocky Mountains. The NMSZ has produced damaging earthquakes in the past, including at least three earthquakes estimated to have had moment magnitudes of 8.0 or greater between 1811 and 1812. According to a USGS earthquake-predicting model (USGS 2002), however, there is a one percent probability of an earthquake occurring in Rutherford County of magnitude 5.0 or greater within the next 100 years as VTS-S is located over 160 miles from the most eastern portion of the NMSZ.

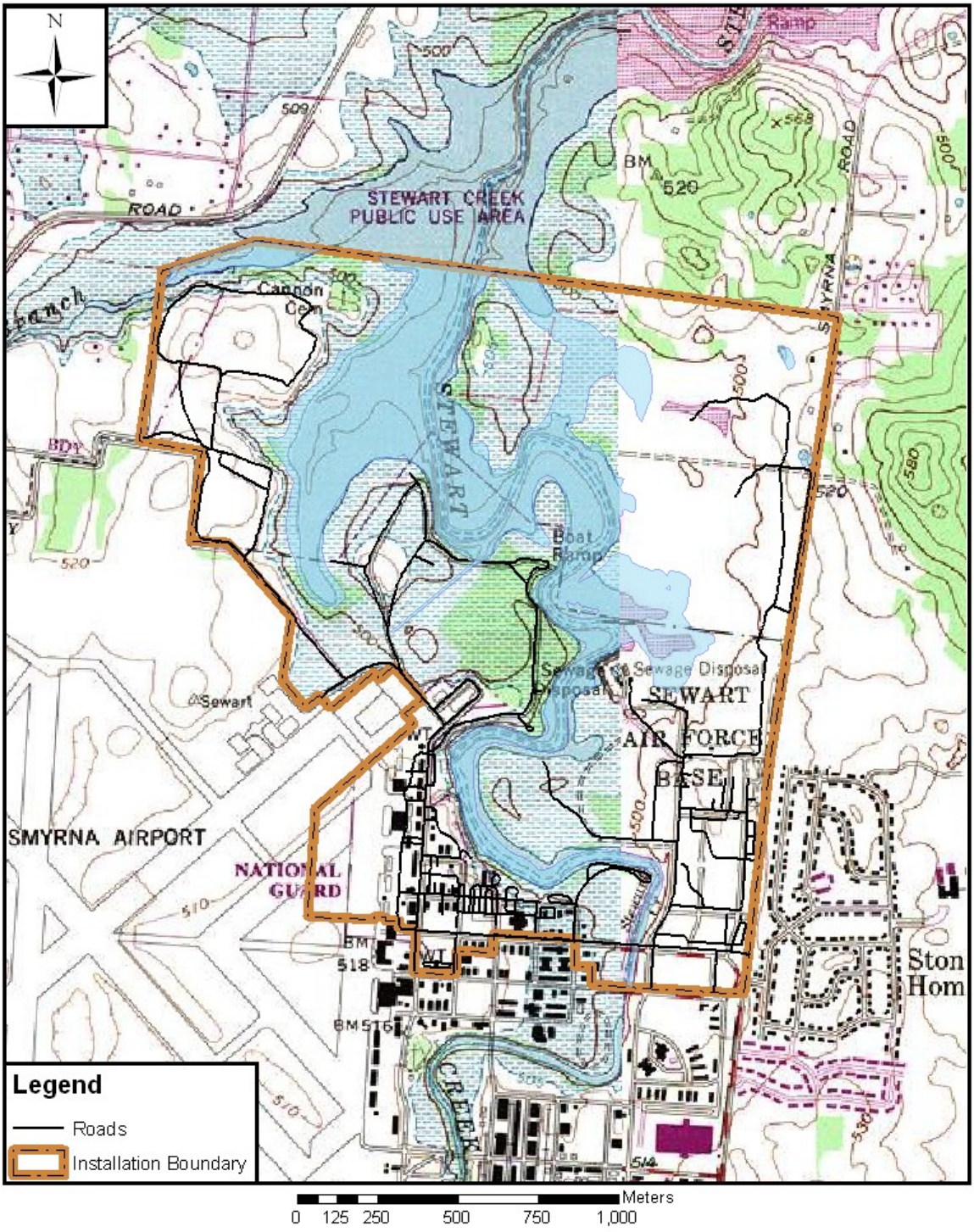

Figure 3.1: Topography of VTS-Smyrna

3.3.3 Petroleum and Mineral Resources

Rutherford County is a major producer of crushed limestone (Tennessee Division of Geology/U.S. Geological Survey 2004). No oil or gas is produced in Rutherford County. There is no commercial utilization of mineral resources on VTS-S.

3.4 SOILS

The United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) (formerly named the Soil Conservation Service) completed a soil survey of Rutherford County in 1977 (True et al.). Descriptions of soils found on the following pages were derived from this publication.
While the soils map (Figure 3.2) was compiled using the most recent data obtained from the NRCS, there are areas on VTS-S such as the landfill on TA3 and the former sewage treatment plant on TA2 (both described as Bradyville-Urban land complex) that should be reevaluated to improve accuracy and planning.

3.4.1 Soil Descriptions (from True et al. 1977)

Soils on VTS-S are mapped in two major soil associations: Rock Outcrop-Talbott-Barfield Association and Bradyville-Lomond-Talbott Association. The soil associations are generalized categories of soil series and types that occur together in a geographical location. They are named for the dominant soils present, but several other similar soils may be included. Ten soil series that occur either singly or in combination in 15 distinct map units (plus "water") were identified on VTS-S (Table 3.2 and Figure 3.2).

Parent material affects soil mineralogy, soil texture, and the internal drainage properties of soils. Soils at VTS-S are derived from weathered sandstone or limestone bedrock, creating the four primary soil components: residuum, colluvium (soil and weathered rock transported downhill by gravity), alluvium (soil and weathered rock transported by flowing water), and loess (deposits of wind-blown silt).
Soils adjacent to J. Percy Priest Reservoir are susceptible to periodic flooding, tend to be poorly drained, and have slower permeability than upland soils. They become very slippery when wet and susceptible to compaction. Other properties of soils at VTS-S influencing their use and management are moderate erodibility, low soil strength, high shrink-swell potential, and high content of gravel or rocks. The majority of the soils found at VTS-S embody these characteristics.

The Armour series is found in valleys and alongside streams in the Central Basin and is comprised of well-drained, deep, loamy soils. These soils formed from deep, old alluvium and underlying clay-derived limestone. Depth to underlying bedrock may range anywhere between 30 inches and 8 feet. Slopes range from 0-5 %. It is moderately acidic and well suited for cropland, pasture, and woodland uses. When located on a slope, these soils are severely erodible.

The Arrington series consists of deep, loamy, well-drained soils found primarily in bottoms and depressions. Upper silty layers of this series may be 30 to 40 inches deep with dense, hard clay found beneath. These soils formed in recently deposited sediment washed from limestone-derived soils. Slopes range from 0-2 %. It is considered well suited for cropland, pasture, and woodland uses. Puddling and rutting may occur from wheeled and tracked equipment when the soil is wet.

Table 3.2 Soil types on VTS-S

Soil Symbol (Figure 3.1)	Soil Name	Acres
Am	Armour Silt Loam, 0-5 % slopes	14.1
Ar	Arrington Silt Loam, depressed and occasionally flooded	9.8
BrA	Bradyville Silt Loam, 0-2 % slopes	3.1
BrB	Bradyville Silt Loam, 2-5 % slopes	47.9
BrC2	Bradyville Silt Loam, 5-12 % slopes, severely eroded	22.1
BsB3	Bradyville Silty Clay/Loam, 2-5 % slopes, severely eroded	3.8
BtC	Bradyville-Rock outcrop complex, 2-12 % slopes	25.3
Bu	Bradyville-Urban land complex	469
CuB	Cumberland Silt Loam/Clay, 2-5 % slopes, moderately to severely eroded	122.8
CuC2	Cumberland Silt Loam, 5-12 % slopes, eroded	19.7
GRC	Gladeville-Rock outcrop-Talbott Association, rolling	≤ 1.0
HcA	Harpeth Silt Loam, 0-2 % slopes	57.5
Lo	Lomand Silt Loam, 0-5 % slopes	167.4
Ly	Lynnville Silt Loam, floodplain	≤ 1.0
Pd	Pits and Dumps	29.8
	Total Soil Acreage	*992.3
W	Water	171.7

Data obtained from the United States Natural Resources Conservation Service

***** Total soil acreage may differ from the 868 acres presented in Chapter 2.1 due to the varying water levels of the J. Percy Priest Reservoir

The Bradyville series is generally found on upland sites and consists of deep, well-drained soils. Limestone bedrock is typically found 40 to 60 inches deep. These soils formed in a clayey residuum weathered from limestone. Slopes range from 0-12% and may erode very easily. Soils in this series cover approximately 78 acres (8%) at VTS-S. In areas with low grade, these soils are well suited for cropland and pasture uses. In steeper areas, however, rock outcrops may interfere with the use of cultivation and harvest equipment, limiting land use to pasture. Bradyville soils have very low strength and are poorly suited for most road construction.

The Bradyville-Urban land complex is found on portions of the training site that have been artificially filled and sculpted or smoothed for industrial development, paving, and landscaping using heavy machinery. In the remaining undisturbed areas, soils of the Bradyville series are dominant. Using available NRCS data, this describes the cantonment area, all of TA3, and the southern tip of TA2. Combined, this complex covers 469 (47%) acres of the training site.

The Cumberland series consists of very deep, well-drained soils that are typically found on high stream terraces and uplands. Typical depth to bedrock may range from 5 to 8 feet but can be greater. These soils were formed in alluvium and in the underlying residuum weathered from limestone. Approximately 14% of VTS-S is covered by soil in this series. Slopes range from 0-12%**.** This soil series is well suited to cropland, pasture, woodland, or construction. Erosion control practices are essential at higher slopes.

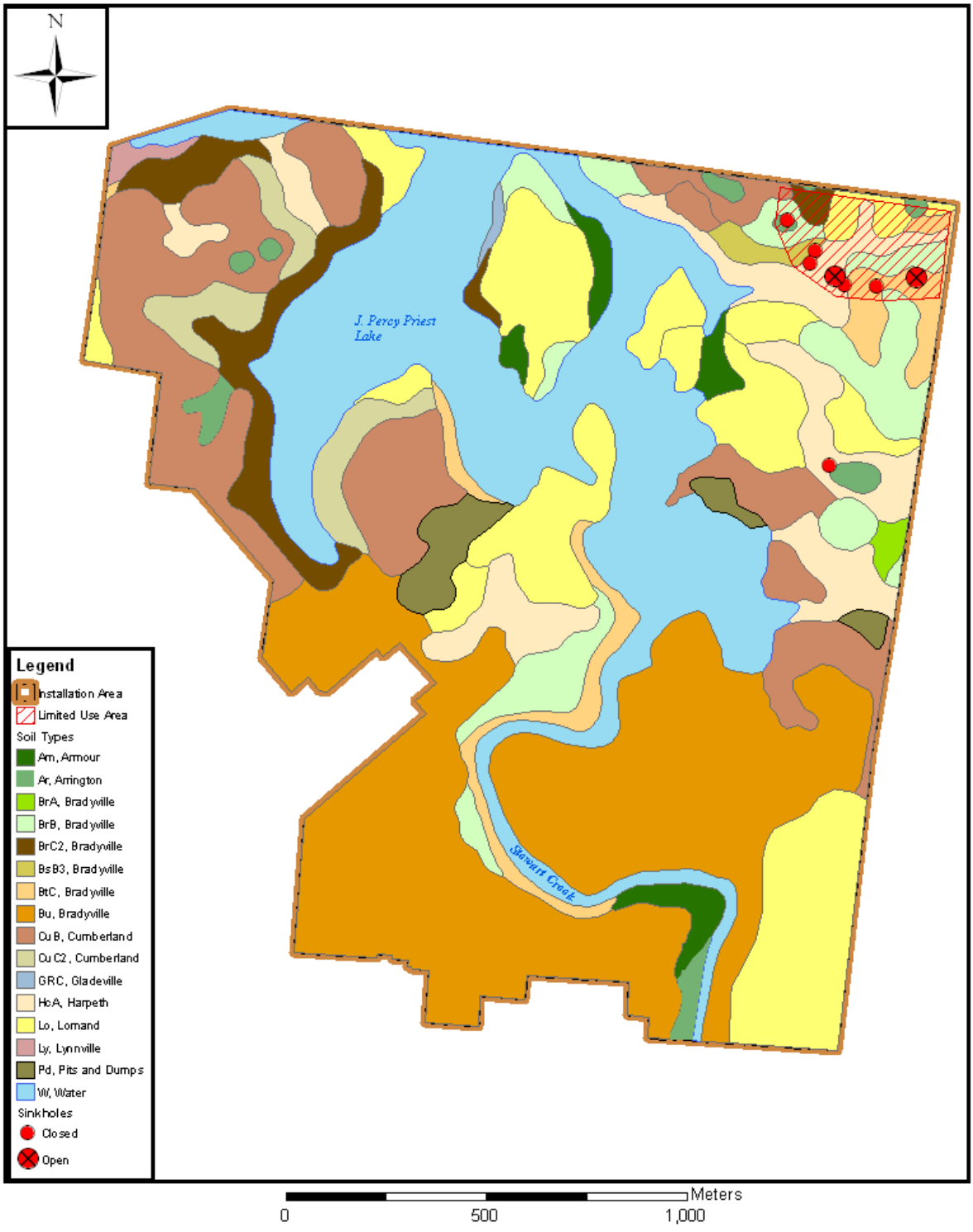

Figure 3.2: Soil Types on VTS-Smyrna

The Gladeville-Rock outcrop-Talbott Association is generally 40 percent Gladeville soils, 20 percent limestone rock outcrop, and 15 percent Talbott soils, with the remainder being a patchwork of other local soil types. Gladeville soils are thin and clayey with large outcrops of bouldery limestone. This association is often described as "gladey," implying the presence of limestone cedar glades. This land is best suited for red cedar woodlands.

The Harpeth series is mostly found in upland depressions and toe slopes at VTS-S and consists of deep, loamy, well-drained soils. These soils were formed by a thin layer of loess with limestone-derived residuum. Depth to bedrock ranges from 5 to 8 feet. Slopes range from 0-5%.

The Lomond series consists of deep, loamy, well-drained soils formed in deep alluvial deposits or in mixtures of loess and alluvial deposits. Slopes range from 0-5%. These soils are located in inland and lakeshore uplands on VTS-S. Depth to bedrock is generally less than 60 inches.

The Lynnville series is most often found in floodplains and in upland depressions. Soils consist of very deep, moderately well-drained soils. These soils formed in loamy alluvium on floodplains and, at VTS-S, are nearly level. The water holding capacity of these soils is quite high and runoff is slow. While there is only a small area at VTS-S containing these soils (NW corner of TA6), care should be taken to avoid wheeled or tracked vehicle use on them when soils are saturated.

The Pits and Dumps land type is typified by highly modified areas containing excavations, garbage dumps and open pits. At VTS-S, the areas most fitting this description may be found on TA3 where there are several old landfill sites. In its present state, this area is not to be used for training.

3.4.2 Soil Erosion Potential

Soil erosion potential, or erosivity, is of particular importance in an area that is subject to the effects of armored vehicular training. Tracked and wheeled vehicles should be used where most appropriate on the training site. It is important to consider the ability of the soil to withstand or recover from the effects of armored vehicular training. Soil erosion potential is principally influenced by rainfall (R), slope length and gradient (LS), soil texture or erodibility (K), cover protecting the soil (C), and special practices (P) such as terracing or planting on the contour. Humans control only the C and P factors. Factors R, K, and, to some extent, LS are inherent to the soils' geographic location, topography, and physical properties and are generally not influenced by humans. The Universal Soil Loss Equation (A=RxLSxKxCxP) uses these factors to estimate the average annual soil loss due to sheet and rill erosion for a specific soil with specific management. It provides an estimate of soil loss in tons per acre per year. It does not include other sources of erosion, such as gully or bank erosion.

Interpretation of the data found in the soil surveys reveals that potential for significant soil erosion (Figure 3.3) and compaction (due to clayey composition and general wetness) are the primary problems affecting the soil resources at the VTS-S site. Without proper conservation strategies in place, VTS-S could lose land appropriate for training. The erosion index (EI) shows the soils' potential for erosion over a given period of time (Table 3.3) considering the effects of rainfall, erodibility, and slope, and adjusting for differences in soil erosion tolerance.

The Bradyville and the Cumberland soil series are the most erodible soil types found at the training site (Figure3.3 and Table 3.3). While none of the soils at VTS-Smyrna are considered "highly erodible," nearly half of the soils at VTS-S require some special consideration to minimize impact from training. Utilization of special conservation practices makes it possible to not only train on the soils at VTS-S without causing excessive damage, but also to more easily repair any damages that may be incurred.

Table 3.3 Soil erosion potential

Soil Symbol	Acreage	Slope (%)	LS Minimum	LS Maximum	T-factor	K-factor	Erosion Index (EI)	HEL Class
AmA [1]	10.6	0 to 2	0.05	0.33	5	0.43	1.1-7.1	NHEL
AmB [1]	3.5	2 to 5	0.13	0.87	5	0.43	2.8-18.7	NHEL
Ar	9.8	0 to 2	0.05	0.47	5	0.37	0.9-8.7	NHEL
BrA	3.1	0 to 2	0.05	0.3	3	0.43	1.8-10.8	NHEL
BrB	47.9	2 to 5	0.13	1.1	3	0.43	4.7-39.4	PHEL
BrC2	22.1	5 to12	0.56	3.32	3	0.43	20.1-119.0	PHEL
BsB3	3.8	2 to 5	0.14	0.84	3	0.43	5.0-30.1	PHEL
BtC	25.3	2 to 12	0.13	4.02	3	0.43	4.7-144.1	PHEL
Bu	469	0 to 2	0.05	0.35	3	0.43	1.8-12.5	NHEL
CuB [2]	121.7	2 to 5	0.13	1.1	5	0.37	2.4-20.4	NHEL
CvB3 [2]	19.7	2 to 5	0.44	4.49	5	0.37	8.1-83.1	NHEL
CuC2	1.1	5 to 12	0.13	0.81	5	0.37	2.4-15.0	PHEL
GRC	1	2 to 15	0.13	2.27	1	0.17	5.5-96.5	PHEL
HcA	57.5	0 to 2	0.05	0.35	5	0.43	1.1-7.5	NHEL
LoA [3]	101.2	0 to 2	0.05	0.35	5	0.43	1.1-7.5	NHEL
LoB [3]	66.2	2 to 5	0.13	1.1	5	0.43	2.8-23.7	NHEL
Ly	1.0	0 to 2	0.05	0.3	5	0.37	0.9-5.6	NHEL
Pd	29.8	12 to 20	1.75	0.32	5	0.43	37.6-140.6	PHEL

LS = Topographic factor (length and steepness of slope) Data obtained from SAIC 2000
T = Tolerable soil loss (acres/year)
K = Soil erodibility factor
EI = Erosion Index

HEL Class: **NHEL** = not highly erodible land; PHEL = potentially highly erodible land.

[1] Soil mapping units combined and represented by symbol "Am" in Figure 3.1

[2] Soil mapping units combined and represented by symbol "CuB" in Figure 3.1

[3] Soil mapping units combined and represented by symbol "Lo" in Figure 3.1

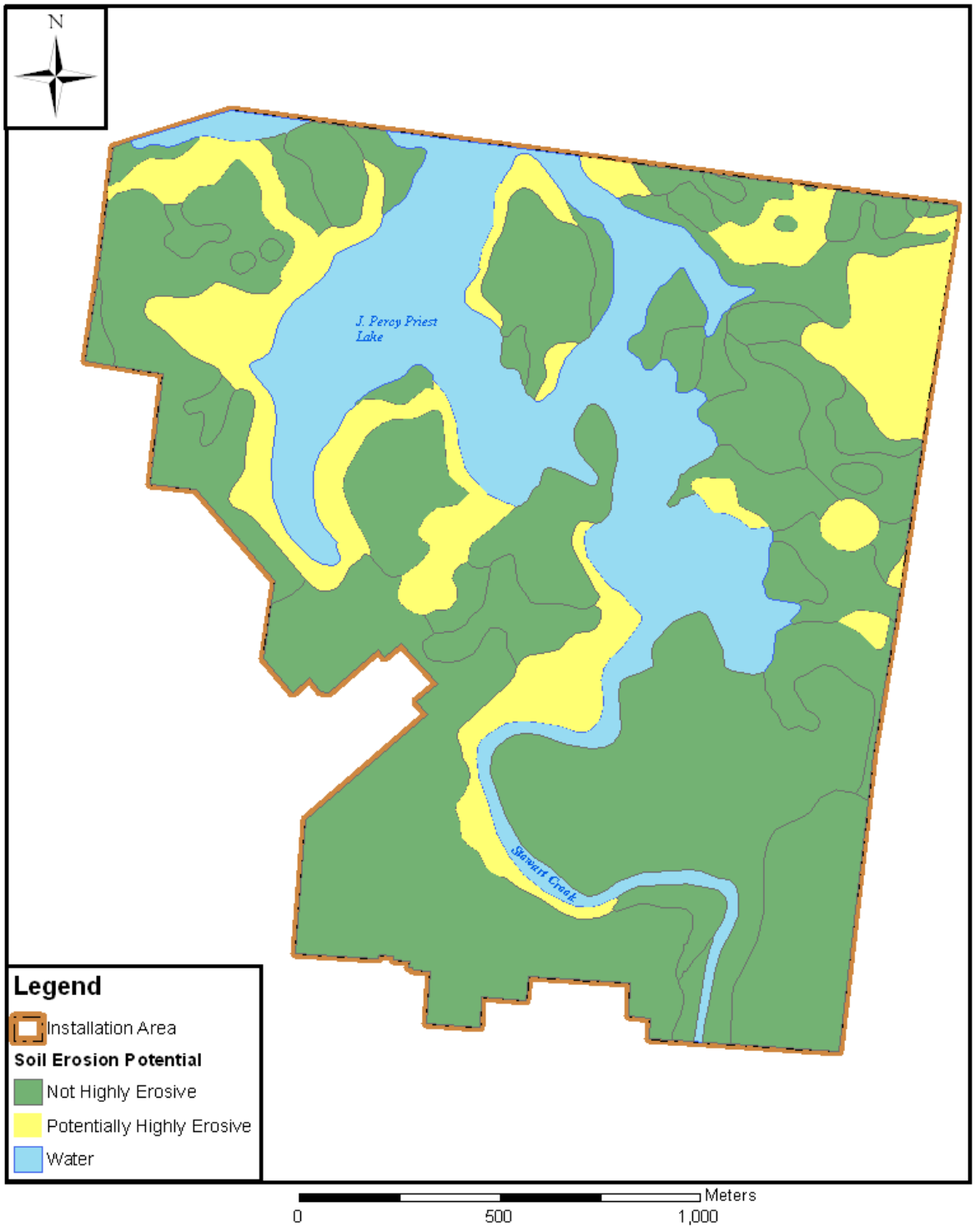

Figure 3.3: Soil erosion potential on VTS-Smyrna

3.4.3 Prime Farmland

Approximately 391 acres of the VTS-S soils are recognized as prime farmland soils; however, they are not currently managed to produce food, feed, forage, fiber, and oilseed crops. Soils were actively farmed prior to 1970 when the USACE granted TNARNG a license to use the site. The TNARNG utilizes the site for the primary purpose of military training, which takes precedence over agricultural land use at this time.

3.5 WATER RESOURCES

3.5.1 Surface Water

VTS-S is located within the Stones River Watershed (USGS Hydrologic Unit #05130203) (Figure 3.4), which includes approximately 589,440 acres (921 square miles) of land and water and ultimately drains into the Cumberland River. Perennial surface water features at VTS-S include Stewart Creek and the J. Percy Priest Reservoir (Figure 3.5).

Stewart Creek is a fourth-order stream that drains a watershed area of 44,608 acres (69.7 square miles) that encompasses crop and livestock agriculture as well as the urbanized region of Smyrna and the training site. Stewart Creek enters the VTS-S on the southeastern border, approximately 1,000 feet west of the eastern site boundary. The creek generally flows northward, but also meanders westward and eastward before merging with the J. Percy Priest Reservoir.

The J. Percy Priest Lake, into which Stewart Creek flows, is an impoundment of the Stones River covering approximately 14,200 acres (22.2 square miles). The USACE maintains the lake, which provides recreation, hydroelectric power, and flood control to surrounding areas. Water from J. Percy Priest Lake is also the primary source of drinking water for several neighboring communities. The lake's winter and summer pool levels are maintained at 480.0 and 483.0 feet above mean sea level (AMSL), respectively. The maximum pool level of the reservoir (flood-control storage level) is 504.5 feet AMSL (USACE 2006).

3.5.1.1 Drainage Systems

The Stones River watershed drains portions of Rutherford, Wilson, Cannon, and Davidson Counties before emptying into the Cumberland River in eastern Davidson County. The Cumberland River joins the Ohio River, near Paducah, Kentucky, and the Ohio flows into the Mississippi River east of Charleston, Missouri. The Mississippi River eventually drains into the Gulf of Mexico.

Storm water runoff from the installation's cantonment area flows northeast and is directed to Stewart Creek via open-flow ditches and limited sewer lines and is not treated before entering the creek. This storm drainage system was designed by the U.S. Air Force and dates from the World War II era. Drainage from the training areas flows into Stewart Creek, as well, by way of surface swales and wet weather conveyances.

Main tributaries to Stewart Creek include Rocky Fork, Olive Branch, Harris Branch, and Rock Spring Branch. All of these waterways are upstream of the portion of Stewart Creek that flows on VTS-S.

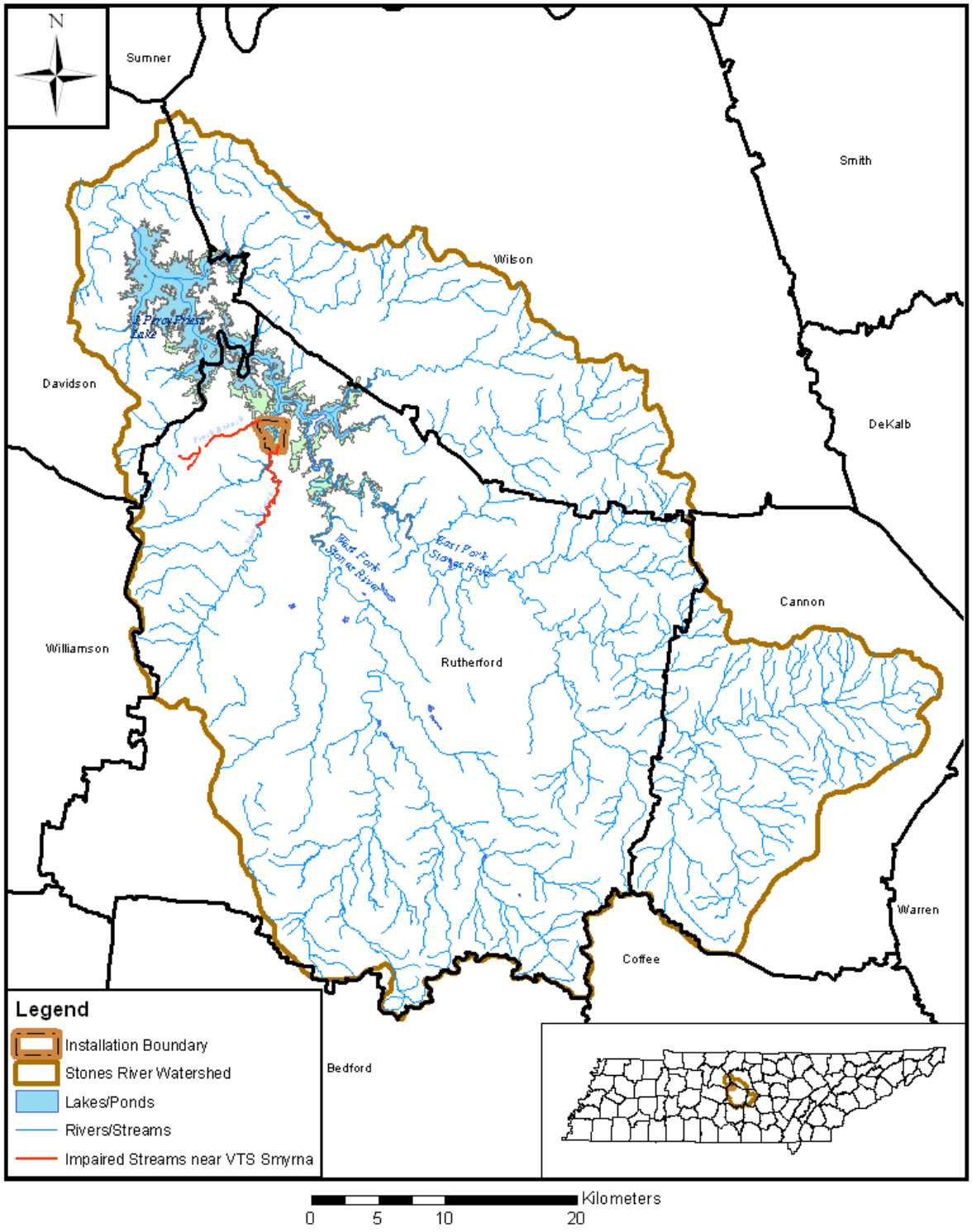

Figure 3.4: Stones River Watershed, noting impaired streams on or near VTS-Smyrna.

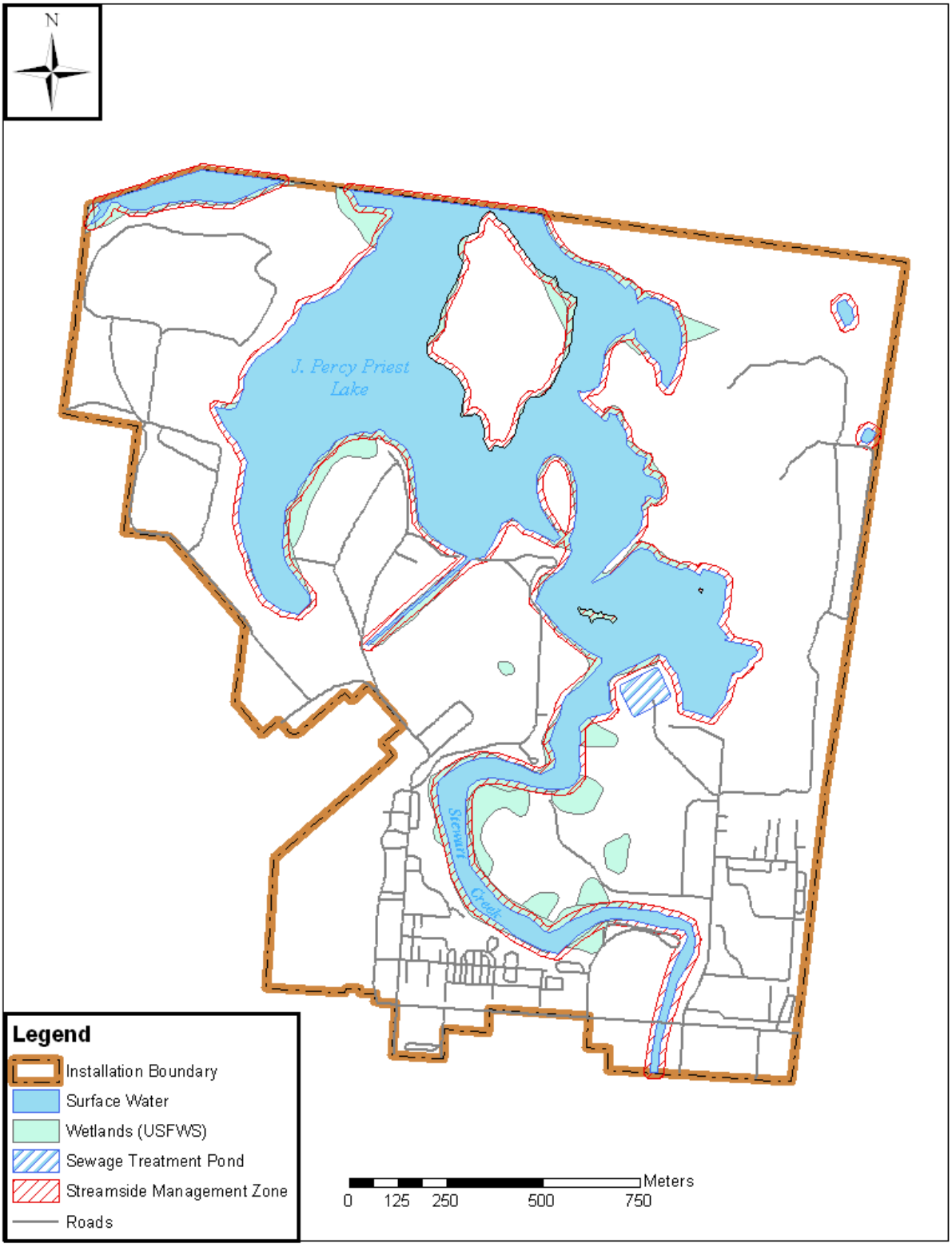

Figure 3.5: Surface water resources on the VTS-Smyrna.

3.5.1.2 Floodplains

Approximately 200 acres of the training site are inundated by J. Percy Priest Lake for at least part of the year. At winter draw-down of the lake, a significant portion of that acreage is a mudflat. Approximately 80 percent of the undeveloped areas of the training site lie within the 100-year floodplain.

According to the U.S. Federal Emergency Management Agency (2007), the area including and immediately surrounding VTS-S is located in an area of high flood risk. This designation indicates that there is a 1% chance of flooding at the training site each year, and that there is a 26% chance of onsite flooding during the next 30 years. This risk is mitigated to a certain degree by the ability of USACE engineers to lower water levels at J. Percy Priest Lake in anticipation of excessive precipitation; however, such scenarios may not always be predicted. In some cases, reservoir levels may need to be allowed to reach the maximum flood storage capacity of 504.5 feet AMSL. Restrictions are placed on construction and other land altering activities below the 508-line (508 feet AMSL; Figure 3.5) on all properties bordering J. Percy Priest Lake, including VTS-S, to allow the USACE the ability to flood this region, if necessary (see Section 2.1.2).

May 2010 Flooding: A series of unusually strong storms fed by a stationary front bringing humid, tropical air up the Mississippi River valley dropped up to 15" of rain in a two-day period (May 1-2, 2010). Over 13" was recorded in Nashville. This storm system caused record flooding in west and middle Tennessee, including the Cumberland and Tennessee Rivers. The J. Percy Priest dam was nearly overtopped during this flooding, as were other dams in the Cumberland system, and the spillway gates were opened to avoid overtopping. The peak water level recorded by the USACE for J. Percy Priest dam was 504.9' MSL (USACE 2010). As Figure 3.6 shows, much of the undeveloped portion of the VTS-S was flooded during this event. No structures were affected, however, and overall damage on the training site was minimal.

In April 2011, high water again closed several recreation areas along J. Percy Priest Lake, although there was not substantial flooding in the region. On the VTS-S, portions of the training areas were again inundated, but there was no significant damage or impact on training.

3.5.2 Ground Water

VTS-Smyrna lies above the Central Basin aquifer which consists of generally flat-lying carbonate rocks of Ordovician to Devonian age and underlies the Central Basin physiographic province. Ground water is stored in and moves through solution-enlarged vertical joints and horizontal bedding planes. Wells commonly yield 5 to 20 gallons per minute and are an important source of drinking water throughout much of the Central Basin.

The flow system in the Central Basin aquifer is generally 300 feet or less below the surface. Ground water depth at VTS-S ranges from two to three feet near Stewart Creek to as much as 40 feet at the training site's highest elevations. Ground water is recharged via the percolation of precipitation into the Central Basin aquifer. Nevertheless, some fractures and faults through the Central Basin aquifer system may allow recharge to the underlying Knox aquifer, whose upper formations can also provide substantial quantities of water to wells in the Central Basin at depths of 1000 feet or more (Brahana and Bradley 1986).

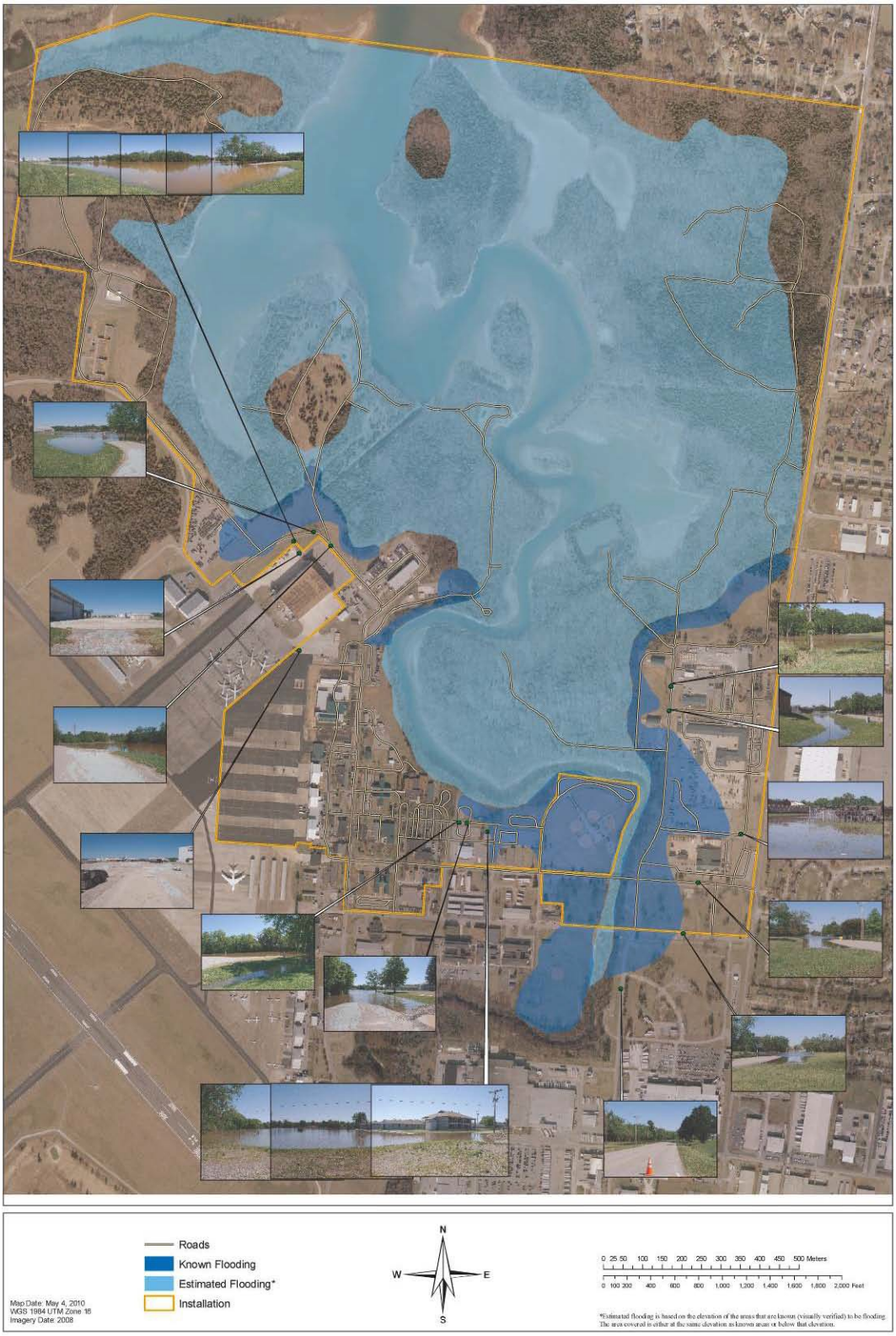

Figure 3.6: Flooding on VTS-Smyrna on 4 May 2010. Dark blue indicates known flooded areas; light blue indicates extrapolated flooding**.**

Ground water at VTS-S, and throughout most of the Central Basin, is rich in carbonic and other organic acids which slowly dissolves the limestone bedrock (Lose and Assoc. Inc. 1994). The resulting voids in the carbonate rock may eventually form extensive cave networks or collapse and create sinkholes or depressions on the ground's surface. Geologic features formed in such scenarios are termed "karst" topography and are found throughout Middle Tennessee. The nature of karst features allows surface and ground waters to have more direct contact and significant interactions with one another, thereby underlining the importance of responsible management of each system.

There are numerous sinkholes in the northeastern corner of the training site (see Section 3.2; Figure 3.2), each of which is individually marked and flagged. Two of these of these have small, inconspicuous openings at the surface but are deep and potentially hazardous to VTS-S personnel, contractors, or trespassers should they decide to travel into the off-road area. Access is restricted to foot traffic in these areas and training exercises are not recommended. The sinkholes have been posted to indicate restricted access, but further determination and marking of the potential use of the entire area is needed.

3.5.3 Water Quality

Stewart Creek's designated use classification, according to the Tennessee Department of Environment and Conservation (TDEC) Rule 1200-4-4, includes fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. From Harris Branch to Rock Fork Creek (Figure 3.4), Stewart Creek is partially supporting of the designated uses listed above (EPA 1998, 2007). "Partially supporting" means that water quality is considered moderately impacted by pollution and that water quality criteria are exceeded with some frequency. The primary sources of contamination to Stewart Creek are siltation, suspended solids, and nitrate pollution originating from above ground and storm sewer runoff in surrounding urban and industrial areas as well as flow alteration from construction activities.

Some portions of Stewart Creek are listed on the State of Tennessee's 303(d) list for nitrate contamination and for loss of biological integrity due to siltation (TDEC 2008 and 2017). This designation applies to 7 miles of Stewart Creek upstream of VTS-S and ends approximately 550 yards downstream from the southern boundary of VTS-S (EPA 2007). Several tributaries of Stewart Creek are also impaired for the same reasons, including Finch Branch, which empties into J. Percy Priest Lake just outside the most northwestern boundary of VTS-S.

3.5.3.1 Water Quality Assessments

An initial water quality assessment was conducted on the portion of Stewart Creek within the boundaries of the VTS-S during the fall (low-flow) of 1998 and the following spring (high flow) (SAIC 1999). Two stations were sampled: one upstream in Stewart Creek off the shore of TA3 and the second off the shore of TA5 where the creek widens into the reservoir.

Results from this study indicated that water quality in Stewart Creek on the VTS-S was generally good, with low concentrations of toxic metals, nutrients, anions, and fecal coliform. Inconsistent results were found for several analytes. In the December 1998 sampling, potassium, chloride, sulfate, total dissolved solids, and total organic carbon were higher than the April 1999 sampling date. Higher December concentrations were most likely due to lower flows and lower temperatures. All of the concentrations were within ranges expected to be harmless to aquatic biota. Higher concentrations of calcium, total fecal coliform, and total suspended solids were found during the April 1999 sampling period. Based on the measured parameters, the water quality at the two sites sampled is sufficient to support benthos and fish communities.

Biosurveys of the benthic macroinvertebrate communities at each sampling point were also performed during this baseline study. Results revealed that relatively few taxa and numbers of individuals occupied

the waters of Stewart Creek at the time of survey. This lack of population density and diversity was attributed to low habitat availability, an intrinsic feature of many embayments, as well as potential point source discharges found upstream of the training site's surface waters. While neither of these impacts appears to be aggravated by the activities occurring at VTS-S, these results highlight the need to take extra care to avoid soil erosion, sedimentation, and imposition on Streamside Management Zones on the facility.

More recent water quality data (54 sampling events spanning 2001-2007) has been obtained from TDEC's Division of Water Pollution Control (unpublished data) at Stewart Creek sample sites 0.8 to 13.7 miles upstream from VTS-S. Mixing and backflow of waters from impoundments such as J. Percy Priest Lake into upstream tributaries make analysis of such a wide range of sampling sites necessary. During these sampling events, E. coli and fecal coliform samples were collected that exceeded 126 colony forming units per 100 ml (TDEC Water Quality Rule 1200-4-3-.03) on at least 28 out of 54 sampling events for E. coli and 27 out of 56 sampling events for coliform. Higher levels of both E. coli and coliform occurred during winter months.

Dissolved oxygen (DO) levels in water samples taken from the 2001-2007 time period noted above were within designated water quality standards during this same period of sampling. The State of Tennessee's General Water Quality Criteria states that DO levels for wadeable streams in subecoregion 71i "shall not be less than a daily average of 5.0 mg/l with a minimum DO level of 4.00 mg/l." A reading taken September 19, 2006 of 4.23 mg/l is below the required daily average of 5.0 mg/l. The available data suggests that this is the only sample taken on this day indicating a violation of the daily average of 5.0 mg/l water quality standard. However, this appears to be a one-time event; sampling data from before and after the 4.23 mg/l result were all above the 5.0 mg/l standard.

Other parameters monitored during TDEC sampling include metals such as cadmium, nickel, copper, arsenic, iron, aluminum, silver, and zinc, and nutrients including phosphorus, nitrogens and sulfate. Monitoring for these parameters indicated levels well within acceptable water quality standards.

A follow-up aquatic habitat survey was conducted in 2007-2008 for the purpose of reassessing water quality and aquatic habitat quality and describing the macroinvertebrate and fish communities on VTS-S (URS 2009). Sampling was conducted at eight locations – five in the lake and three in the flowing portion of Stewart Creek – in November-December 2007 and in March 2008. Three of the sampling points were reference points located beyond the training site boundaries: two were in bays of the lake downstream of VTS-S and one was located on Stewart Creek upstream of the training site.

Water quality was found to be generally good and conducive to supporting a diverse aquatic community. Measured variables including pH, dissolved oxygen, conductivity, turbidity, nitrogen concentration (measured as total kjeldahl nitrogen), hardness, and total suspended solids were within regulatory limits at both lake and stream stations. Dissolved oxygen measurements did show substantial variation among the sampling points that suggests it is impacted by point source input from the sewage treatment plant upstream of the VTS-S.

Stream habitat was considered not impaired under the Tennessee Department of Environment and Conservation protocol for stream habitat assessment. The lake stations had poor habitat in the open water areas due to silty substrate, but the shoreline habitat was generally good.

The macroinvertebrate survey found low diversity of benthic invertebrates at both the stream and lake sampling points. Both sampling events found a much lower number of individuals and of species than in the 1999 survey. This difference may have been caused by sampling location discrepancy: the

macroinvertebrate samples in 2007-2008 were collected in open water habitats which typically support less diversity than shoreline sites. Fish were abundant at both sampling periods, but diversity scores indicate that the fish community is fair to poor at all locations. The predominance of omnivorous species and low numbers of more sensitive carnivore or insectivore species were responsible for the low diversity scores; however, the results from the training site samples were consistent with the reference points from beyond the site boundaries.

These water quality studies should be repeated every 5-10 years to identify and evaluate changes from previous investigations. In addition, a more thorough macroinvertebrate study is recommended to determine whether the variation between the 1999, 2008, or the new results is due to differing sampling efforts, timing, or degradation of the macroinvertebrate population.

3.5.3.2 Streamside Management Zones

Maintaining vegetative buffers (i.e., undisturbed woody vegetation) commonly called Streamside Management Zones (SMZs) along streams and other waterways is an extremely effective water pollution control measure. Such buffer zones filter and decrease velocities of stormwater runoff, protect banks from channel erosion by stabilizing soils, provide flood control, and help support various aquatic and streamside habitats.

The Town of Smyrna's Water Quality Buffer Zone Policy requires that a vegetation buffer zone extend a minimum of 2 times the width of the channel on either side of the channel of all perennial and intermittent stream waterways and wetlands (see Section 5.1.5 for more detail). This requirement applies to VTS-S along the banks of Stewart Creek up to its confluence with J. Percy Priest Lake. As Stewart Creek has been impounded by the J. Percy Priest Dam, the current channel width is not that of a true stream, the waterway type for which this guidance was written. Therefore, a uniform 50 foot SMZ will be demarcated and maintained along either side of the Stewart Creek shoreline at VTS-S (Figure 3.5).
Similarly, the USACE requires that vegetation buffers of 50 feet be maintained along all shores of J. Percy Priest Lake. This measurement is taken from the shoreline when the lake is at summer levels. Mapping and posting of SMZs along the waterways of VTS-S was completed in 2009-10.

3.5.3.3 Water Supply

Potable water for VTS-S is supplied by the Town of Smyrna from J. Percy Priest Reservoir. The town of Smyrna can provide up to 8,000,000 gallons per day for the local community. A storage tank on the training site has the capacity to hold 500,000 gallons of water.

3.5.3.4 Wastewater Discharge

All domestic wastewater at VTS-S, as well as process wastewater produced from the CSMS and FMS, including their associated wash racks, is discharged to the Town of Smyrna sanitary sewer system. The industrial processes that generate wastewater at the CSMS, and FMS include, in part, floor cleaning, parts washing, and equipment washing at the wash racks. The CSMS also has a paint booth operation that generates wastewater. Wash racks located at the CSMS and FMS pass wastewater through oil/water separator devices before being discharged into the Town of Smyrna sanitary sewer system. Industrial stormwater from the CSMS and FMS is also discharged to the Town of Smyrna sanitary sewer system. Outside the cantonment on VTS-S, portable sanitary units are used and wastes are removed by permitted, licensed septic haulers.

The stormwater system at VTS-S is in the process of being updated to better handle water generated by industrial practices, wash racks, and vehicle maintenance activities. Maintenance is no longer conducted on the flight line, but rather inside the hanger where systems can better handle generated wastewater. The AASF

has been relocated to Barry Field, and the unused aviation fuel farm is being removed entirely. This has greatly reduced the potential for sediment, floatables, and free oil and grease present in stormwater emissions. The oil/water separator has been updated at the VTS-S wash rack, and outflows directed to the Town of Smyrna sanitary sewer system rather than J Percy Priest Lake. These actions have reduced the number of dedicated stormwater outfalls on VTS-S to three.

3.6 WETLANDS

To meet the definition of "jurisdictional wetland" under Section 404 of the Clean Water Act, an area must exhibit three traits: (1) hydrophytic vegetation, (2) hydric soil, and (3) wetland hydrology. Areas that are periodically wet, but do not meet all three criteria, are not jurisdictional wetlands subject to section 404 of the Clean Water Act. Areas that have been disturbed or that are classified as problem area wetlands, however, may not meet all three criteria due to man-induced alterations, but are still considered jurisdictional wetlands. Wetlands store water and minimize flooding. They also filter sediment, excess nutrients, and other impurities from water as it is stored. The aquatic vegetation found in wetlands protects shorelines from erosion and provides food and cover for wildlife. Wetlands provide habitat for micro- and macro-invertebrates that use or break down nutrients and contaminants.

3.6.1 Wetlands Vegetation

In 2000, SAIC conducted an inventory of wetlands at VTS-S using routine determination methods established by the USACE (U.S. Army Corps of Engineers 1987). According to this survey, approximately 1.3% (11 acres) of VTS-S is covered by potential jurisdictional wetlands, including approximately 4.6 acres of bottomland hardwood wetland, 3.9 acres of palustrine emergent wetlands, and 2.5 acres of scrub shrub wetlands. These habitats are described below; a complete list of species found at VTS-S, including scientific names, can be found in Appendix F. As the SAIC survey did not include GIS mapping of potential wetlands, the wetlands data depicted in Figure 3.5 were obtained from the National Wetland Inventory, which is managed by the USFWS and is available at: http://www.fws.gov/nwi/.

The mixed bottomland hardwood habitat type occurs in narrow to wide bands in floodplain areas along the banks of Stewart Creek and low-lying areas adjacent to the shores of the J. Percy Priest Reservoir. These sites may be frequently inundated with floodwaters during the wet season (December to April), and flooding is of sufficient duration during the growing season to create wetland conditions. These sites are dominated by mature trees and have not been significantly disturbed for many years. Dominant tree species include sycamore, boxelder, green ash, silver maple, slippery elm, bald cypress, and black willow.

Palustrine wetlands at VTS-S have formed as a result of reservoir management of the J. Percy Priest Reservoir and are found adjacent to the lake on the mainland western boundary of TA2. These areas are dominated by graminiod and herbaceous species, with a few scattered shrubs or small trees. Wetlands of this type at VTS-S have large expanses of open water, up to one meter deep, and cover at least several acres. Dominant persistent species include numerous members of the sedge, rush, and grass families, such as wool-grass, soft rush, and cattail. Other common nonpersistent herbaceous species include marsh smartweed, Pennsylvania smartweed, arrowleaf tearthumb, jewelweed, and bushy seedbox. Hydrology varies from semi-permanently to permanently flooded and is controlled by pool elevation of the lake. These sites are usually wet for extended periods (greater than one month) during the growing season.

Scrub shrub wetlands occur in floodplain areas along the shores of J. Percy Priest Lake adjacent western boundaries of TA2 and are often found in areas that have seen heavy disturbance by humans. They may represent a transitional stage of succession between a marsh and a forested wetland. Dominant species include buttonbush, silky dogwood, roughleaf dogwood, river cane, elderberry, spicebush, and saplings of many of the tree species found in the site's bottomland hardwood wetland areas. Hydrology varies from

temporarily flooded to seasonally flooded, saturated, or semi-permanently flooded. These sites may be wet for brief (one to two weeks) to extended periods (greater than one month) during the growing season; some of these sites may remain saturated for much of the growing season. Scrub shrub communities are intermixed with other wetland types at VTS-S.

3.6.2 Wetlands Inventory and Mapping

Aerial photographs, visual observation, and/or photo point monitoring can be used to effectively monitor onsite wetlands to ensure that avoidance measures have been effective and to ensure that no additional rehabilitation projects are needed in the areas surrounding the wetlands. Such monitoring could be integrated into a routine site assessment performed annually.

In December of 2010, URS conducted a wetlands delineation survey of VTS-S. The areas assessed were those indicated as wetlands by a National Wetlands Inventory map downloaded from the U.S. Fish and Wildlife Service. Wetland areas were determined based on hydrology, soils, and dominant plant species. URS used a push soil sampler to collect samples up to 18 inches deep and compared the samples to the Munsell color chart to determine the soil type. The vegetation of the overstory and understory were evaluated to find the dominant plant species. The hydrology was determined by the characteristics of the site and by evaluation of site maps. The results of the survey are shown in Figure 3.7 (URS 2012). Some of the sites sampled were found to not be wetlands. A total of 13.12 acres of VTS-S were found to be wetlands. Their categorization and details are outlined in Table 3.4 (URS 2012).

Accurate surveys of wetland and aquatic flora, fauna, threatened and endangered species, and exotic species conducted at regularly scheduled intervals would provide valuable insight into the health of the training site's wetlands, associated waterways, and surrounding habitats. Macroinvertebrate bioassays provide data that is particularly useful when assessing the biological integrity of an aquatic setting as these animals react very quickly to environmental changes and are generally plentiful in most aquatic settings. Therefore, if there is reason to suspect change in the water quality of the training site's wetlands such as a dramatic change in water levels or contamination due to construction, natural disaster, or a hazardous chemical spill, a macroinvertebrate survey may be initiated as a precursor to recovery efforts. An analysis of macroinvertebrate populations at multiple points at VTS-S was conducted by URS in 2008 (URS 2009) and found relatively low diversity levels of benthic invertebrates in all habitats sampled.

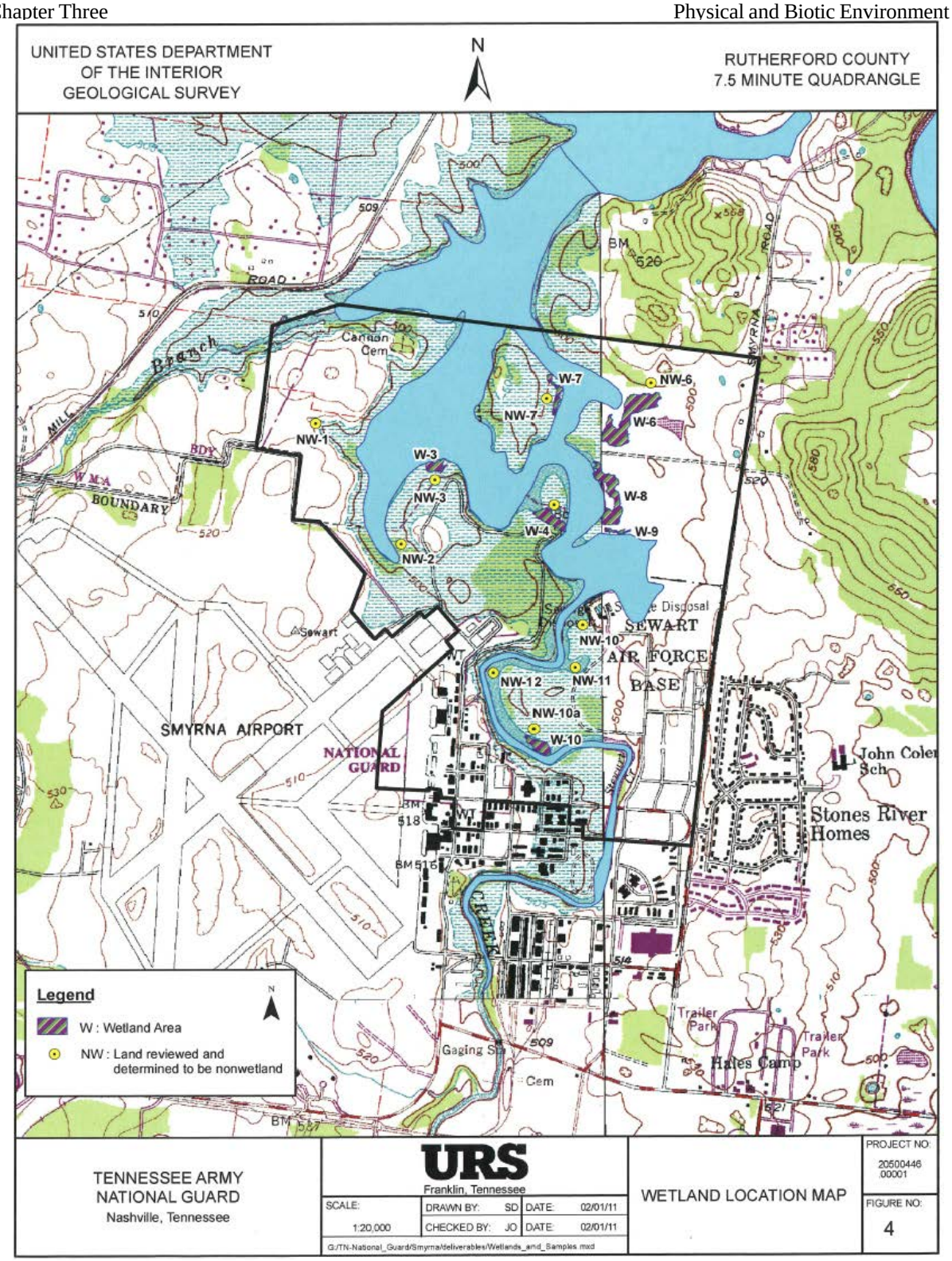

Figure 3.7: Map of Wetlands Delineation from 2010 Survey

Table 3.4 Wetland Areas from 2010 Survey

Wetland Identified	Total area (acres)	Vegetation			Soil	Hydrology/Observations	Wetland Type	RAM Score
		Common	Scientific	Reg. Status				
Wetland 3	0.756	Red Maple	*Acer rubrum*	FAC	0-2' 7.5YR 4/4	Shoreline Depression	PFO	71
		Black Willow	*Salix nigra*	OBL				
		Box Elder	*Acer negundo*	FACW	2-12' 7.5YR 4/1			
		Green Ash	*Fraxinus pennsylvanica*	FACW				
		Button Bush	*Cephalanthus occidentalis*	OBL				
		Hair grass	*Deschampsia falvese*	NI				
		Manna grass	*Glyceria striata*	OBL				
		monkey grass	*Liriope muscari*	NI				
Wetland 4	1.568							
		Green ash	*Fraxinus pennsylvanica*	FACW	0-2 7.5YR 3/1	Floodplain Depression	PFO/POW	69
		Black Willow	*Salix nigra*	OBL	2-8 7.5YR 4/1			
		Sycamore	*Platanus occidentalis*	FACW	8-12 7.5YR 5/6, 5/1			
		Box Elder	*Acer negundo*	FACW				
		American Elm	*Ulmus americana*	FACW				
		Bald cypress	*Taxodium distichum*	OBL				
		Button bush	*Cephalunthus occidentalis*	OBL				
		silky dogwood	*Cornus amumom*	FACW				
		Wool grass	*Scirpus cyperinus*	OBL				
		manna grass	*Glyceria striata*	OBL				
		Smart weed	*Polygonum amphibium*	OBL				
		Lizard tail	*Saurunus cernuus*	OBL				
		Poison Ivy	*Toxicodendron radicans*	FAC				
Wetland 6	5.278							
		Green Ash	*Fraxinus pennsylvanica*	FACW	0-1.5 organic layer	Drainage to a	PEM/PSS	88
		Black Willow	*Salix nigra*	OBL	1.5-7 7.5YR 5/2	shoreline depression		
		Button bush	*Cephalunthus occidentalis*	OBL	7-12 7.5YR 4/6-4/2			
		silky dogwood	*Cornus amumom*	FACW				
		Wool grass	*Scirpus cyperinus*	OBL				
Wetland 7	0.772							
		Green ash	*Fraxinus pennsylvanica*	FACW	0-3 7.5YR3/3		PFO	61
		Black Willow	*Salix nigra*	OBL	4-12 7.5 YR 4/2, 7.5YR 6/1	Shoreline Depression		
		Box Elder	*Acer negundo*	FACW				
		American Elm	*Ulmus americana*	FACW				
		Hackberry	*Celtis accidentalis*	FACU				
		Smartweed	*Polygonum amphibium*	OBL				
		Button bush	*Cephalunthus occidentalis*	OBL				
		Lizard tail	*Saurunus cernuus*	OBL				
		Carex sp.	*Carex sp.*	FACW				
Wetland 8	3.357							
		Hackberry	*Celtis occidentalis*	FACU	0-2 7.5YR 3/1	Shoreline Depression	PFO/PEM	73
		American Sycamore	*Platanus occidentalis*	FACW	2-6 7.5YR 4/2			
		Green ash	*Fraxinus pennsylvanica*	FACW	rock			
		Black Willow	*Salix nigra*	OBL				
		Box Elder	*Acer negundo*	FACW				
		American Elm	*Ulmus americana*	FACW		Geese		
		Button bush	*Cephalunthus occidentalis*	OBL				
		silky dogwood	*Cornus amumom*	FACW				
		Wool grass	*Scirpus cyperinus*	OBL				
Wetland 9	0.286							
		Black Willow	*Salix nigra*	OBL	0-2 7.5YR 3/1		POW	73
		Button Bush	*Cephalanthus occidentalis*	OBL	2-8 7.5YR 4/1	Floodplain Depression		
Wetland 10	1.105							
		American Sycamore	*Platanus occidentalis*	FACW	0-2 7.5YR 3/1	Floodplain Depression	PFO	65
		Green ash	*Fraxinus pennsylvanica*	FACW	3-12 7.5YR 4/2			
		Box Elder	*Acer negundo*	FACW				
		American Elm	*Ulmus americana*	FACW				
Total area of wetland	13.122							

3.7 VEGETATION

The VTS-S is part of a larger ecosystem that is known as the Interior Low Plateau Section of the Eastern Deciduous Province (Bailey 1980; McNab and Avers 1994). Prior to widespread settlement and development, the natural landscape was composed of a mosaic of interacting communities linked by hydrologic flow, nutrient cycling, fire, animal movement, and transitions between communities. The modern landscape supports islands of somewhat natural areas (with one or more communities present) within a sea of anthropogenic features such as roads, buildings, farms, and cities. Fire has probably been the principal historical disturbance, previously burning over moderate-sized areas between natural barriers with low frequency and low intensity (McNab and Avers 1994). Climatic related influences include occasional droughts and ice storms.

In recent history, the most significant impact to vegetation communities at VTS-S was caused by the impoundment of the Stones River by the J. Percy Priest Dam in 1968. This action drastically altered the hydrogeology of all surrounding areas, which directly (and in some cases, immediately) affected vegetation adjacent to the lake by creating aquatic habitat where there were once riparian and mesic communities and converting additional mesic uplands to bottomland and riparian ecosystems.

3.7.1 Vegetative Cover

At the time of European settlement, most of VTS-S was probably covered by patches of oak-hickory forest, cedar glade, and possibly a mosaic of bluestem prairie-oak-hickory forest (USFWS 1995, Shea 1999). Approximately 43% of VTS-S is currently forested. The principal cover type is eastern redcedar, which is found in dense stands in TA2 and likely represents secondary regeneration on previously cleared farmland. Oak-dominated forests occur in some of the drier upland sites, while sugar maple, green ash, and hackberry dominate much of the more mesic forest and bottomland areas adjacent to Stewart Creek and J. Percy Priest Lake.

During a vegetation community survey completed in 2007, AMEC identified a total of 284 plant species at VTS-S [49 trees, 23 shrubs, 18 vines, and 194 herbaceous plants (see Appendix F for complete flora list)] and described 12 vegetation associations within six different natural vegetation communities. These community types include: (1) upland mixed redcedar forests, (2) closed canopy, upland redcedar woodlands, (3) open canopy, redcedar stands, (4) closed canopy, upland deciduous forest, (5) closed canopy, floodplain/bottomland hardwood forests, and (6) open field, managed grasses/herbaceous plants. The community classifications are described below and are depicted in Figure 3.8.

3.7.1.1 Upland, Mixed, *Juniperus virginiana* Forests (map unit R1, Figure 3.8)

Juniperus virginiana-Aesculus glabra Xeric Rock Woodland (R1)

This community type is most prevalent in thin, rocky soils on lakeside bluffs. The canopy is mostly small/stunted eastern redcedar and Ohio buckeye. The understory is sparse but contains poverty oat grass and blunt lobe cliff fern over rocky soil. This woodland type transitions to more mesic oak-hickory forest with shagbark hickory, scarlet oak and southern red oak being more common in the canopy.

3.7.1.2 Closed Canopy, Upland *Juniperus virginiana* Forest (map unit F1)

Juniperus virginiana –Celtis laevigata/*Frangula caroliniana* Forest (F1)

This forest type is found primarily on dry-mesic upland sites and occupies the largest area of any forest cover type at VTS-S. Most of this forest association occurs as dense, even-aged stands of early seral eastern redcedar and sugarberry. Based on both topographic location and the presence of occasional oak, hickory, and sugar maple in the understory, it is assumed that this association

would succeed to dry-mesic oak-hickory or maple-ash-oak forest in the absence of disturbance. However, due to the relatively heavy clay soils and their water-holding capacities, portions of this forest type may naturally remain as redcedar-sugarberry-hackberry stands. This area was heavily disturbed by clearing and agricultural use for many years in the past and the historic forest type that occurred in this area may be difficult to determine.

3.7.1.3 Open Canopy, *Juniperus virginiana* Woodland (map unit C1)

Open *Juniperus virginiana* stands (C1)

These areas generally have widely spaced eastern redcedar and occur in relatively dry portions of the training site. The understory in these areas consists primarily of old field species as described under O1. Therefore, it appears that these stands are the result of past logging, clearing, and possibly farming, as well as recent training exercises, and would likely succeed to surrounding forest types in the absence of disturbance. No areas meeting general characteristics of cedar

glades or barrens were observed in these areas during the field investigation. However, some areas, particularly near the northeast corner of the training site, appear to be significantly drier than most of these stands and contain winged elm, wiry panic grass, poverty oat grass, hairy white old field aster, and patches of prickly pear cactus. While no typical indicators of glade flora were found, it is unclear if some of these areas may have historically contained cedar glade plants.

3.7.1.4 Closed Canopy, Upland Deciduous Forest (map units F2, F4, F7, and F8)

Acer saccharum-Fraxinus americana-Quercus (*shumardii*, *rubra*, *falcata*) Forest (F2)

This forest type occurs in the transition between mesic or bottomland forest and drier eastern redcedar or oak-hickory forest. Canopy species include sugar maple, white ash, southern red oak, northern red oak, scarlet oak, and white oak. The overall appearance of this forest type is one of a sugar maple-oak association and differs from F7 by having a larger percentage of the canopy dominated by oaks and a patchier, sparser, and less diverse herbaceous layer. The understory is relatively open with occasional patches of black snakeroot and individuals of Virginia grapefern occurring. Virginia creeper and poison ivy also occur in patches or clumps.

Variations within this forest type include areas of nearly pure stands of regenerating sugar maple. These areas have an overstory of eastern redcedar and an understory of leaf litter. Another variation occurs where this forest type transitions to bottomland, and sugarberry and American elm become more prominent.

Celtis laevigata/*Symphoricarpos orbiculatus* Forest (F4)

This forest type occupies the disturbed forest area generally between F1, in drier areas, and F3, in the lowlands along Percy Priest Lake. This forest type is similar to F1; however it differs by having coralberry as a dominant shrub. In fact, coralberry often represents up to 75% or more of the understory species in this forest type. The canopy is typically dense and even-aged, similar to F1, and lacks vertical stratification. However, the shrub and herbaceous layers appear more lush, dense, and diverse than in F1, with species such as wingstem, Japanese grass, butterweed, and occasional sedges occurring throughout. Japanese grass also covers large portions of the forest floor in this and other forest types in the study area.

This forest type may have historically been mesic maple-ash-oak forest because a number of areas contain sugar maple seedlings in the understory and because of the general topographic position. However, portions of this forest type may succeed to a type of bottomland forest of sugarberry and American elm.

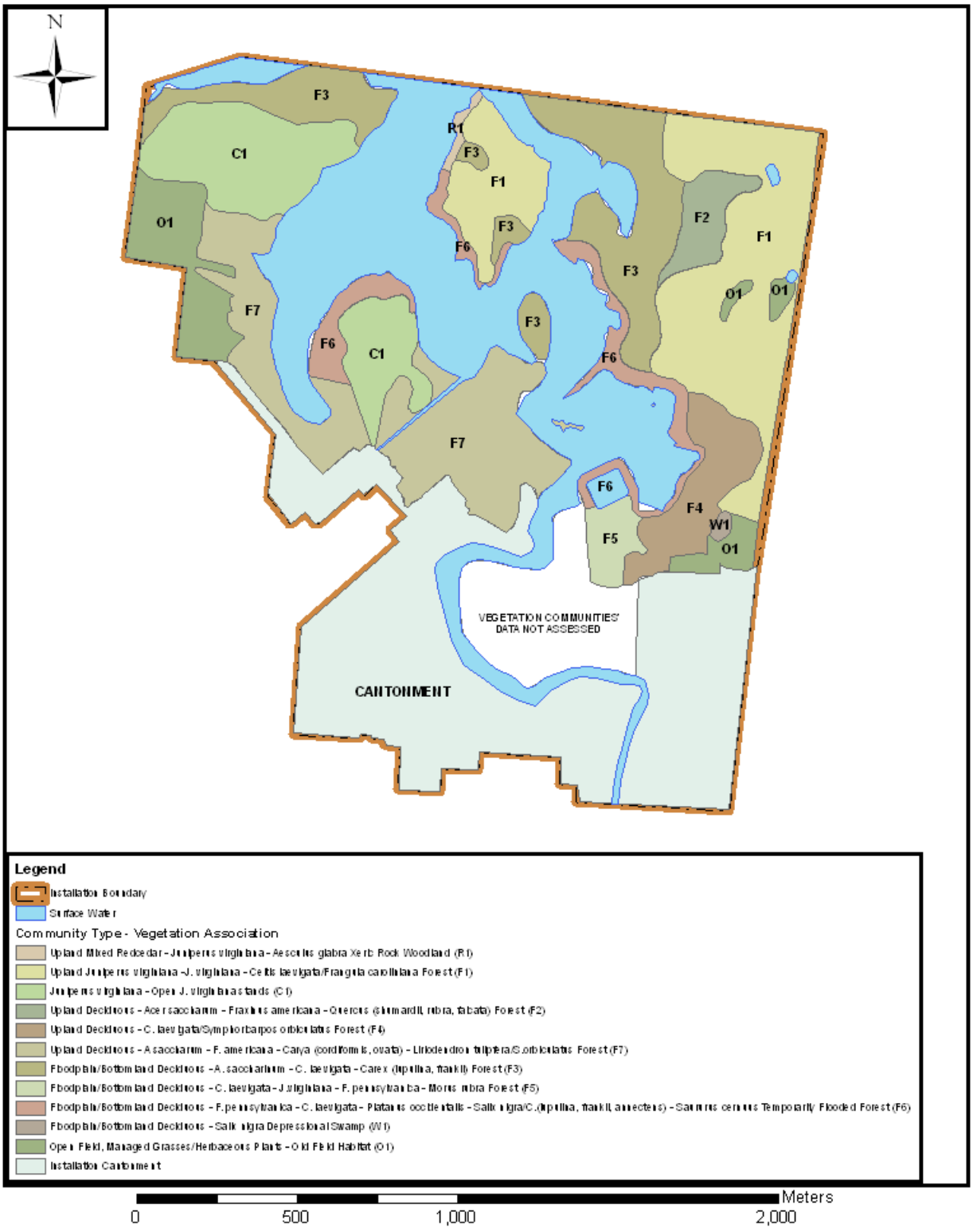

Figure 3.8: Vegetation communities on VTS-Smyrna

Acer saccharum-Fraxinus americana-Carya (*cordiformis,ovata*)-*Liriodendron tulipifera*/ *Symphoricarpos orbiculatus* Forest (F7)

The forest type is similar to F2 but differs in having fewer oaks and more mesic species in the canopy such as tulip poplar. Other differences include a more lush and diverse herbaceous layer, including species such as green dragon, tall thimbleweed, and mayapple.

3.7.1.5 Closed Canopy, Floodplain/Bottomland Deciduous Forest (map units F3, F5, F6, and W1)

Acer saccharinum-Celtis laevigata-Carex (*lupulina, frankii*) Bottomland Forest (F3)

This forest type occurs on low, wet ground near the margin of Percy Priest Lake. Much of the area where the forest type occurs appears to be a depressional area that is at or near ordinary high water of the lake. In some areas, the canopy is dominated by nearly pure stands of silver maple, while other areas have sugarberry sharing dominance. Some stands, particularly those dominated by silver maple are very open with few shrubs and an almost continuous carpet of sedges in the ground layer. This may be the result of fairly consistent inundation or saturation in these areas that precludes the growth of other species. Coralberry occurs in areas of higher ground.

Celtis laevigata-Juniperus virginiana-Fraxinus pennsylvanica-Morus rubra Forest (F5)

This forest type is similar to F3 and occupies a similar topographic position and location on the soil moisture gradient. However, this type differs in having occasional stands of the floodplain species green ash and red mulberry. This may indicate a slightly lower elevation or wetter soil than found in types F1 and F3. Shrub and herbaceous species composition and understory density are highly similar to F3.

Fraxinus pennsylvanica- Celtis laevigata-Platanus occidentalis-Salix nigra/*Carex* (*lupulina, frankii, annectens*)-*Saururus cernuus* Temporarily Flooded Forest, (F6)

This association occurs in the lowest and wettest areas immediately bordering Percy Priest Lake. Dominant canopy species at the waters edge include black and green ash. In slightly drier locations there are mixed stands of sugarberry, sycamore, green ash, and boxelder. Most of these stands, particularly those at the waters edge, appear to be inundated for a good portion of the growing season. Herbaceous growth is either minimal due to the presence of dense leaf litter (areas of slightly higher ground and less light penetration) or dominated by various sedges as well as other floodplain/bottomland herbaceous species such as swamp smartweed, jewelweed, frogfruit, Virginia water horehound, and bushy seedbox. Other graminoids include green bulrush, rice cutgrass, and woodgrass. Emergent areas intermingled with black willow thickets have vegetation dominated by sedges (as described above) and occasional pure stands of lizard's tail.

Salix nigra Depressional Swamp (W1)

This forest type includes a small, isolated basin occupied by a dense stand of black willow. The understory is mostly leaf litter but contains patchy areas of false nettle, soft rush, and sedges.

3.7.1.6 Open Field, Managed Grasses/Herbaceous Plants (map unit O1)

Old Field Habitat

Old fields are areas that have been mown and maintained. These areas typically have vegetation dominated by dense stands of non-native meadow fescue. Other species include lespedeza, arrow plantain, passion flower, pokeweed, mullein, redtop, alfalfa, Johnson grass, and Canada smooth goldenrod. Native species that do occur are primarily common disturbance-oriented plants. It is likely that these areas would succeed to forest types similar to the surrounding forest if left undisturbed.

The managed grasses/herbaceous plants category includes regularly mowed lawns in the cantonment area, areas of relatively bare soil around some of the firing ranges, and other areas that are mowed or cleared on a regular basis for training purposes. The grass in these areas consists largely of fescue with a mixture of other grasses and weedy herbaceous plants. Such communities are dependent upon continued and regular human activities and maintenance; otherwise they would be invaded by woody pioneer species. As portions of this area located in the cantonment were not included in the vegetation survey completed in 2007 (AMEC), the entirety of this habitat type is not represented in Figure 3.8.

3.7.2 Forest Management

In recent years, small areas in the forests of VTS-S have been thinned or cleared for training purposes (e.g., trails, bivouac sites); however, to date, the forests at VTS-S have no history of active management.

3.7.2.1 Forest Inventory

A forest inventory and a forest management plan (FMP) were completed in 2006 by Thompson Engineering, Forest Management Group, and Aerostar Environmental Service via a contract through the U.S. Army Corps of Engineers, Mobile District (See Annex 1). The training site was inventoried by training area, to ensure stand identification and management was compatible with other management activities on the training site. Stands were delineated through the use of aerial imagery and ground observations. Sample points were then taken in each stand (number of plots per stand was dependent on acreage of the stand) to collect the physical data needed to calculate timber volumes. The complete data for all forest stands is provided in the VTS-Smyrna FMP (Thompson Engineering et al. 2006) and includes sawtimber and pulpwood volumes (apportioned by species/species groups), dominant and co-dominant species, average basal area and DBH, average number of snags per acre, minimum and maximum tree ages, general health assessment, and current condition of the stand.

The forest inventory determined that a total of 456 acres of VTS-S were covered in forests in April 2005. The forest stands are typically dominated by eastern redcedar, red oaks, and other miscellaneous hardwoods such as maples and hackberries, with a substantial amount of green ash in some stands. Red oaks are co-dominant in some stands, as are hickory, sycamore, and black willow. Timber volumes are given in Table 3.5. The average DBH for the entire installation was calculated as 8.3 inches, and the average basal area was 56.1 square feet per acre. Most stands are 5-30 years old; although some had trees approaching 40 years in age. While some redcedar stands appear to be in the mid to early stages of succeeding into oak-hickory or maple-hickory forest, others, found on poorly-drained, heavy soils, will most likely maintain current compositions. The overall health of the forest stands was classified as good in April 2005.

The forest inventory data was utilized to develop management prescriptions for each forest stand on VTS-S based on forest health and commercial timber production goals. Military requirements and goals were then incorporated into the final forest management plan for VTS-S presented in Annex 1. The forest management plan covers a ten year period and will be reviewed and revised as needed during that time in conjunction with the INRMP review process. The forest inventory should be repeated in 2015 to provide updated information for the next ten-year planning cycle.

Timber harvests will be conducted at VTS-S for the purposes of opening up needed training areas and improving forest health. Both clear-cutting and marked tree thinning practices will be used. The intensity of the thinning is dependent on two factors: 1) training mission needs and 2) prescriptions of the installation's Forest Management Plan. The initial harvesting project will be to thin the densely wooded redcedar stands in TA 2.

Table 3.5 Forest Product Volume Summary for VTS-Smyrna Based on the April 2005 Forest Inventory

Timber Product	Per Acre		Installation Total	
	Tons	Board Feet	Tons	Board Feet
Sawtimber				
Pine	1.5	178.2	685	81,348
Pole	0	0	0	0
CNS	0.1	13.6	46	6,208
Cedar	0.1	13.7	46	6,254
Red Oak	0.8	107.7	365	49,165
Hickory	0.2	19.9	91	9,084
White Oak	0.2	26.5	91	12,097
Ash	0.1	8.8	46	4,017
Poplar	0.5	53.4	228	24,377
Walnut	0.1	16.3	46	7,441
Misc. Hardwood	2.4	316.3	1,096	144,391
Pulpwood				
Pine	0	0	0	0
Hardwood	14.9	5.5	6,082	2,511

3.7.2.2 Prescribed Fire

Prescribed burning is a forest management tool used to improve wildlife habitat, reduce available fuels to minimize wildfire hazard, and control invasive pest plant species. Planned burn schedules will be determined by TNARNG as the annual workplan is developed each year; however, prescribed burning will not take place at VTS-S until substantial timber harvests occur, as many areas are currently too densely vegetated to safely conduct prescribed burns. TNARNG will coordinate training activities to avoid conflict and will also, were feasible, provide trained personnel to assist with burning activities. Future uses of prescribed fire at VTS-S are further detailed in Annex 2.

3.7.3 Invasive Pest Plants

Non-native plants have become a significant part of most ecosystems in this age of extensive international travel and trade. Many of the species brought into a new environment remain uncommon, requiring human intervention to reproduce and/or spread. Certain species, however, are invasive: they reproduce prolifically and spread rampantly throughout an ecosystem, causing significant disruption to the natural system. Because the predators and diseases of exotic species are rarely transplanted with them, the invasive pests lack natural control mechanisms. Invasive plants typically displace native species and change the species composition of a community. They can also change edaphic characteristics of the site by altering such factors as water use, shade, or flammability.

A number of invasive plant species can be found on VTS-S. A complete survey of the training site was completed in 2005 (Dynamic Solutions, LLC 2005a), and again in 2014 (Boyd et. al. 2015). Chief among the problem species are: privet (*Ligustrum* spp.), multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus spp.*), tree of heaven (*Ailanthus altissima*), sericea lespedeza (*Lespedeza cuneata*), Japanese honeysuckle (*Lonicera japonica*), Japanese grass (*Microstegium vimineum*), Johnson grass (*Sorghum halapense*), mimosa (*Albizia julibrissin*), Korean clover (*Kummerowia stipulacea*), and winter creeper (*Euonymus fortunei*). All of these species are listed as "severe threats" on the Tennessee Exotic Pest Plant Council list (TN-EPPC 2004). All landowners are requested to control such plants if found growing on their property. In addition to impacting native communities and threatening rare or endangered plant

species, these exotic pest plants can interfere with training activities. Privet, olives, and multiflora rose, in particular, can create dense, difficult to traverse stands which make an area unsuitable for mounted or dismounted maneuvers. Methods for managing these species will be discussed in section 4.2.10 and Annex 3.

Complete eradication of these problem species is unlikely to be possible. In the case of small, recently established infestations – tree-of-heaven and winter creeper at VTS-S – rapid control efforts may eliminate the species from the site. For the more prevalent species, reducing their numbers and extent and limiting their impacts on native species is the goal. Control of these species is typically a combination of manual/non-chemical efforts and application of herbicides. A detailed plan of attack against these invasive pest plants is presented in Annex 3, Invasive Pest Plant Control.

3.8 FISH AND WILDLIFE

3.8.1 Migratory Birds

Migratory birds are species which move between at least two locations, typically one for breeding and one for overwintering. Protected species are identified in C.F.R. Title 50 Section 10.13. Songbirds, shorebirds, and waterfowl may fall into this category (those with at least some populations that breed in the continental United States and spend their non-breeding months in the tropics). Attention has centered on neotropical migrants since this group is experiencing steep rates of population decline. However, decreasing populations have also been observed in resident bird species, and temperate-zone migrants, which only migrate within North America. It is DoD policy to promote and support a partnership role in the protection and conservation of migratory birds and their habitat by protecting vital habitat, enhancing biodiversity, and maintaining healthy and productive natural systems on DoD lands consistent with the military mission.

The Migratory Bird Treaty Act (16 U.S.C. 703-711) provides protection for migratory birds. Under the Act, willful, knowing attempts to take, kill or remove migratory birds is unlawful unless authorized by the U.S. Fish and Wildlife Service. Feathers or other parts, nests, eggs, and products made from migratory birds are also covered by the Act. Take is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, trapping, or collecting. Migratory bird hunting regulations, established by the U.S. Fish and Wildlife Service, allow the taking, during designated seasons of ducks, geese, doves, rail, woodcock, and some other species. In addition, permits may be granted for various non-commercial activities involving migratory birds and some commercial activities involving captive-bred migratory birds. Misdemeanor or felony violations of the Act by individuals or organizations may result in significant fines or imprisonment.

In Tennessee, over 250 bird species regularly depend on the food and shelter provided by forests, thickets, and fields located throughout the state during semi-annual migrations, breeding and nesting seasons, and for some, perpetually throughout the year. A baseline survey of the birds utilizing the training site was completed in 2008 (AMEC). During this study, 144 bird species were documented using habitats found on VTS-S (see Appendix F for complete list). Of these, all but six species are Migratory Birds as defined above. The native wild turkey (*Meleagris gallopavo*) and northern bobwhite (*Colinus virginianus*) are not protected under the MBTA, but are state protected game birds. The non-native invasive bird species found at VTS-S, Eurasian collared dove (*Streptopelia decaocto*), rock pigeon (*Columba livia*), European starling (*Sturnus vulgaris*), and house sparrow (*Passer domesticus*), are not protected and can be controlled.

A 2012 planning level bird survey conducted by URS (URS 2013) detected a total of 120 bird species during four seasonal survey periods. URS 2013 reports detecting 87 neotropical migrant species, one species deemed as in need of management by the state of Tennessee, and 14 species rated by NatureServe as vulnerable, imperiled, or critically imperiled. Three detected species are of particular interest. The great egret (*Ardea alba*) is deemed in need of management by the state of Tennessee. The solitary sandpiper (*Tringa solitaria*) and prairie warbler (*Setophaga discolor*) are both USFWS birds of conservation concern.

Four habitats on the property have been noted as being especially valuable to avian communities due both to species richness observed and to the "uniqueness" of the locations: the lake and stream shorelines of the installation; wetland areas found in TA2; the former sewage treatment pond in TA2; and the woodlands surrounding Cannon Cemetery in TA6, in which a great-horned owl (*Bubo virginianus*) was confirmed to have successfully fledged two young (AMEC 2008). URS 2013 identified mudflats and shorelines of the lake as important to wading birds, hardwood tracts as important to migrating neotropical migrants and breeding birds, and open patches with native grasses as important to grassland birds.

Executive Order 13186 (10 January 2001), "Responsibilities of Federal Agencies to Protect Migratory Birds" requires each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a MOU with the USFWS within two years that shall promote the conservation of migratory bird populations. The DoD has established a programmatic MOU which basically commits DoD to implementing management and conservation of migratory birds for non-readiness activities per EO 13186. The DoD/MBTA rule authorizes unintentional take of migratory birds during Military Readiness Activities. TNARNG will coordinate with USFWS if any measurable negative effects on migratory bird populations at VTS-S are identified, though none have been at this time.

An ecosystem management approach is used to provide for all species utilizing VTS-S and their habitats. Migratory bird species and habitat requirements are protected through these broader ecosystem management actions. Impacts to migratory birds are further avoided through REC reviews of all projects proposed. Several habitat management actions specifically intended to provide for migratory birds include surveying birds every five years to identify population changes early on, maintenance of wood duck boxes (se Section 3.8.1.1), and grassland mowing limitations. TNARNG avoids mowing open grasslands from April to September for protection of nesting birds. Areas where taller growth will not impede training are mowed in late March and allowed to grow until November. Where grasslands must be maintained low cut, 25-50 foot un-mowed buffer strips are left along forest edges, which are only mowed every 3-5 years. Ecosystem management based practices that benefit migratory birds include protecting wetlands, maintaining a 50 foot SMZ on both sides of all streams that protects both riparian zones and bottomland hardwood forest, IPP management, and minimizing the use of pesticides.

3.8.1.1 Wood Ducks

As a contribution to waterfowl habitat at VTS-S, a local eagle scout initiated a project building nesting boxes for wood ducks (*Aix sponsa*) and installing them along the shores of J. Percy Priest Lake. The wood duck is an uncommon-to-locally-common summer resident of Tennessee, preferring nesting sites in naturally-occurring hollows of dead or unhealthy trees found in wooded areas located alongside marshes, streams, and lakes (Robinson 1990). Wood ducks exhibit a high rate of return to the same breeding area each year and often choose the same nesting sites for many years in a row (Kirby 1990). Egg laying begins as early as March and can extend through much of June (Goetz and Sharp 1980).

Fourteen wood duck boxes were installed early in the summer of 2004, and eleven more were installed in 2006, in the early fall. Each winter (December to February), the boxes are cleaned and inventoried for suspected types of inhabitants, estimated number of hatched eggs from the previous year, if applicable, and for box condition. Repairs and replacements are performed, when necessary. Supporting this species of migratory waterfowl helps to increase the biodiversity of the entire training site.

The 2010 wood duck box inventory found 20 boxes in functional condition; 17 contained wood duck eggs or remnants indicating a total of 139 successful hatchings. Twenty un-hatched eggs were found. One box was inhabited by a roosting eastern screech owl which was left undisturbed, and two boxes contained squirrel nesting material which was removed.

3.8.2 Wildlife and Game Management

A comprehensive mammal survey conducted by the Conservation Management Institute in 2005 detected twenty mammalian species at VTS-S including, among others: white-tailed deer (*Odocoileus virginianus*), grey fox (*Urocyon cinereoargenteus),* prairie vole (*Microtus ochrogaster*), cottontail rabbit (*Sylvilagus floridanus*), and raccoon (*Procyon lotor*) (see complete list in Appendix F). Numerous waterfowl, wild turkey, and perennial songbirds also exist in the area.

Environmental Services Inc. conducted a herpetofauna and mammal survey in 2015. In addition to most of the mammals found in the 2005 mammal survey, Environmental Services Inc. found evidence of woodchuck (*Marmota monax*), southern flying squirrel (*Glaucomys volans*), and American beaver (*Castor canadensis*). The herpetofaunal component of the survey detected eleven species of frogs and toads, nine species of lizards and snakes, five species of turtles, and one species of salamander (Appendix F).

To date, no hunting has occurred at VTS-S due to the training site's relatively small size and proximity to heavily developed civilian areas; however, the USACE-managed Wildlife Management Areas bordering the training site are open to hunting during appropriate seasons.

J. Percy Priest Lake is routinely stocked by TWRA with numerous game fish species. The primary game fish found in the lake are multiple species of bass and catfish, white crappie, Asiatic carp, and bluegill (URS 2009). Fishing on VTS-S from the shores of J. Percy Priest Lake is open to TNARNG personnel and is allowed with permission from the Facility Manager or designated representative (Bldg. 609). A valid Tennessee fishing license is also required. Equipment is restricted to rod and reel or cane poles with lines (no trot lines, snag lines, or nets are allowed), and catch limits are as set forth by Tennessee State Law.

3.9 RARE, THREATENED, OR ENDANGERED SPECIES

3.9.1 Rare plant species at VTS-S

A survey for sensitive, threatened, or endangered plant species was performed by AMEC in 2006 during a vegetation community survey of VTS-S. Although no state or federally listed plant species were found during this survey, potentially suitable habitat may exist for at least some of the plants listed. The Tennessee Division of Natural Heritage (TNDNH) and the USFWS have identified four federally endangered plants, seven state endangered plants, eleven state threatened plants, and an additional seven state special concern plants found within a five mile radius of VTS-S (Table 3.6). These species predominantly occur in cedar glade and barrens habitats. Those portions of the VTS-S which might support such ecotypes have been greatly affected by both past land use history and the aggressive spread of several non-native exotic species, resulting in poor habitat quality. To date, none of these species has been found on the training site.

A survey for the Stones River bladderpod (*Lesquerella stonensis*), was conducted in the spring of 2008 (SpecPro). Stones River bladderpod was defined as a ***species at risk*** in a 2004 report prepared for the USFWS and DoD (NatureServe). While *species at risk* are not currently covered by the Endangered Species Act, they are considered to be critically imperiled. Taking a proactive management approach to such populations and to the habitats which support them could help to avoid federal listing and protect the species, while also ensuring that the installation's capacity for military training activities is not diminished. There are documented occurrences of Stones River bladderpod within 2 kilometers of VTS- S; however, the 2008 survey did not detect this species on the installation.

A formal Rare, Threatened, and Endangered (RTE) PLS was conducted by URS and subcontractors at VTS-S in 2012 (URS 2013). The plant species component of the survey delineated and surveyed plant communities with potential to harbor rare plant species on multiple occasions throughout the growing season (spring, summer, and fall), to ensure any rare plant species that could possibly be present would be detected and documented. No RTE plant species were identified during the survey. It is unlikely that any RTE species were overlooked due to the intensive nature of the survey, and no intact naturally occurring habitat that would harbor RTE species were found during the survey.

3.9.2 Rare animal species at VTS-S

According to a baseline survey of mammals, completed in 2005 (Conservation Management Institute), VTS-S is home to the meadow jumping mouse (*Zapus hudsonius*), an organism with Tennessee State status of "in need of management." TWRA defines "in need of management" as:

> Any species or subspecies of nongame wildlife which the executive director of the TWRA believes should be investigated in order to develop information relating to populations, distribution, habitat needs, limiting factors, and other biological and ecological data to determine management measures necessary for their continued ability to sustain themselves successfully. This category is analogous to "Special Concern."

A variety of habitats on VTS-S may support meadow jumping mice. They are known to prefer moist grasslands and other thickly vegetated areas bordering streams, ponds, or marshes. The individual captured during the 2005 survey was found approximately 200 meters from the shore of J. Percy Priest Lake in redcedar woodland habitat. A later 2012 RTE PLS specifically targeted, but failed to capture, the meadow jumping mouse (URS 2013).

Four bird species with Tennessee State status of "in need of management" were documented on VTS-S during an avian study completed in 2008 (AMEC): great egret (*Ardea alba*), sharp-shinned hawk (*Accipiter striatus*), cerulean warbler (*Dendroica cerulea*), and yellow-bellied sapsucker (*Sphyrapicus varius*). While the sharp-shinned hawk is considered "in need of management" statewide populations appear to be currently stable.

A 2008 AMEC bird survey identified 14 birds with Tennessee State designations of "vulnerable", "imperiled", or "critically imperiled": pied-billed grebe (*Podilymbus podiceps*), double-crested cormorant (*Phalacrocorax auritus*), black-crowned night heron (*Nycticorax nycticorax*), blue-winged teal (*Anas discors*), Cooper's hawk (*Accipiter cooperii*), osprey (*Pandion haliaetus*), northern bobwhite (*Colinus virginianus*), American coot (*Fulica americana*), sora (*Porzana carolina*), spotted sandpiper (*Actitis macularius*), brown creeper (*Certhia americana*), winter wren (*Troglodytes troglodytes*), golden-crowned kinglet (*Regulus satrapa*), hermit thrush (*Catharus guttatus*), magnolia warbler (*Dendroica magnolia*), prairie warbler (*Dendroica discolor*), and Canada warbler (*Wilsonia canadensis*). URS conducted a RTE PLS and general bird survey on VTS-S in 2012 but did not detect any RET bird species (URS 2013). State conservation status of all VTS-S avian species may be found in Appendix F.

Eco-Tech Consultants conducted bat mist-net surveys in 2012 to determine presence/absence of Indiana (*Myotis sodalis*) or gray (*Myotis grisescens*) bats, as a subcontractor to the URS RTE PLS. They failed to capture either species. The acoustic bat survey component of a baseline mammal PLS failed to detect any listed species as well (CMI 2005). Environmental Services Inc. used acoustic and mist-net methods to identify bat species at VTS-S in a 2013 survey (Environmental Services Inc. 2013). The acoustic survey detected the presence of big brown bats (*Eptesicus fuscus*), eastern red bats (*Lasiurus borealis*), hoary bats (*Lasiurus cinereus*), and tri-colored bats (*Perimyotis subflavus*). Possible calls of the evening bat (*Nycticeius humeralis*), little brown bat (*Myotis lucifugus*), and gray bat were detected, but not at high enough confidence levels to place them at the site. The mist-net component of the survey caught seven eastern red bats, two tri-colored bats, one evening bat, and one male gray bat. A 2017 bat planning level survey conducted by Apogee environmental consultants failed to capture any listed

species. Apogee 2017 did report possible detections of Indiana and tricolored bats, though not at levels significant enough to confidently place them at the site. To date, no surveys have captured or even possibly detected the threatened northern long-eared bat on VTS-S.

The gray bat (*Myotis grisescens*) is federally listed as an endangered species. Gray bats are known to roost in caves near Percy Priest Lake, and the captured gray bat is believed to have been foraging along the waterways in VTS-S. The closest known summer roost cave, which is also a maternity roost cave, is located approximately 4.5 miles from VTS-S. This colony is close enough that its members could forage on site during the summer. The next two closest known summer roost caves are approximately 13 and 23 miles from the training site. The closest known gray bat hibernacula is located approximately 60 miles from the installation. No caves suitable for gray bats were found on sight in a 2005 karst survey (DSL 2005) or a 2013 bat habitat survey conducted by Copperhead Consulting (ESI 2013). The habitat component of Apogee's 2017 survey failed to find any suitable karst features as well. The wooded areas on VTS-S are considered to be low quality bat habitat (ESI 2013, Apogee 2017). The single male gray bat was therefore believed to have simply been foraging while passing through VTS-S.

The gray bat is the only federally listed species known to occur on site. The tricolored bat is however known to occur on site and USFWS is currently evaluating a petition for its listing. The USFWS' 90-day finding indicated that the petition presented substantial information indicating that listing may be warranted. The Service is currently conducting a 12-month status review for the tricolored bat.

The Tennessee Division of Natural Heritage and USFWS (2004) have identified additional sensitive animal species documented within a 5-mile radius of VTS-S that may occur at the training site but which have not yet been found there (Table 3.6).

3.10 CULTURAL RESOURCES

3.10.1 Palaeoenvironment

The prevalence of northern pine, spruce, and deciduous tree pollen in pollen core samples taken from Anderson Pond in White County, Tennessee, indicates that cool, moist conditions dominated on the Eastern Highland Rim ca. 23,000 B.C. (Stanyard and Lane 1999). During the late Wisconsin glacial period (ca. 17,000 to 14,300 B.C), boreal taxa of jack pine, spruce, and fir were dominant. This forest began to be replaced by a spruce-fir-deciduous forest around 14,000 B.C., when jack pines became locally extinct. Cool-temperate mixed mesophytic forest taxa became most abundant during the early Holocene epoch (ca. 10,500 and 6,000 B.C.), which coincides with the earliest human occupation of the region.

The Altithermal (Hypsithermal) warming and drying period (also referred to as the "prairie maximum"), which occurred from ca. 6,000 to 3,000 B.C., is reflected by an influx of oak, ash, and hickory pollen and a diminishing amount of mixed mesophytic forest taxa. At this time, patches of prairie intermingled with climax-aged mixed deciduous forests, while the limestone cedar glades characteristic of the Central Basin expanded in response to increased warmth and more frequent summer droughts.

The mixed mesophytic forest achieved its present distribution in the period from ca. 4,000 to 2,000 B.C., following the Altithermal period and the onset of more moist conditions. Eventually, much of the prairie forest ecotone moved westward toward its present boundary and limestone cedar glades contracted, becoming islands within the mixed mesophytic forest.

3.10.2 Pre-European Populations

Little is known about the protohistoric populations of central Tennessee, as the sixteenth century Spanish expeditions by de Soto and Pardo seem to have been confined to the eastern portions of the state. English

traders who crossed the Blue Ridge Mountains in the 1670s encountered the Overhill Cherokee. Other major tribes that are known to have inhabited the state in the seventeenth century include the Chickasaw, Creek, Yuchi, and Shawnee.

Shawnee permanent settlements were reported in the Cumberland River Valley in 1681, but were repeatedly expelled by both the Cherokee and Chickasaw (Sims 1947; Clayton 1880). It is thought that there were few permanent Native American settlements in Middle Tennessee prior to European colonization, as the land was used as hunting grounds by several tribes in the region. According to *A History of Rutherford County*, "the Indians to the south [Cherokee and Chickasaw] would not allow the Shawnees to establish permanent settlements on their hunting ground, and even fought among themselves for hunting rights." (Sims 1947).

The Chickasaws, typically residents of Northern Mississippi, claimed western Tennessee for hunting territory, but did not permanently settle large portions of the state. The Overhill Cherokee settlements in the Appalachian region are believed to represent the only sizeable American Indian settlements in Tennessee from the early eighteenth century onward.

Table 3.6 Rare plant and animal species found at or in the vicinity of VTS-S

SCIENTIFIC NAME	COMMON NAME	HABITAT	Federal Status[1]	State Status[2]	Global Rank [3]
Allium stellatum	glade onion	glades	None	E	G5
Ammoselinum popei	Pope's sand parsley	glades	None	T	G4
Amsonia tabernaemontana var. gattingeri	limestone bluestar	glades, barrens, and rocky banks	None	S	G53TQ
Anemone caroliniana	Carolina anemone	cedar woodlands	None	E	G5
Arabis hirsuta	western hairy rockcress	glades and LS bluffs	None	T	G5
Arabis perstellata	Braun's rockcress	LS bluffs	E	E	G2
Astragalus bibullatus	Pyne's ground-plum	glades	E	E	G1
Astragalus tennesseensis	Tennessee milk-vetch	glades	None	S	G3
Dalea candida	white prairie clover	barrens	None	S	G5
Dalea foliosa	leafy prairie clover	rocky washes in glades	E	E	G2G3
Echinacea simulata	wavy-leaf purple clover	glades and barrens	None	T	G3
Echinacea tennesseensis	Tennessee coneflower	glades	None	S	G2
Evolvulus nuttallianus	prairie morning glory	glades	None	S	G5
Leavenworthia exigua var. exigua	glade-cress	glades	None	S	G4T3
Lesquerella densipila	Duck River bladderpod	cultivated fields	None	T	G3
Lesquerella stonensis	Stones River bladderpod	cultivated fields	None	E	G1
Mirabilis albida	pale umbrella-wort	glades	None	T	G5
Oenothera macrocarpa	Missouri primrose	cedar glades	None	T	G5
Panax quinquefolius	American ginseng	rich woods	None	S-CE	G3G4
Phlox bifida ssp. stellaria	glade cleft phlox	glades	None	T	G5?T3
Schoenolirion croceum	yellow sunnybell	wet areas in glades	None	T	G4
Silphium pinnatifidum	southern prairie-dock	barrens	None	T	G3Q
Stellaria fontinalis	water stichwort	LS creek beds	None	T	G3
Talinum calcaricum	limestone fame-flower	glades	None	S	G3
Zanthoxylum americanum	northern prickly-ash	cedar woodlands	None	T	G5
† *Accipiter striatus*	sharp-shinned hawk	open woodlands	None	D	G5
† *Ardea alba*	great egret	forested wetlands	None	D	G5
Chondestes grammacus	lark sparrow	grasslands, woodland edges	None	T	G5
† *Dendroica cerulea*	cerulean warbler	forested wetlands	None	D	G4
Etheostoma microlepidum	finescale darter	swift rivers and streams	None	D	G2G3
Gyrinophilus palleucus	Tennessee cave salamander	caves	None	T	G2G3
Myotis grisescens	gray bat	cave-like habitats	E	E	G3
† *Sphyrapicus varius*	yellow-bellied sapsucker	mixed forests	None	D	G5
Typhlichthys subterraneus	southern cavefish	caves	None	D	G4
† *Zapus hudsonius*	meadow jumping mouse	moist grasslands	None	D	G5

† Documented at VTS-S

[1] Federal status abbreviation codes:

E – Listed federally as an endangered species

PS – Partial Status (taxon which is listed in part of its range, but for which TN subspecies are not included in Federal designation.)

[2] State status abbreviation codes (Tennessee Department of Environment and Conservation):

(**E**) Endangered –in danger of becoming extinct in Tennessee because of (a) rarity throughout range, or (b) rarity in Tennessee

(**T**) Threatened –likely to become endangered in the immediately foreseeable future

(**S**) Species of concern, deemed in need of management (vascular and non-vascular plants)

(**S-CE**) Species of concern due to commercial exploitation

(**D**) Deemed in need of management (nongame animals)

[3] Global Rank: The Division of Natural Heritage estimate of abundance on a global scale. Ranking codes are:

G1- extremely rare and critically imperiled **G3**- very rare **G5**- very common

G2- very rare and imperiled **G4**- common

3.10.3 Historic Overview

European Contact, Colonization, and Early Statehood

By the time English explorers began arriving in the Tennessee River valley, the Cherokee tribe had emerged as the dominant culture and had established control of a large area that included eastern Tennessee, western

North Carolina, and northern Georgia (Stanyard et al. 1998). As a result of the American victory in the Revolutionary War (1775-1783), in which the Cherokee sided with the British, many of the Cherokee were driven to the southern portion of their claimed territory, into what is now northwest Georgia.

Shortly following the settlement of Nashville, some of the first permanent European settlements were established in the Rutherford County area. One of the first of these was the Stewart Creek community, which was founded in the mid-1790s and was located near the present day training site (Sims 1947; Weeks 1992). This area was likely chosen because of its location on Stewart Creek and its close proximity to the Stones River. Early land grants in the Rutherford County area were provided by North Carolina to early settlers between 1786 and 1797, several of whom settled in the vicinity of Stones River (Sims 1947). The farms and plantations of the area were established by these early pioneers, many of whom later figured prominently in the formation of Tennessee's governmental institutions and served as community leaders.

Elements of the Chickasaw, Shawnee, and Cherokee tribes frequented the Stewart Creek community on hunting and raiding trips, but there is no evidence of permanent villages in the Stewart Creek area during the colonial or territorial periods.

Davidson County (from which Rutherford County eventually emerged) was created by the North Carolina legislature in 1783 when Tennessee was a territorial extension of that state. The Stewart Creek area became part of Sumner County in 1786, then Wilson County, and finally Rutherford County (authorized by the legislature in 1803). The original county seat was located in the community of Jefferson, near present day Smyrna. In 1812, the county seat moved to a more central location that became incorporated as Murfreesboro in 1817 (Sims 1947).

Murfreesboro Pike and the Railroad

Commerce with Nashville shifted from Jefferson to Murfreesboro after the latter became the county seat of government. This move quickly led to the construction of a more direct Nashville to Murfreesboro route, then called Nashville Pike. The settlement of LaVergne, located two miles west of the VTS-S, preceded the establishment of Smyrna. Nashville Pike ran through the center of LaVergne and a mile south of Smyrna. This road is now called the Old Nashville Highway and parallels Murfreesboro Road, which was constructed in the early 1900s and is located approximately one mile northeast of the older road.

Built in 1847–1851, the Nashville and Chattanooga Railroad is one of the state's oldest railroads (Weeks 1992). This railroad served as an essential tool for the movement of vast numbers of men and tons of military supplies for both the Confederate and Union armies during the Civil War. The town of Smyrna was established along the railroad line to serve the commercial needs of plantations in the area.

One of the largest of these plantations, named Goochland, was located on some of the land now occupied by VTS-S. The only visible remnant of this plantation is the slave cemetery, preserved in the center of the cantonment area east of the guard gate. The plantation house and outbuildings were demolished by the Army in 1941, in preparation for the Smyrna Army Air Base (Weeks 1992).

Military History

During the U.S. Civil War, the movements of both Union and Confederate troops and their numerous minor skirmishes heavily impacted LaVergne, Smyrna, and Stewart Creek. LaVergne's location astride the Nashville Pike funneled thousands of troops and wagons through the area. Conflicts at LaVergne spilled over into Smyrna and up Stewart Creek to the plantations located there. The Jefferson Pike Bridge over Stewart Creek and the Nashville Pike Bridge were of considerable strategic importance for movement of men and supplies, and considerable efforts were made before, during, and after the Battle of Stones River in northwest Murfreesboro to keep the bridges from being destroyed. Union defense systems were constructed to protect the bridges and the railway from cavalry raids and to ensure speedy repairs to keep the supply lines open to the large supply depot in Nashville.

While the movement of armies and supplies continued through LaVergne and Smyrna throughout the four years of the war, the area was particularly impacted during the Stones River campaign, in northwest Murfreesboro (December and January 1862), and during the Battle of Nashville (November and December of 1864).

On December 22, 1941, in reaction to the bombing of Pearl Harbor, the United States War Department ordered construction of an air bombardment base near Nashville, Tennessee, the Smyrna Army Air Base. The selected site was established to train B-24 and B-17 pilots and crew. A crew of 6,000 men completed construction of the original 200 buildings and associated landing strips. The site, initially designated as a temporary facility, opened on July 1, 1942. After World War II, base activities were reduced and shortly afterward, in 1947, the base was deactivated until 1948 when it was reopened for use by the 314th Troop Carrier Wing. In 1950, the Smyrna Army Air Base was renamed Sewart Air Force Base (Sewart AFB), to honor Major Allen J. Sewart, Jr., who was killed during a Solomon Islands bombing mission in 1942 (Stanyard and Lane 1999).

Throughout the Korean Conflict (1950–1953), Sewart AFB supported the 314th Troop Carrier (C-119 planes); the 516th Carrier Group (H-19 helicopters, comprising the Air Force's only helicopter group); and the 513th Troop Carrier Group (C-123 Provider planes). In 1957, the base acquired the C-130 Hercules aircraft and retired its C-119 planes. The following year, the 513th Troop Carrier wing was deactivated and the 463rd wing transferred to Ardmore Air Force Base, Oklahoma. At that time, Sewart AFB was the only base in the U.S. that supported C-130 Hercules aircraft. In 1961, Sewart AFB was designated as a permanent installation and in July 1962, the United States Air Force Advanced Flying School was established under the 4442 Combat Crew Training Group.

Sewart AFB closed in 1970, at which time the site encompassed approximately 2,636 acres, including 635 units for family housing that are now privately owned. Prior to deactivation, it supported the 839th Air Division, the 64th Tactical Airlift Wing (which provided troop transport to Ft. Campbell, Kentucky), the 4442nd Combat Crew Training Wing (transferred to Dyess AFB, Texas), the 314th Combat Support Group (transferred to Blytheville, AK), and the 839th TAC Hospital (State of Tennessee Military Department 1999).

When the Sewart AFB closed, the USACE retained a portion of the former installation, including the Cantonment area, and the National Airport Authority retained the airfield. In 1970, the TNARNG obtained a license from the Nashville USACE to utilize 780.55 acres for education of troops and various field training purposes on a continual basis. The remaining 67.05 acres under license from the USACE are administered by the Mobile District. Another portion of the former Sewart AFB was transferred to the State of Tennessee for operation of the Tennessee Rehabilitation Center.

Portions of Sewart AFB, not licensed to the TNARNG, were either sold or transferred to various entities. The majority of the remaining area was the airfield, was transferred to the Metropolitan Nashville Airport Authority. The airfield has subsequently been transferred to Rutherford County and the Town of Smyrna and is currently operated by the Rutherford County/Smyrna Airport Authority (Town of Smyrna 2001).

The remaining portions have been sold and are now privately owned. The city of Smyrna previously had a license for a large parcel of land for sewage treatment purposes on TA2. The only residual signs of the treatment plant are access roads and a large, perennial pond (Figure 2.4). Several DoD-related landfills are believed to be on the site within what is now known as TA 3.

3.10.4 Native American Resources

The VTS-S is located on lands adjudicated to the Cherokee Nation. Chickasaw, Choctaw, Kaskinampo/Coushatta, and Shawnee may also have aboriginal ties to central Tennessee in the area now managed by the TNARNG at VTS-S (Riordan 1998).

- The federally-recognized Chickasaw Nation of Oklahoma is located in southern Oklahoma, with headquarters in Ada.
- Descendants of Choctaw Indians who avoided removal from Tennessee lands are federally recognized as the Jena Band of Choctaw in Louisiana and the Mississippi Band of Choctaw Indians in Mississippi. The Oklahoma Choctaw are federally recognized as the Choctaw Nation of Oklahoma.
- Federally recognized tribes of the Coushatta are the Alabama-Quassarte Tribal Town of the Creek Nation of Oklahoma, the Coushatta Tribe of Louisiana, and the Alabama-Coushatta Tribe of Texas.
- Today, the Shawnee are represented by two federally-recognized groups, the Absentee Shawnee in Oklahoma and the Eastern Shawnee in Missouri.

To date, no Native American sacred plant, animal, or mineral gathering localities are known from VTS-S; however, all archaeological sites identified during cultural resources surveys are potential Native American sacred sites. No human remains or funerary objects have been identified from VTS-S.

3.10.5 Cultural Resources Identified on VTS-S

The TNARNG is meeting Section 110 responsibilities to inventory and evaluate historic and cultural resources under its jurisdiction at VTS-S. Numerous cultural resources investigations have been conducted within the boundaries of the VTS-S. A Phase I cultural resources survey (Stanyard and Lane 1999), a Phase II archaeological survey (Barrett and Karpynec 2005), and a Historic Building Inventory (Cleveland et al. 2001) have been completed and historic property surveys are ongoing.

Six archaeological sites were discovered at VTS-S in 1978, during a reconnaissance-level shoreline survey for the USACE, Nashville District. The survey was conducted by Daniel S. Amick during the winter drawdown of J. Percy Priest Reservoir. A report of this investigation is not available; however, site descriptions were documented on official state forms and may be found in the archives of the Tennessee State Archaeology Division. All six sites examined (40RD52, 40RD53, 40RD54, 40RD55, 40RD56, and 40RD57) were prehistoric; however, their National Register of Historic Places (NRHP) eligibility status is unknown as they have yet to be formally investigated.

In 1999, Stanyard and Lane completed a Phase I archaeological survey of the VTS-S. Five previously

unreported archaeological sites and nine isolated finds of prehistoric cultural material were discovered during the study. Results of this study indicate that two of the sites (40RD233 and 40RD234) were determined to exhibit significant historical findings, and therefore are eligible for listing in the NRHP. The other three (40RD231, 40RD232, and40RD235) were considiered potentially eligible. All of the nine isolated finds were determined to be ineligible for the NRHP. During the Phase II archaeological survey (Barrett and Karpynec 2005), sites 40RD231, 40RD232, and 40RD235 were determined to lack historical significance warranting further investigation or future preservation and were deemed ineligible for listing in the NRHP.

In 2001, a historic building inventory was completed at the VTS-S (Cleveland et al.). Results included the identification of 48 individual buildings within the boundaries of the VTS-S, including 10 barracks, 17 administrative/training/shop facilities, 2 buildings originally utilized as a pastry kitchen/cafeteria, 3 recreation facilities, 8 utility/storage facilities, 4 warehouses, and four hangars. Of the 48 inventoried properties at the VTS-S, 29 were constructed for military activities related to World War II. Nineteen buildings were constructed for use by Stewart AFB during the 1950s and 1960s. None were recommended eligible for the NRHP. Twenty-seven of the properties qualify for dismissal under the DoD 1986 Programmatic Agreement governing World War II-era temporary buildings. Two of the properties, although of sufficient age, have been altered over time and do not display any historical or architectural significance. The remaining 19 properties are less than 50 years of age and do not exhibit “exceptional” significance in accordance with NRHP Criteria Consideration G. Moreover, nearly all of the 48 inventoried properties have been extensively altered and modified over the years, thereby diminishing and compromising their historic integrity.

CHAPTER 4
MANAGEMENT GOALS:
GOALS, OBJECTIVES AND TASKS FOR NATURAL RESOURCES MANAGEMENT

4.1 MILITARY MISSION GOALS AND OBJECTIVES

VTS-Smyrna exists to provide a location and facilities for the training of Tennessee National Guardsmen. Ensuring the availability of mission-critical training land for now and the future is the primary objective of the VTS-Smyrna natural resource management.

The following are military mission-related objectives that will be accomplished in cooperation with the natural resources management actions proposed in this INRMP:

- Clear training site boundary fenceline to meet security requirements
- Create a boundary trail, where feasible
- Reclaim old roadbeds in TA 2 for use by the Bradley training school
- Thin TA 2 overstory and create two small (1 acre) openings for platoon assembly areas
- Renovate berm and baffle ranges to accommodate new enhanced performance ammunition
- Investigate TA 3 cleanup funding options and potential changes in allowable use

4.2 NATURAL RESOURCES GOALS AND OBJECTIVES

The ultimate goal of the TNARNG natural resources program is to maintain healthy natural ecosystems while training soldiers to meet the mission requirements. Training programs and land management are both long-term, ever-changing processes, and the goals and objectives presented here are intended to guide TNARNG activities for the foreseeable future. The projects list is scheduled five to ten years out and will be updated annually as needed. Table 4.3 presents the list of projects given in the sections that follow, projected implementation years, and predicted costs.

4.2.1 Ecosystem Management and Maintenance of Biodiversity

In 1994, the Office of the Under Secretary of Defense for Environmental Security issued a memorandum to all forces in the Department of Defense (DoD) to implement Ecosystem Management on DoD lands. Ecosystem management blends multiple-use needs, provides a consistent framework to manage installations, and ensures that the integrity of the system of DoD lands remains intact. DoD Instruction 4715.03, "Environmental Conservation Program", implements policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources on property under DoD control.

Ecosystems are "explicit units of the earth that include all of the organisms, along with all components of the non-living environment within its boundaries" (Ecological Society of America 1996). The aim of "ecosystem management" is to manage the land for the health of the whole rather than for constituent pieces, such as game species, timber, or rare species. Maintaining the system as a functioning whole ensures the continuing ability of that system to meet future needs.

Ecosystem management is not easily planned or measured. Many functions of an ecosystem take place on scales far larger and longer than most human activity, and the boundaries of an ecosystem are not

easily defined. For the purposes of this INRMP, the property line of the training site will function as a permeable border around a series of interconnected systems (forest, grassland, riparian) which make up a whole, which is itself a part of a larger system. Management of the training site must focus on the training site, but must take into account the activities beyond the fenceline, as well.

The biological integrity of ecosystems found on VTS-S has been greatly affected by historical land uses, such as complete clearing of natural vegetation for settlement, agriculture, forestry, and military purposes; habitat fragmentation due to building roads, railroad, facilities for military training, and J. Percy Priest Lake; and disruption of historic wildfire cycles. None of the habitats currently found on the training site are regionally rare; the site has only a small area of soils suitable to the cedar glade/barrens ecotype. The extent of the shoreline along J. Percy Priest Lake and Stewart Creek does make the riparian habitat a significant community type. All of the ecosystems on the VTS-S will be managed to maintain or increase native biodiversity and to ensure that those systems continue to function fully. Long-term monitoring will be utilized to track the effectiveness of the ecosystem management and other tasks (see section 4.2.11).

Goal 1: Provide the ecosystem types needed for training.

Objective 1-1: Manage for mission-suitable habitats or "missionscape".

Targets:

- 1a) Identify natural resources characteristics needed for training activities on VTS-S through consultation with the Base Operations Supervisor for Training Site Command, Base Operations Supervisor, units, and trainers. Use this information to review and revise the missionscape statement annually.
- 1b) Determine appropriate acreage and locations for given mission habitats based on training needs and VTS-S characteristics. Review and revise the missionscape plan annually.
- 1c) Develop and implement management actions to create, improve, or expand mission habitats, as needed.

Goal 2: Maintain or improve ecosystem, habitat, and species diversity.

Objective 1-2: Identify ecotypes present on the training site and maintain up to date information regarding those systems.

Targets:

- 1d) Repeat vegetation community PLS survey every 10 years.
- 1e) Repeat wetland PLS survey using USACE formal delineation guidelines every 10 years.
- 1f) Repeat surface water quality assessment every 5 years.

Objective 1-3: Characterize the species composition, ecosystem health, and wildlife use of the significant habitats on VTS-S.

Targets:

- 1g) Repeat rare, threatened, and endangered species PLS every 5 years.
- 1h) Conduct a bat PLS every 5 years.
- 1i) Repeat avian PLS every 5 years.
- 1j) Conduct an insect PLS and repeat every 5 years.
- 1k) Repeat aquatic fauna survey, including macroinvertebrate and vertebrate organisms every 5 years.
- 1l) Repeat mammal PLS every 10 years.
- 1m) Repeat herpetofaunal PLS every 10 years.

Goal 3: Protect unique communities.

Objective 1-4: Develop management strategies to protect ecotypes/habitats of importance.

Targets:

- 1n) Identify and prioritize ecotypes of significance at regional and local scales. Create a map and priority list of extant ecosystems.
- 1o) Identify threats and training that could impact significant habitats in an ongoing process.
- 1p) Determine the necessity of significant habitats to training activities, and identify alternate areas for training where feasible. Collect threat and usage details.
- 1q) Develop a protection plan for significant habitats.

Objective 1-5: Manage for ecosystem health, wildlife, and improved habitat quality.

Targets:

- 1r) Eliminate invasive exotic species where feasible (see Section 4.2.10)
- 1s) Initiate conversion to native species to restore natural vegetation communities, especially in grassland areas, where there is no conflict with military training.
    - 1t) Identify locations for native species restoration.
    - 1u) Develop restoration plan.
    - 1v) Implement restoration plan as possible.
- 1w) Institute prescribed fire regime for grassland and forest management where appropriate, incorporating training site needs, nesting bird protection, and the historic fire regime (see Section 4.2.8).
- 1x) Implement measures of biodiversity at multiple scales to monitor habitat health (see Section 4.2.11).

4.2.2 Rare, Threatened, and Endangered Species (RTE) Management

A single male federally endangered gray bat (*Myotis grisescens*) was captured at VTS-S during a 2013 bat survey (ESI 2013). None were captured during a bat mist-net survey conducted the previous year (URS 2013) or detected by acoustic surveys during a 2005 mammal survey (CMI 2005). No suitable roost or hibernation caves, or other karst features were found during a 2005 karst survey (DSL 2005), or during the bat habitat evaluation of the 2013 or 2017 bat surveys (ESI 2013, Apogee 2017). The 2013 bat habitat survey determined bat foraging and commuting habitat on VTS-S to be moderate, with quality declining with distance from the lake shore. Gray bats are known to roost in caves along other portions of Percy Priest Lake. They are known to prefer feeding over open water and along forest openings and passages. It was therefore determined that the bat was simply foraging while passing through VTS-S. However, precautions are still taken to avoid inadvertently harming gray bats that are possibly utilizing the area for foraging and commuting. Deforestation of the watershed reduces their foraging habitat quality, as they mostly feed on flying insects, such as mayflies and beetles (NatureServe, 2017). Potential unanticipated impacts of tree removals are prevented by evaluating all proposed projects through REC process evaluations and coordination or consultation with USFWS when needed. Mayfly larvae are susceptible to aquatic pollution, turbidity, and siltation that human activity can cause (NatureServe, 2017). Siltation and water contamination is prevented by implementation of BMPs to all soil disturbing actions and 50 foot riparian buffers/SMZs along all lake shores, wetlands, and waterways on VTS-S.

No Indiana or northern long-eared bats have been captured or had confirmed detections on site. Bat monitoring will continue to be implemented every five years to detect any change in site use or activity levels. The USFWS Tennessee Field Office only considers presence/absence bat surveys good for two full field seasons. Therefore, the survey conducted in the 2017 field season will only be

considered valid through September 2019. Projects that could affect bats implemented on VTS-S after September 2019 will either require a new presence/absence survey for gray, Indiana, and northern long-eared bats, or presence will have to be assumed and formal consultation conducted.

Tricolored bats are known to occur on site, and were first detected acoustically on site by CMI in 2005. They were captured and detected by ESI in 2013, and possibly detected by Apogee in 2017. The tricolored bat is currently petitioned for listing. The USFWS' 90-day finding indicated that the petition presented substantial information indicating that listing may be warranted. The Service is currently conducting a 12-month status review for the tricolored bat. The same precautions already being implemented for ecosystem management and water quality protection that benefit the gray bat also benefit the tricolored bat. If proposed for listing, the tricolored bats requirements will be further evaluated and necessary actions updated in the INRMP.

To date, five rare species with State status have been documented at VTS-S, meadow jumping mouse (*Zapus hudsonius*), sharp-shinned hawk (*Accipiter striatus*), great egret (*Ardea alba*), cerulean warbler (*Dendroica cerulean*), and yellow-bellied sapsucker (*Sphyrapicus varius*). All of these species have Tennessee state status of 'species in need of management'. It is appropriate to further explore the extent of each population at VTS-S as well as their habitat requirements.

Such proactive planning is also the driver behind the DoD's 'species at risk' designation. Species at risk (SAR) are defined as plant and animal species that are not yet federally listed as threatened or endangered under ESA, but that are either designated as candidates for listing or are regarded by NatureServe as critically imperiled or imperiled throughout their range. Stones River bladderpod (*Lesquerella stonensis*) is the only SAR currently on the DoD list that is likely to be found at VTS-S; however, a survey completed in 2008 (SpecPro) and a RTE PLS conducted in 2012 (URS 2013) did not detect any populations of this plant on the training site.

Additional information will be added if other RTE species are identified on the training site, if the status of any existing RTE species should change, and/or if management protocols are developed for them.

Goal 1: Prevent accicental take of federally listed species and ensure ESA compliance.
Objective 1-1: Quantify and monitor populations of state and federal RTE species on VTS-S.

Targets:

- 2a) Conduct a comprehensive RTE PLS every 5 years.
- 2b) Develop or incorporate newly discovered or newly listed species into an Endangered Species Management Component (ESMC) as needed.
- 2c) Develop monitoring protocols for newly discovered RTE species as needed.
- 2d) Regularly communicate with TWRA and USFWS, including coordination or consultation on projects that could affect RTE species.

Goal 2: Monitor for federally listed bat species on VTS-S.
Objective 1-2: Monitor and characterize use of federally listed bat species on VTS-S.

Targets:

- 2e) Survey and characterize bat species use of VTS-S. Incorporate current USFWS Indiana bat monitoring guidance to ensure all endangered bat species requirements are met by the survey protocol.
- 2f) Develop or update ESMC to include listed bat species management as needed.

Goal 3: Maintain or enhance native plant communities that support listed species.
Objective 1-4: Identify and manage native plant communities currently or potentially supporting RTE species.

Targets:

- 2g) Develop community-based RTE habitat management plans as needed.
- 2h) Control invasive plants where impacting RTE habitats as needed.
- 2i) Monitor community health through long-term vegetation monitoring in conjunction with vegetation community PLSs.

4.2.3 Reclamation/Mitigation

Reclamation and mitigation are a part of the everyday management of the training site. Guidance for minimizing and/or controlling erosion is provided in Section 5.1.2 (Table 5.1) and Section 5.1.3 (Table 5.2). These best management practices are applicable to all soil-disturbing actions on VTS-S.

Major projects of reclamation and mitigation are included under the more specific environmental topic involved (e.g., erosion control, wildlife habitat, etc.). The primary one addressed in this INRMP is the reclamation of the former landfill in TA 3.

The land on which the former sewage treatment plant and the landfill are located (in TAs 2 and 3, respectively) is off limits to all military training at this time. While the sewage treatment pond is explicitly excluded from the USACE license agreement, the site of the former landfill is not. This area covers a significant portion of the training site and could be valuable for field maneuvers. The former landfill has been determined eligible for restoration and reclamation funding through the Defense Environment Restoration Program (DERP) as a Formerly used Defense Site (FUDS). This program is managed and directed by the USACE.

It is the understanding of the ENV Office that these areas in TAs 2 and 3are to be excluded from all natural resource management activities, including, but not limited to, environmental baseline studies and timber harvests. It is impossible to adequately manage natural resources on this portion of the training site without greater understanding of the site's condition or without a clear assertion of what activities are allowed. Further investigations should be performed to determine the feasibility of reclaiming this area for training purposes and/or the need to officially exclude this area from the TNARNG license and, therefore, TNARNG responsibility.

4.2.4 Erosion Control and Soil Conservation

Erosion control is an on-going issue at a facility where large wheeled and tracked vehicles are utilized on a regular basis. Erosion may lead to sedimentation of streams, damage to habitat, and surface irregularities that make training difficult or impossible. Erosion issues need to be identified and repaired as quickly as possible. Documentation of recurring problems will allow adjustment to training use to avoid such problem areas.

According to the 2005 DA Sustainable Range/Installations Environmental Activities Matrix, erosion control and repair is predominantly a facilities or range responsibility. The Environmental Office will provide survey and reporting support, technical guidance, and assistance with permits as required. Repair efforts will be funded in accordance with the matrix.

Goal 1: Prevent, identify, and minimize the development of erosion and sedimentation problems on VTS-S.

Objective 4-1: Prevent erosion issues from occurring.

Targets:

- 4a) Restrict vehicle traffic on highly erodible soils at water/s edge by maintaining 50 foot riparian buffer zones (SMZs) along all stream and lake shores.
- 4b) Post and maintain signs identifying SMZs.
- 4c) maintain all SMZs during all timber harvests and other clearing activities, retaining all trees that exist within the buffer zone.
- 4d) Monitor erosion at the boat ramp in TA 4 and repair as needed.
- 4e) Develop training for soldiers, commanders, and planners in BMPs, the importance of SMZs, and their applicability to TNARNG actions.
- 4f) Develop an "erosion guide" for VTS-S that identifies areas experiencing repeated erosion and gives guidance in appropriate repair and avoidance methodology.

Objective 4-2: Identify and minimize potential erosion problems early on.

Targets:

- 4g) Monitor for potential erosion issues during regular site visits.
- 4h) Develop a reporting form for TNARNG soldiers and training site personnel to report potential or existing erosion problems identified during other daily activities.
- 4i) Install reporting form on the Environmental webpage for easy access for all personnel.
- 4j) Develop a system for compiling erosion reports, prioritizing projects, and tracking project progress and budget through the ENV office.
- 4k) Establish regular surveys of training areas to identify and prioritize degraded or eroded areas requiring rehabilitation.

Goal 2: Identify and rehabilitate existing erosion problems.

Objective 4-3: Repair existing erosion issues.

Targets:

- 4l) Coordinate repair of erosion problems when identified. (Typically a Facility responsibility).
- 4m) Implement physical and mechanical erosion control methods as needed.
- 4n) Revegetate erosion sites as needed.

4.2.5 Watershed Management

The riparian ecosystem, consisting of mixed bottomland hardwood wetland forests, occurs on approximately 6 percent (50 acres) of the training site along the banks of Stewart Creek and J. Percy Priest Lake. Riparian areas serve as interfaces between aquatic and terrestrial ecosystems. These communities serve as valuable wildlife habitat and corridors, promote streambank stabilization, trap sediments and nutrients, filter runoff water, and help to moderate flooding. As J. Percy Priest Reservoir is also a major source of area drinking water, it is especially important to responsibly manage its boundaries within the training site in order to maintain good water quality.

Limited military training activities occur within the riparian areas at VTS-S. For much of the year, the natural water table makes the area too wet for vehicle or troop movement. Stream fording by vehicles and foot traffic is only allowed at designated sites as permitted by the USACE.

The TNARNG will maintain riparian habitats along waterways by implementing, at minimum, a 50 foot riparian buffer zone, also known as a streamside management zone (SMZ) on either side of Stewart Creek and along the shores of J. Percy Priest Lake. Vehicular traffic in the SMZ will be kept to a

minimum and authorization must be obtained from the USACE before conducting maintenance and construction activities (see Section 5.1.5 for additional guidance). Foot traffic through riparian areas is not regulated, but vehicles will be kept to established roads and trails. SMZs should remain continuous along the shores of Stewart Creek and J. Percy Priest Lake. Where wetlands are present, a 50 foot riparian buffer zone will be established and marked with Siebert stakes on all sides of the wetland.

The riparian habitat is variable in size. While the restricted-activity Streamside Management Zone is at least 50 feet on either side of the waterway, the actual riparian area typically extends much further beyond the streambank. All areas of bottomland hardwood forest should be considered to be within the riparian zone, and care should be taken to minimize impacts on water and habitat quality.

An area in the northeastern portion of Training Area 2 contains a series of karst features, some of which are open, potentially hazardous sinkholes (see Section 3.2). The nature of the area makes contamination of ground water a special concern as fissures and open sinkholes can serve as direct pathways to ground water supplies. These sinkholes are currently marked individually; however, due to their concentrated nature and varying degrees of hazard, this area will be marked off-limits to all vehicular traffic. While foot traffic will be permitted, reasonable caution is advised.

Riparian areas are particularly susceptible to invasion by exotic plant species. The Stewart Creek shoreline is heavily infested with privet (*Ligustrum* spp.) and Japanese honeysuckle (*Lonicera japonica*), while Nepalese browntop grass (*Microstegium vimineum*) carpets the lower understory throughout the training site's bottomland hardwood forests. These species drastically modify the habitat quality of the area and will require intensive efforts to control.

Goal 1: Improve understanding of ecosystem dynamics and stressors within watersheds.
Objective 5-1: Improve knowledge of existing riparian areas and their conditions.

Targets:

- 5a) Conduct vegetation community surveys and aquatic fauna surveys as noted in Section 4.2.1
- 5b) Survey streams as part of regular erosion surveys as noted in Section 4.2.4
- 5c) Develop and implement monitoring protocol for water resources to assess water quality across the training site and at in-flow and out-flow points.

Goal 2: Minimize nutrient, sediment, and non-point source pollution entering streams.
Objective 5-2: Improve buffering quality of the riparian areas.

Targets:

- 5d) Perform riparian habitat assessments to identify degraded riparian corridors and prioritize restoration efforts.
- 5e) Restore degraded buffers with appropriate native vegetation, as needed
- 5f) Repair erosion and sedimentation problems as identified, in accordance with Section 4.2.4
- 5g) Control invasive species in the riparian communities to allow native species to re-establish (see Section 4.2.10)
- 5h) Monitor riparian ecosystems to determine effects of management through long-term vegetation monitoring and repeat surveys (see Section 4.2.11).

Objective 5-3: Protect shoreline of Stewart Creek, J. Percy Priest Lake, and all riparian areas from potential causes of erosion.

Targets:

- 5i) Restrict all vehicular traffic, especially of large vehicles and machinery, along highly erodible soils at water's edge by maintaining, at minimum, a 50 foot riparian buffer zone (SMZ).
- 5j) Post and maintain signs/Seibert stakes identifying SMZs biennially.

- 5k) Maintain SMZs during all timber harvests and other clearing activities, retaining all trees that exist within the buffer zone.
- 5l) Educate troops, management staff, and others on the importance of SMZs, the limitations to their use, and regulatory and permitting issues involved in riparian area activities.

4.2.6 Wetlands Protection

VTS-S has approximately 13.2 acres of wetland ecosystem, the majority of which are located on the eastern shore of J. Percy Priest Lake in Training Area 2 (URS 2010). This ecotype is of importance for its chemical and sediment filtration functions as well as providing habitat for many species. These sites at VTS-S have not all been formally classified as jurisdictional wetlands as defined under Section 404 of the Clean Water Act (CWA) (see Section 3.6); however, considering their immediate proximity to J. Percy Priest Lake, a municipal water source, the wetlands at VTS-S will be treated as jurisdictional for the purposes of this INRMP. The wetlands' inland boundaries are, in all cases, either bottomland forests, regularly inundated with water, or adjacent to abrupt, rocky woodland borders, both of which habitats are unsuitable for most training exercises.

Goal 1: Manage for healthy resilient wetlands with no net loss of acreage, function, or values.
Objective 6-1: Improve knowledge of existing wetlands and their conditions.

Targets:

- 6a) Wetland surveys as noted in Section 4.2.1.
- 6b) Conduct a floristic study of wetland habitats. Significant flora will be subject to appropriate monitoring.
- 6c) Conduct a faunal study of wetland habitats. Significant fauna will be subject to appropriate monitoring.

Objective 6-2: Implement and enforce effective buffers around wetlands areas.

Targets:

- 6d) Post signs identifying 50' wetland buffers.
- 6e) Identify areas surrounding wetlands that require a vegetative buffer or filterstrip (or repair thereof) for protection.
- 6f) Educate troops, management staff, and others on the importance of wetland buffers, the limitations to their use, and regulatory and permitting issues involved in wetland area activities.
- 6g) Visually monitor wetlands annually to ensure compliance with wetland buffers.

4.2.7 Forest Management

Approximately 43 percent (373 acres) of VTS-S is covered by forest habitat composed of redcedar woodlands, a mixture of upland hardwoods and evergreens, and bottomland hardwoods. The desired future condition of the forest at VTS-S is a range of forest types and ages, approximating natural habitat conditions and provided needed training opportunities. Timber production is not a primary goal of forest management on VTS-S, but timber harvest may be an appropriate method to achieve training needs, native species restoration, and/or forest health goals.

While the current health of the forests on VTS-S is generally good, some areas of the training site (the redcedar stands in TA 2, especially) are too dense for effective training use and need to be thinned. Other areas need selective thinning in order to maintain forest health and enhance the quality of wildlife habitat.
The Forest Management Plan (FMP) for the VTS-S is found in Annex 1 to this INRMP.

Goal 1: Provide optimum forestland training opportunities for TNARNG.
Objective 7-1: Improve training areas by selected timber harvesting techniques.
Targets:

- 7a) Consult with training site staff annually to determine needs of TNARNG for forestland training operations at VTS-S, and identify areas requiring alterations to the forest stands for training purposes.
- 7b) Identify appropriate management practices to create desired training conditions, as needed.
- 7c) Implement timber management to support training, as needed. Program projects through STEP or RPTS as appropriate

Goal 2: Manage for forest health, and habitats of RTE, wildlife, and native plant species and communities.
Objective 7-2: Maintain forest inventory and other information needed for forest management.
Targets:

- 7d) Repeat forest inventory every 10 years.
- 7e) Conduct planning levels surveys as noted in Section 4.2.1

Objective 7-3: Improve forest health and habitat quality across the training site.
Targets:

- 7f) Identify stands requiring improvement through forest inventory, planning level surveys, and general observation.
- 7g) Perform timber stand improvement activities IAW Annex 1.
- 7h) Conduct prescribed burning, where appropriate, to improve forest health and wildlife habitat, IAW Annex 3 (see Section 4.2.8).
- 7i) Control invasive exotic species within the forest ecosystem IAW Annex 3 (see Section 4.2.10).
- 7j) Maintain appropriate stand conditions along and around waterways with streamside management zones and best management practices.
- 7k) Monitor changes to biodiversity and species composition through long-term vegetation monitoring, repeat surveys, and regular timber inventory (see Section 4.2.11).

4.2.8 Fire Management

Catastrophic wildfire is not a common threat in Middle Tennessee, but must be planned for. Prior to modern development, the natural ecosystems found at the current site of VTS-S depended on infrequent, low-intensity fires to maintain open forest understories and to prevent such dense, shrubby growth as is found in the redcedar stands in TA 2. Prescribed fire will be a useful forest management tool, decreasing the risk of unplanned wildfire by reducing excess fuels as well as improving the land for military training maneuvers. Use of prescribed fire will help to maintain grassland areas and may also be used to effectively manage certain pest plant species. The existing road network at VTS-S provides the basis for a firebreak system; however, creation of additional breaks will be necessary, taking special precautions around the training site's boundaries adjacent to developed areas. The Wildland Fire Management Plan for VTS-S is found in Annex 2 of this INRMP.

Goal 1: Control and minimize threats to property and personnel associated with wild and prescribed fire.
Objective 8-1: Ensure sufficient firebreaks for protection of VTS-S resources and to prevent fire escape from the training site.

Targets:

- 8a) Identify any additional firebreaks needed.
- 8b) Create firebreaks where needed, with consideration for erosion potential and the 508 line. VTS staff responsibility.
- 8c) Maintain firebreaks as needed. VTS staff responsibility.

Goal 2: Utilize prescribed fire as appropriate to maintain training area conditions and native ecosystems.
Objective 8-2: Perform prescribed burning as appropriate for training and ecosystem management needs, IAW Annex 3.

Targets:

- 8d) Obtain required training for authorized TNARNG personnel for prescribed burning and wildland fire fighting.
- 8e) Obtain equipment required for prescribed burning, as needed.
- 8f) Coordinate with the TN Division of Forestry or other organizations to provide a trained prescribed fire burn boss and implement burns, as needed.
- 8g) Conduct post-burn evaluations to monitor efficacy of prescribed fire program.
- 8h) Review and update Wildland Fire Management Plan annually, and revise every 5 years.

4.2.9 Fish and Wildlife Management

Currently, there are no specific fish and wildlife management activities conducted at VTS-S. Ecosystem management focuses on maintaining or improving the system as a whole; therefore, TNARNG policy is to manage animal species through maintenance and/or manipulation of their habitat. Appropriate treatment of the forest, grassland, and riparian ecosystems should benefit the species that utilize those habitats. However, further information about the species that are utilizing the training site will allow further enhancement of this plan for the benefit of wildlife species.

There is no hunting at VTS-S due to concerns of installation security and for the safety of the public and the soldiers. Fishing on VTS-S from the shores of J. Percy Priest Lake is open to TNARNG personnel and is allowed with permission from the Facility Manager or designated representative (Bldg. 609). A valid Tennessee fishing license is also required.

Goal 1: Maintain healthy fish and wildlife populations through maintenance of healthy vegetative communities, habitats, and ecosystems.
Objective 9-1: Maintain complete and up-to-date fish, wildlife, and vegetation community data for VTS-S.

Target:

- 9a) Perform PLSs for species groups as outlined in Section 4.2.1.

Objective 9-2: Manage habitats for all native species

Targets:

- 9b) Protect and maintain native species vegetative buffers around water sources, in accordance with SMZ protocols (See Section 4.2.5).
- 9c) Install and maintain nest boxes for appropriate bird species, when feasible.
- 9d) Convert grassland areas to native plant species where feasible. See Section 4.2.1.

- 9e) Monitor vegetation community condition through PLS. See Section 4.2.1.
- 9f) Implement vegetative community/habitat management actions as needed.
- 9g) Educate troops, management staff, and others on protection of wildlife species and habitats.

Objective 9-3: Manage animal pests to protect training land availability, ecosystem health, and RTE species.

Targets:

- 9h) Conduct population counts for deer, beaver, feral hog or other species as needed.
- 9i) Consult with the TWRA about the carrying capacity of pest animals on VTS-S and determine when population control is needed.
- 9j) Implement population control when needed through coordination with appropriate agencies.

4.2.10 Pest Management

Pest Management at VTS-S is directed by the TNARNG Integrated Pest Management Plan (IPMP). Integrated pest management is "a comprehensive approach to pest control or prevention that considers various chemical, physical, and biological suppression techniques; the habitat of the pest; and the interrelationship between pest populations and the ecosystem" (Armed Forces Pest Management Board 1987).

According to DoD regulations and TNARNG policy, only DoD or State Certified Pesticide Applicators may apply any (restricted or general use) pesticide or herbicide to VTS-S property. The only exception to this rule is occasional small application of ready-made general use pesticides applied on a "self-help" basis. At this time, all chemical pest control on the VTS-S is provided by a contracted pest control company, or state certified TNARNG applicators. All chemical pesticide applications must be reported to the TNARNG Integrated Pest Management Coordinator (see Appendix I for forms).

The primary natural resources aspect of pest management is the control of invasive species. Nonnative species have the potential to degrade training land at VTS-S and impact the usability of the land for training purposes. A variety of invasive pest plants are of concern at VTS-S: common privet, Japanese honeysuckle, multiflora rose, autumn olive, and thorny olive are the most prevalent. These plants can out-compete native plant species, change water and nutrient cycling, and drastically change the ecosystems in which they occur. The invasive species management plan for VTS-S is included in Annex 3.

Goal 1: Ensure pest management on VTS-S accomplishes the intent and requirements of the TNARNG IPMP.

Objective 10-1: Implement the TNARNG IPMP

Targets:

- 10a) Accomplish required pesticide application reporting quarterly and annually.
- 10b) Review program to ensure legal compliance annually.
- 10c) Review program to evaluate proper IPMP procedures are followed annually.

Goal 2: Control animal and plant pests as needed to achieve training and environmental objectives.

Objective 10-2: Control IPP species (IAW Executive Order 13112) to protect the natural ecosystems of the training site.

Targets:

- 10d) Repeat survey to identify and map IPP infestations every 5 years.
- 10e) Implement appropriate pest plant controls IAW Annex 3.

- 10f) Monitor change in IPP infestations through long-term vegetation monitoring and repeat surveys (See 4.2.11).

Objective 10-3: Control invasive species for improvement of training areas.

Targets:

- 10g) Identify problem plant species that may interfere with training activities and develop control plans.
- 10h) Implement appropriate controls to eliminate problem plants from training areas. VTS responsibility.
- 10i) Monitor change through long-term vegetation monitoring and repeat surveys (See 4.2.11).

Objective 10-4: Control pest species for safety and comfort of training site users.

Targets:

- 10j) Install, as feasible, and maintain bat boxes and bird nest boxes for biological control of mosquitoes around buildings and bivouac sites.
- 10k) Regularly monitor training site for presence of imported red fire ant infestations.
- 10l) Control pest animal populations as needed. VTS responsibility.

Objective 10-5: Control pest animals for the protection of natural communities and RTE species, and to minimize loss of training land.

Targets:

- 10m) Gather information about game and other species populations on the training site and in the region.
- 10n) Consult with TWRA about species carrying capacities of the training site and whether population control is needed when necessary.

4.2.11 Long-term Vegetation Monitoring

The goal of long-term monitoring is to track changes to the land resulting from training activities or other forces. In the fall of 2002, the Environmental Office established vegetation monitoring plots at three TNARNG training sites (Catoosa, Milan, and Tullahoma) following the original Land Condition Trend Analysis (LCTA) line-transect point quadrat methodology; however, plots were not established at VTS-S at that time as it was determined that the spatial design used for LCTA would not be useful at VTS-S due to the training site's small size.

A comprehensive, scientifically valid monitoring program should be developed for the VTS-S. Data collected through a vegetation monitoring program will be used to track impacts of various management activities on overall habitat health on the training site, especially in riparian systems, forest stands, and rare species habitat.

Goal 1: Use analyses of data collected through long-term vegetation plots to monitor effects of training and land management activities on VTS-S.

Objective 11-1: Develop and implement a vegetation monitoring program.

Targets:

- 11a) Develop vegetation monitoring protocols for VTS-S.
- 11b) Establish permanent vegetation monitoring plots.
- 11c) Resample monitoring plots as appropriate IAW monitoring protocol.

4.2.12 Grounds Maintenance

Environmentally and economically beneficial landscaping practices can reduce maintenance costs while also providing wildlife habitat. Planting windbreaks around buildings, establishing forest, prairie, or wildflower areas, and reducing mowing are all ways to spend dwindling maintenance dollars more wisely, educate the public about the benefits of reduced maintenance, and become better stewards of the environment.

Goal 1: Apply environmentally beneficial grounds maintenance techniques to maintain an attractive and functional landscape that meets training and other TNARNG needs.

Objective 12-1: Utilize regionally native plant species for all landscaping and restoration efforts if feasible.

Targets:

- 12a) Use native grasses to seed exposed soils except where the native warm season grass growth habit is incompatible with use (e.g., firing ranges).
- 12b) Use native shrubs, trees, and wildflowers for aesthetic plantings.
- 12c) Create a list of non-native plants to avoid and a list of native alternatives and their planting requirements for landscaping purposes.

Objective 12-2: Identify areas where the "edge" between maintained and natural can be blurred and adjust grounds maintenance activities to produce a less sharp division.

Targets:

- 12d) Survey the training site for transitional areas between natural and maintained landscapes that need improvement.
- 12e) Develop and implement a program to create more graduated edges in transitional areas requiring improvement. Ensure that changes to the vegetation structure will not affect training or safety.

Objective 12-3: Adjust maintenance schedules for protection of specific environmental values (e.g., breeding seasons of native birds).

Targets:

- 12f) Create list of values that may be impacted by grounds maintenance, determine appropriate scheduling, and process for their protection.
- 12g) Modify the ground maintenance calendar in the INRMP to reflect these protection efforts.

4.2.13 Recreational Use Management

At VTS-S outdoor recreation is limited due to the primary mission of the training site and the danger is presents to public safety. Public access is restricted because of hazards related to on-going construction projects as well as to training activities: small arms firing, convoy movement, training residue (e.g., fox holes and concertina wire), and training mechanisms (e.g., moving targets). All of these are potential hazards to outdoor recreationists on foot or in a vehicle. For this reason, public access to the training site land by road is controlled by secured gates.

Waters surrounding VTS-S, including J. Percy Priest Lake and Stewart Creek, are readily accessible by watercraft and are used for fishing, swimming, boating, and other aquatic activities. It is imperative that signs identifying VTS-S shores as restricted are clearly visible from the water and well maintained, for reasons of security, safety, and liability.

Any person entering the training site for any purpose prohibited by law or lawful regulation is

trespassing. Criminal trespass is a Class C misdemeanor under Tennessee Code 39-14-405 and may be aggravated criminal trespass under TCA 39-14-406 (Class B misdemeanor) if the person knows they do not have the property owners' effective consent to do so and they intend, know, or are reckless about whether their presence will cause fear for the safety of another. Trespass may endanger the life of the person entering the training site as well as potentially endanger the lives of Tennessee Army National Guardsmen and/or interfere with training. Tennessee Recreation Use Statutes (Liability of Land Owner to Person Using Land) are found in TCA 70-7-101 to 104.

Goal 1: Take precautions to minimize conflicts with nearby recreational use so that it does not interfere with training or result in hazardous situations for the public or TNARNG personnel.
Objective 13-1: Identify and make known the legal public access restrictions on VTS-S.

Targets:

- 13a) Identify locations on VTS-S at which access limitations may be unclear or unstated, especially along the facility's shorelines.
- 13b) Post and maintain regulations and signs to inform public of site access limitations as needed. VTS facility responsibility.

4.2.14 Environmental Hazards

It is of paramount importance to the TNARNG to ensure to the fullest extent possible the safety of all persons that access the VTS-S. This includes site personnel, soldiers, and other users of the facility, as well as members of the public that may approach the training site via Stewart Creek or J. Percy Priest Lake whether on purpose or by accident.

In addition to training-related hazards discussed in Section 4.2.13, the presence of a series of sinkholes in TA 2 (see Section 3.5.2), some with vertical openings at ground level, may pose a risk to those entering that portion of the site. The potential exists for those passing through that portion of the site to incur serious injury.

After a survey of karst features, conducted in 2005 (Dynamic Solutions), individual sinkholes were identified. Due to the linear nature of these karst features and the potential for new surface openings to form, this area in the northeastern portion of TA 2 has been declared off limits for all vehicular traffic. There are no restrictions to foot traffic; however, permanent signs should be installed so that the potential dangers are more apparent to those accessing this area.

Goal 1: Identify environmental hazards and minimize their risk to TNARNG staff and soldiers.
Objective 14-1: Identify and post naturally-occurring features that present hazards on VTS-S

Targets:

- 14a) Conduct a karst feature survey every 10 years to track changes in the landscape.
- 14b) Post and maintain regulations and signs that delineate boundaries and use restrictions of areas with concentrated karst features. VTS facility responsibility

4.2.15 Cultural Resources Management

TNARNG has an approved Integrated Cultural Resources Management (ICRMP) for the VTS-S (contained within the ICRMP for the properties within Tennessee) and has conducted three consultations with 20 American Indian tribes with an interest in TNARNG properties. The ICRMP addresses cultural resources management in more detail and provides procedures to consider the effects that natural resources activities might have on cultural resources.

Natural resources management activities proposed in the INRMP that may require Section 106, Section 110, or tribal consultation include ground-disturbing activities associated with land rehabilitation and maintenance (erosion control and rehabilitation of eroded areas or trails) and forest management (timber harvests, tree planting). Some military training activities, e.g., engineering training and other ground-disturbing activities, are considering "undertakings" that must be conducted in accordance with the ICRMP. Each activity conducted in accordance with the INRMP must be coordinated through the Environmental Office's Cultural Resources Manager and the ICRMP to ensure that they will comply with all applicable federal and state cultural resources requirements.
Both of the NRHP eligible sites at VTS-S should be avoided when planning and implementing any ground disturbing activities in the immediate area. The cemetery (40RD233) should be accurately delineated by systematic probing before any such activity occurs with 200 meters of the perimeter, as it is currently defined. A secure fence should be placed around the cemetery after it has been thoroughly delineated.

The other NRHP eligible site (40RD234) is a military earthwork that was likely constructed during the Civil War. It may have been constructed during the Stone's River campaign, which played a significant role in military history. A secure fence should be placed around 40RD234 in order to protect it from deliberate or inadvertent damage. The prominent earthworks can be used to define the site's perimeter.

Goal 1: Conduct all natural resources management actions on VTS-S in compliance with the goals, objectives, and policies of the ICRMP, and applicable laws and regulations.
Objective 15-1: Adhere to guidelines presented in the TNARNG Integrated Cultural Resources Management Plan for VTS-S.

Objective 15-2: Ensure that potential cultural resources sites are identified and are avoided during all natural resources management activities.

Objective 15-3: Ensure that sites of prehistoric or historic significance which are encountered during natural resources management activities are properly reported, protected, and evaluated as required by state and federal regulations.

Objective 15-4: Protect cemeteries on the VTS-S in accordance with the license.

4.2.16 Geographic Information Systems (GIS)

TNARNG Environmental has an extensive GIS database. It incorporates relatively complete training site information including all required SDS/FIE feature classes as required by National Guard Bureau. TNARNG GIS Branch meets or exceeds the CIP data calls required by NGB.

Goal 1: Maintain, update, and expand the GIS database to make accurate data available for training and management planning.
Objective 16-1: Maintain a constantly improving GIS.
Targets:
- 16a) Identify the data layers captured and those still needed.
- 16b) Update older data layers and create new layers, as needed, or as information becomes available.
- 16c) Make data available for use through interactive web applications.

- 16d) Develop appropriate wording to be included in all Conservation contracts to ensure data is collected and presented in the correct format for the TNARNG GIS database.

4.2.17 Environmental Management Systems (EMS)

The TNARNG Environmental office is in the process of developing an ISO 14001 Program. When completed, the environmental management system (EMS) and International Standard Organization (ISO) 14001 standard will:

- establish a mission-focused EMS within their purview;
- comply with Executive Order (EO) 13148, 'Greening the Government';
- conform to ISO 14001 per Department of Army (DA) and Army National Guard (ARNG) policy; and
- provide National Guard Bureau (NGB) with information regarding specific requirements for implementation.

EMS implementation will encompass the entire TNARNG installation, including VTS-S. The EMS implementation requirements apply to all installation missions, facilities, tenants, contractors, and activities. The surrounding communities, regulators, and other interested parties will be notified of the installation's EMS efforts and encouraged to become participants in and/or contributors to the process.

4.2.18 Climate Change

Climate change is well established in the scientific literature and has the potential to effect the military mission and natural resources in a variety of ways. Predictions of its effects vary, but rising sea levels, shifts in normal weather patterns, and increased frequency of extreme weather events support its occurrence. In response, the President of the United States issued Executive Order (EO) 13653 "Preparing the U.S. For the Impacts of Climate Change" (2013) ordering all federal agencies to consider climate change in their future planning. The DoD responded to the EO with the 2014 Climate Change Adaptation Roadmap, which guides all DoD components to deal with climate change through adaptation to occurring and predicted changes, and through mitigation by reducing the military's greenhouse gas emissions. Executive Order 13693 "Planning for Federal Sustainability in the Next Decade" (2015) instructs federal agencies to prepare to be sustainable through various approaches that DoD components can implement.

All planning for climate change response on VTS-S must begin with consideration of the predicted changes. The 2014 National Climate Assessment predicts the following climate changes in the southeast United States (Chapter 17, 2014). The three major issues expected in the southeast are increased temperatures, reduced precipitation, and continued ocean rise. The Smyrna, Tennessee area is expected to see increasing temperatures, with short term fluctuations due to natural variability. Average annual temperatures are expected to increases 4-8^{o}F by the end of the century, depending on the extent to which greenhouse gas emissions are reduced. It is expected that the number of days >95^{o}F will increase 20-30 days per year, the number of nights >75^{o}F will increase as well. The number of nights <32^{o}F are expected to decrease by 12-20 days per year on average. There is expected to be an increase in the frequency of extreme heat events.

Precipitation predictions are less certain than temperature predictions, but in general, there is expected to be a 2.5-5.0% decline in precipitation. The precipitation is expected to come in fewer, more extreme, rain events. There are expected to be fewer hurricanes with an increased percentage of them being of high intensity (category 4 & 5). The reduction in rain events and increased rapid runoff through flood events

will likely reduce infiltration and aquifer recharge. While VTS-S is far from the ocean, rising salt water will likely compromise aquifers along the coast, forcing coastal populations to get fresh water from aquifers farther inland.

The increased temperatures with longer periods between more extreme rain events will likely lead to more droughty conditions broken up by increased flood events and intensity. Increased hot droughty periods will likely lead to increased fire occurrence and more extreme fire behavior. Increased fire, heat, and reduced water may effect forest and plant community composition. These conditions could further lead to increased issues with invasive pest plants. Increased temperatures may lead to increased populations of insect and pathogens effecting both humans, animal and plant communities. Erosion and resulting siltation will likely become more of an issue with increased flood events. Shorter wet periods and increased flooding/rapid runoff events will likely reduce water infiltration and aquifer recharge. Increased siltation and surface water temperatures could alter aquatic community health and species composition. Increased surface water temperatures could lead to increased algal blooms and disease causing agents, creating human health issues. Reduced water availability may threaten wetland condition and reduce acreage.

More research will be required to better predict the coming changes and prepare for them. The complexity of this issue and its potential outcomes will require careful development and implementation of a VTS-S plan over the next several years. Likely actions will include continued protection of riparian areas to shade surface waters and reduce erosion; gradual introduction of more drought resistant native plants with deep root systems to resist erosion and establish a large seed bank for response to the changing conditions; continued vegetation monitoring to track changes in plant communities and predict/respond to change; improve water use efficiency; initiate water recapture; and etc.

Goal 1: Develop and implement a climate change response plan.
Objective 18-1: Conduct necessary research to predict likely local influences of climate change.
Target:
- 18a) Review climate change predictions.

Objective 18-2: Develop and implement a climate change response plan
Targets:
- 18b) Determine which changes TNARNG can practically affect through management actions.
- 18c) Identify functional approaches to manage for each aspect of change.
- 18d) Develop a climate change management plan to protect and manage natural resources.
- 18e) Implement the climate change management plan.

4.2.19 Pollinator Management

Pollinators are critical to the U.S. crop/food production, plant reproduction, and ecosystem health. Pollinator populations have declined precipitously over the previous decades due to loss of natural forage and other habitat factors, introduced mites and diseases, reduced genetic diversity, and exposure to pesticides. The President of the United States issued a Presidential Memorandum “Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators” (2014) in response to these substantial threats to U.S. food production and ecosystems. The Under Secretary of Defense then issued a memorandum “DoD Policy to Use Pollinator-Friendly Management Prescriptions” in response to the presidential memorandum. The Under Secretary’s memorandum “expands DoD policy to use current best management practices, as appropriate, specifically to protect pollinators (e.g. bees, birds, bats, butterflies, moths) and their habitats, and establishes policy to coordinate with partners on pollinator issues”. A later MOU between DoD and the Pollinator Partnership affirms DoD’s responsibilities and commitment to

support and undertake activities to conserve, protect and restore pollinators and their habitats as practicable on their lands within DoD mission and policies, and within federal laws and regulations.

Little is known about the pollinators using VTS-S at this time. More research and study is needed to determine which pollinators currently use the site, the current pollinator habitat conditions, and best approaches to benefit and conserve pollinators. This research will be conducted over the next several years. Appropriate management practices that work in conjunction with mission needs and constraints will then be identified and incorporated into a pollinator management plan.

Goal 1: Determine pollinator use and habitat condition on site.
Objective 19-1: Conduct necessary research to identify pollinators using the site, and the condition of their habitat.

Targets:

- 19a) Conduct a comprehensive survey of terrestrial macroinvertebrates.
- 19b) Survey pollinator habitat conditions on site.

Goal 2: Develop and implement a pollinator management plan.
Objective 19-2: Develop and implement a pollinator management plan.

Targets:

- 19c) Identify specific issues with pollinator species composition and habitat conditions.
- 19d) Identify appropriate and practicable management approaches to address identified issues.
- 19e) Develop and implement a pollinator management plan.

4.3 SUSTAINABLE RANGE PROGRAM (SRP)

The Sustainable Range Program (SRP) was conceived and implemented to improve the way the Army designs, manages, and uses ranges to ensure that current and future doctrinal requirements are met. As defined in AR 350-19, The Army Sustainable Range Program, the goal of the SRP is to maximize the capability, availability, and accessibility of ranges and training land to support training and testing requirements. The military mission is supported by the SRP through the integration of facilities management, environmental management, munitions management, and safety management to efficiently manage and maximize the capability, availability, and accessibility of ranges and training land to support training and testing requirements (Department of Army 2005).

The SRP gives attention to the increasing problem of encroachment on areas surrounding military installations. Encroachment has the potential to affect the accessibility and capability of the Army and the way the military trains. Because Army installations are located in regions that are increasingly urban and agricultural, the relatively natural landscapes found on these installations become islands of biodiversity.

There are eight overall objectives/core areas for the SRP that are designed to ensure the availability and accessibility of army training land (Department of Army 2005). These are:

1. Range Facilities
2. Range Operations
3. Range Maintenance
4. Encroachment
5. Environmental Responsibilities
6. Outreach
7. Integrated Management

8. Professional Development

The SRP program is the responsibility of the Training Site Commander. This program is closely tied to natural resources management and should be conducted in accordance with the standards put forward in this INRMP. The Army's two components of the Sustainable Range Program are the Range and Training Land Program (RTLP) and Integrated Training Area Management (ITAM).

4.3.1 Range and Training Lands Program

The RTLP provides centralized management and prioritization for planning, programming, design and construction activities for live-fire training ranges and maneuver training lands. The RTLP process was developed to assist installations in the integration of mission support, environmental stewardship, and their economic feasibility (Department of Army 2005). In addition, the RTLP identifies the needs for range projects and training land requirements for live-fire ranges and maneuver area. The RTLP establishes how Army ranges are managed and maintained to support the mission requirements of each installation.

4.3.2 Integrated Training Area Management

The ITAM program serves as a link between the RTLP and Natural Resources Management. ITAM provides range officers with the capabilities to manage and maintain training lands and support mission readiness and the Mission Essential Task List (METL). ITAM integrates the mission requirements derived from the RTLP with environmental requirements and environmental management practices and establishes the policies and procedures to achieve optimum, sustainable use of training and testing lands by implementing a uniform land management program.

The ITAM program is a management and decision-making process that integrates army training and other mission requirements for land use with sound natural resource management practices. There are four components of the ITAM program: Range and Training Land AssessmentP0F[1]P (RTLA); Land Rehabilitation and Maintenance (LRAM); Sustainable Range Awareness (SRA); and Training Resources Integration (TRI). These areas do not fall under the control or responsibility of the Environmental Office. The goals and tasks included here are based on the SRP guidance, but may not be identical to the goals of the TNARNG SRP program.

4.3.2.1 Range and Training Land Assessment

RTLA is a management procedure that inventories and monitors land conditions. It incorporates relational database and GIS technologies into the land use decision process. RTLA collects physical and biological resources data from training land in order to relate land conditions to training and testing activities. These data provide the information to effectively manage land use and natural and cultural resources. It is the natural resources data collection and analysis component of the ITAM Program and is used as a standard base for inventory and monitoring on Department of Defense owned/managed properties (CEMML 1999). The intent of RTLA is to acquire essential natural resource baseline information that is needed to effectively manage training lands. RTLA surveys inventory plants and animals and describe the condition of the soils. The information obtained from RTLA surveys may be integrated with standard data elements from ancillary components of ITAM (for example, cultural resources surveys, forest surveys, wetlands surveys, endangered species surveys, and water quality monitoring), satellite imagery, and aerial photography to portray a total picture of the natural and cultural

[1] The Range and Training Land Assessment was formerly known as the Land Condition Trend Analysis (LCTA).

resources of the training site. GIS is used to integrate all natural/cultural resources data and graphically display the relationships between individual resource components.

Goal 1: Establish and maintain an RTLA monitoring system on VTS-S.
Objective: Conduct monitoring and use the data to warn of changes in ecosystem integrity.
Targets:
- 1a) Establish special use plots as necessary on VTS-S.
- 1b) Establish control plots as necessary on VTS-S.
- 1c) Conduct inventories of vegetation, wildlife, and effects of training on RTLA plots.
- 1d) Conduct short-term (every year) and long-term (every 3-5 years) monitoring of plots.
- 1e) Utilize data to determine carrying capacity of training areas.
- 1f) Utilize data to track changes in the training site's ecosystems.

4.3.2.2 Land Rehabilitation and Maintenance

LRAM is a preventive and corrective land rehabilitation and maintenance procedure that reduces the long-term impacts of training and testing on an installation. It mitigates training and testing effects by combining preventive and corrective land rehabilitation, repair, and/or maintenance practices. It includes training area redesign and/or reconfiguration to meet training requirements. LRAM is an active component of the ITAM program that is designed to restore and maintain soil, vegetation, and water resources for long-term sustainable use and training realism. The program uses cost-effective technologies such as revegetation and erosion control techniques to reduce soil loss, control water runoff, and protect soil productivity and riparian areas (adjacent to water and wetlands). A key element in the LRAM program is the watershed or drainage basin approach to land rehabilitation. This approach ensures that land rehabilitation projects address actual land degradation problems, not just the symptoms.

Goals 1: To ensure "no net loss" of usable training lands while maintaining or improving soil, water, and air quality.
Objective: Improve soil, water, and air quality by complying with all applicable laws and regulations, and providing adequate vegetative cover and drainage.
Targets:
- 2a) Comply with all federal, state, and local laws and regulations pertaining to soil stabilization and water and air quality.
- 2b) Provide adequate protection of natural resources by implementing best management practices.
- 2c) Improve surface water quality by reducing sediment concentrations in streams and drainages on VTS-S.
- 2d) Apply land rehabilitation treatment measures following troop training within the next optimum seeding period (spring or fall).
- 2e) Reseed with native species in areas where they would be effective, productive, and cost-efficient.

4.3.2.3 Sustainable Range Awareness

SRA provides a means to educate land users on their environmental stewardship responsibilities. It provides for the development and distribution of educational materials to land users. These materials relate the principles of land stewardship and the practices of reducing training and/or testing impacts. Environmental Outreach also includes information provided to environmental professionals concerning operational requirements. The purpose of SRA is to prevent unnecessary damage to the environment and in particular, training lands, by providing information to all site users.

The SRA program should focus on all land users to include soldiers, leaders, DA civilians, and the local community who may use training lands for recreational purposes. Sustainable Range Awareness is designed to improve their understanding of the effects of their mission, training, or activity on the natural resources of the VTS-S.

Goal 1: Create in those who use VTS-S a conservation ethic that will minimize damage to training lands and natural resources.
Objective: Develop and implement an education program to increase awareness and acceptance of ecosystem management, thereby minimizing damage to training lands and natural resources.

Targets:

- 3a) Develop the VTS-S field card that identifies environmental considerations and guidelines for military tenants utilizing the facilities and resources at VTS-S.
- 3b) Develop other awareness materials for use on VTS-S.
- 3c) Provide public service announcements to inform the public of events occurring on VTS-S.

4.3.2.4 Training Requirements Integration

TRI is a decision making process that supports integration of all requirements for land use with natural and cultural resources management processes. TRI integrates the installation training and testing requirements for land use derived from the RTLP; the range operations and training land management processes; and the installation training readiness requirements with the installation's natural resources conditions. Siting military missions (and other land uses) in areas best capable of supporting the activities is the main goal of TRI. TRI relies heavily on GIS and RTLA to determine land capabilities and includes rotation of training lands as well as scheduling lands according to their "carrying capacity" to support specific missions. TRI also includes those restrictions required to maintain quality training land, provide a safe training environment, and protect significant natural resources. When areas cannot be placed "off-limits" or signage cannot be used, the SRA program will serve to educate the training site users about site limitations.
TRI requires the involvement of and coordination between the POTO, Environmental, and Facilities staffs. The ITAM/TRI Committee, formed by the Adjutant General will serve as the mechanism to bring all the key players together. Coordination must take place for management to effectively schedule and properly allocate activities according to the land's ability to support training events with minimum environmental effects.

Goal 1: Provide information and guidance to VTS-S users to ensure sustainability of training lands for support of the military mission and environmental law compliance.
Objective: Collect, analyze, and provide the information needed to sustain training lands and the environment while implementing the military mission.

Targets:

- 4a) Determine the training land carrying capacity at the time a training event will occur.
- 4b) Plan and distribute activities such as military training, rehabilitation of training damage, rare species habitat management, and natural resources management to minimize conflicts with each other.
- 4c) Update the VTS-S Standard Operating Procedures (SOP), especially the environmental section.

4.4 NATURAL RESOURCES PROJECTS

4.4.1 Survey History

Effective management of natural resources is dependent on a solid understanding of current conditions

and desired conditions. Current conditions are identified through baseline surveys which are repeated as needed as time, human use, or natural occurrence causes change in those conditions. Table 4.1 shows the planning level and other natural resources surveys which have been completed to date for the VTS-S and the anticipated date of the next repetition, if required.

Table 4.1. Surveys completed at VTS-S.

Survey	Completed	Contractor	Next
Soil Survey for Rutherford County, TN	July 1977	U.S. Soil Conservation Service	NA
Natural Resources Aquatic Survey	Aug 1999	Science Applications International Corp.	2020
Natural Resources Terrestrial Survey	Sept 1994 March 2000	Lose and Associates, Inc Science Applications International Corp.	NA
Surface Water Quality Assessment	Jan 2009	URS Corporation	NA
Karst Survey	June 2005	Dynamic Solutions, LLC	2022
Mammal Survey	Nov 2005 Jan 2015	Conservation Management Institute Environmental Services INC.	2025
Invasive Species Survey	Nov 2005 June 2014	Dynamic Solutions, LLC UT Chattanooga	2021
Forest Inventory	Sept 2006	Forest Management Group	2024
Vegetation Community Survey	March 2001 Jan 2007	Environmental Resources Management AMEC Earth and Environmental, Inc.	2022
Avian Survey	Sept 2008 June 2013	AMEC Earth and Environmental, Inc. URS Corporation	2018
Stones River Bladderpod Survey	April 2008	SpecPro, Inc.	NA
Aquatic Fauna Survey	Jan 2009	URS Corporation	2020
Herpetofauna Survey	April 2010 Jan 2015	URS Corporation Environmental Services INC.	2025
Wetlands Survey	Jan 2012	URS Corporation	2022
Bat Survey	Sept 2013	Environmental Services INC.	2022
Bat Habitat Survey	Jan 2013	Environmental Services INC.	NA
Rare Species Survey	June 2013	URS Corporation	2019

4.4.2 Implementation of INRMP 2002-2017

One function of this Revised INRMP is to review the prior INRMP for "operation and effect" in accordance with the 2004 DoD Supplemental Guidance. As noted in Section 1.6, the format of the 2002- 2006 INRMP was found to be unwieldy and difficult to apply. In addition, the project lists provided in the first INRMP were not complete, relative to the extensive lists of goals and objectives outlined in that document, and the layout made it difficult to identify the objective which a given project supported. In general, the 2002-2006 INRMP was found to be ineffective in guiding actual land management efforts. The format of later INRMPs were updated to be more functional, but still had formatting weaknesses. The format of this INRMP has been updated to make the document more functional for land management purposes. It is hoped that many weaknesses of previous INRMPs have been eliminated in this iteration of the plan.

Despite the flaws in the first and subsequent INRMPs, natural resources management has progressed on VTS-S during the time since their implementation: a great deal of basic information has been gathered through planning level surveys, a working relationship has been developed with USFWS and TWRA with regards to a federal endangered species, and the groundwork has been laid for a number of

management actions which will be carried forward in this new INRMP. As an indicator of the current state of the program, the projects from earlier INRMPs have been incorporated into Table 4.2 with a description of the status of each project. Some have been fully implemented, and others are in progress. A few were sidelined for budgetary or time reasons. A number of these projects have been carried over with this revised INRMP and will be completed or implemented during the next five years (see Table B-1, Appendix B).

Table 4.2: Project status from the 2002-2018 INRMP.

Area	Project/Management Action	Status
Environmental		
Training Support	Develop Missionscape statement	Completed
	Develop and implement plan to achieve Missionscape	Completed
	Review and update Missionscape	Completed & On-going
Ecosystem Management	Develop map & priority list of ecosystems	Not Completed
	Collect threat and training use details	Completed
Habitat Management	Identify threats to significant habitats	Completed
	Develop/implement protection plans significant habitats	Completed & On-going
	Conduct water quality monitoring of Stewart Creek	Completed
	Post streamside management zones (SMZs) to implement 50 ft. buffer along water bodies	Completed & On-going
	Post wetland 50 ft. buffers (SMZs)	Completed & On-going
	Update training site SOP with information on SMZs	Completed
	Wetland floristic study	Not Completed
	Develop BMP training module	Completed
	Develop erosion repair guide	Completed
	Develop native planting guide	Completed
	Monitor for potential erosion issues	On-going
	Develop erosion reporting form for soldiers and staff	Completed
	Post erosion reporting form on website	Completed
	Develop erosion report tracking system	Completed but fell out of use
	Develop and implement erosion repair plans as needed	On-going
	Perform water quality monitoring & assessment	Completed 2009
	Vegetation community PLS	Completed 2007
	Conduct periodic wetland survey	Completed 2012
	Riparian habitat assessment	On-going
	Monitor erosion at boat ramp and repair as needed	On-going
	Conduct forest inventory	Completed 2006
	Develop forest management plan	Completed 2006
	Enter VTS-S into forestry reserve accounting system	Completed
RTE Species Management	Rare, Threatened, and Endangered species PLS	Completed 2013, by species prior
	Post rare animal and plant locations in Range Control	Completed
	Identify known locations and suitable habitat of rare species on GIS maps	Completed
	Coordinate tree removal with USFWS for Indiana & northern long-eared bat protection	On-going
	Create rare species identification fact sheets	Completed
	Develop or incorporate newly detected RTE species into ESMC as needed	None needed yet.

Area	Project/Management Action	Status
	Regular communication with USFWS & TWRA, including consultation on major projects	On-going
Wildlife Management	Conduct breeding and migratory bird survey	Completed 2008 & 2013
	Conduct mammal PLS	Completed 2005 & 2015
	Conduct Bat surveys	Completed 2005, 2012, 2013, & 2017
	Conduct herpetile PLS	Completed 2015
	Conduct terrestrial macroinvertebrate PLS	Under Contract 2018
	Conduct aquatic fauna PLS	Not Completed
	Wetland fauna survey	Not Completed
	Install wood duck nest boxes and maintain	Completed & On-going
	Restore grasslands to native species where feasible	No opportunities found yet
Pest Management	Develop/implement an Integrated Pest Management Plan	Completed 2010 & On-going
	Certify and maintain certification of pesticide applicators	On-going
	Report pesticide application data annually	On-Going
	Conduct an invasive pest plant species inventory and map (GIS) locations throughout the training site	Completed 2005 & 2015
	Monitor invasive exotic species of plants and animals	On-going
	Remove invasive exotic shrub species as necessary to provide habitat for native species	On-going
	Control or eradicate invasive species of plants and animals as needed	Initiated by ENV office in 2002, & on-going
Wildland Fire Management	Develop a Wildland Fire Management Plan for VTS-S	Completed
	Develop a fire assistance MOA with Town of Smyrna Fire Department & TNFS	Verbal but no written agreement yet
	Develop and maintain fire breaks	System in place, but none along some fence lines due to access/terrain
	Implement prescribed fire to meet management needs	None implemented yet
	Monitor effects of prescribed fire through post-burn evaluations	Prescribed burns have not been conducted
ITAM		
RTLA (was LCTA in original INRMP)	Conduct planning level floristic survey	Completed 2007
	Conduct planning level topographical survey	Deemed unnecessary- data available from USGS
	Investigate sinkholes and karst features on the site to ensure that a 50-foot buffer is maintained around the openings	Survey completed in 2005, marking not yet completed
	Conduct planning level wetlands survey	Completed 2012
TRI	Convert ~100 acres dominated by successional vegetation to grassland to create maneuver space and to control the spread of invasive exotic shrub species in TA2 and TA6.	Not yet conducted
	Include training site SOP revisions in annual revisions of the INRMP	Annual, on-going
	Use BMPs for tank trail maintenance to eliminate impact to riparian areas and streams	On-going
LRAM	Revegetate areas that are incapable of natural regeneration with native plant materials.	All portions of training site carry appropriate vegetative cover

Area	Project/Management Action	Status
	Establish a 50-foot riparian buffer zone on either side of Stewart Creek, marking with Steibert stakes where necessary	Completed 2009
	Replace riparian vegetation that is impacted by construction/maintenance activities at a 3:1 slope.	On-going

4.4.3 Natural Resources Projects for Revised INRMP

Many natural resources and training site improvement projects are planned for the upcoming years. Most are identified either in Chapter Four of this plan or in the ITAM 5-year plan. Table B-1 (See Appendix B) lists the projects from this INRMP, sorted according to management sphere (ecosystem management, endangered species, wetlands, etc.), goal, and objective.

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CHAPTER 5
RESOURCE PROTECTION GUIDELINES

The projects identified in the previous chapter are intended to improve the management and conservation of natural resources on VTS-S. In addition to large-scale projects, however, appropriate care is necessary in the day-to-day operations and activities of the training site to ensure excessive damage is not inflicted through misuse or carelessness. The following sections provide guidance for the major activity categories occurring on VTS-S to ensure that TNARNG abides by all relevant laws and regulations, the intent of this INRMP, and good stewardship in its use and management of the training site's resources.

5.1 TRAINING OPERATIONS

VTS-S exists for the purpose of training National Guardsmen, and that training does have environmental impacts. The following guidelines should be incorporated into all training activities:

Roads and Vehicles

- No new roads, maneuver trails, maneuver corridors, or training area access points may be created without approval of Range Control.
- Tracked vehicles are restricted to existing maneuver trails, hardened crossings, and designated maneuver corridors when moving between training areas.
- Cross-country maneuver of tracked and wheeled vehicles through forested areas without existing maneuver corridors must be pre-approved by Range Control.
- Bivouac sites and other training areas should be rotated to minimize impact on the soils and vegetation when feasible.
- Vehicles brought to VTS-S from off-site should be thoroughly washed upon arrival at the Cantonment of VTS-S before entering the training areas to minimize the spread of invasive species.
- New roads or trails will not be constructed beneath the 508 line as per USACE authority.

Plants and Animals

- Personnel will comply with State Game and Fish Laws.
- Interaction with wildlife should be avoided due to health and safety concerns.
- Do not disturb experimental exclosures, wildlife management equipment, or facilities.
- Do not cut vegetation 3 inches in diameter or larger, or any trees with protective coverings or special marks.

Streams and Wetlands

- Streamside Management Zones (SMZs) shall be identified around all water bodies. USACE requires that vegetation buffers of 50 feet be maintained along all shores of J. Percy Priest Lake. Perennial and intermittent streams will have an SMZ extending a minimum of 50 feet on either side of the channel. There shall be a 50 foot wide SMZ surrounding all wetland areas.
- Avoid operating vehicles in SMZs.
- Vehicle crossings of riparian zones and streams will only be conducted at designated points.
- Spills will be immediately contained and reported according to the VTS-S Spill Prevention Control and Countermeasures (SPCC) Plan.
- Foot traffic is allowed in wetlands.
- Vehicular traffic is not allowed in wetlands except on established roads.

- There will be no dredging, filling, or dumping of material within wetland areas. Any exceptions have to be approved by the Environmental Office and required state and/or federal permits obtained before the activity takes place.

Wildfire Management

- Open burning is not allowed without a permit.
- Avoid spark-producing activities in dry weather.
- Accidental fires in training areas will be combated by the unit occupying the area, or the nearest unit to an unassigned area, immediately upon discovery.
- The discoverer of a fire will immediately notify VTS-S Range Control and their own immediate superior officer. The next higher headquarters will also be advised, and Range Control will immediately notify the TNARNG Environmental Office.
- Each succeeding commander in the chain of command will take action as appropriate to provide forces to extinguish or control fires pending arrival of fire fighting specialists.
- Prescribed fires will be initiated by authorized trained TNARNG personnel, cooperating agencies, and contractors. If the military mission requires an area of VTS-S to be burned, this information will be provided to the Natural Resources Manager so that the area can be integrated into the overall burn plan for the year. Guidelines and recommendations for using prescribed fire in forest management efforts at VTS-S may be found in Annex 2 and in the installation's Forest Management Plan (Annex 1).

5.2 LRAM and CONSTRUCTION

Activities which disturb the vegetation and soil can be particularly damaging to the environment if improper methods lead to erosion and sedimentation problems. Even actions intended to improve conditions can cause damage if not handled appropriately. Construction activities routinely involve earth moving operations and are subject to the following guidelines:

- Follow the Erosion Control Best Management Practices listed in Table 5.1.
  - Additional information on erosion control procedures is available in the Tennessee Erosion and Sediment Control Handbook (Price and Karesh 2002) available at: http://www.state.tn.us/environment/wpc/sed_ero_controlhandbook/
- Schedule and perform land rehabilitation projects as soon as possible following disturbance, allowing sufficient time for soils to recover before the area again experiences regular use. Seed during optimum seeding periods for individual species. Seeding made in fall for winter cover should be mulched.
- Use temporary erosion control methods (such as cover crops) during rainy periods to protect the soil.
- Include all necessary rehabilitation work, best management practices, and associated costs in project proposals and construction contracts and specifications.
- Only native plant species will be used for landscaping and reclamation work, wherever feasible.
  - When planting native grasses, include non-persistent grasses that act as a cover crop for the first two or three years to minimize erosion before native species become established, for example: red top, timothy, winter wheat, and grain sorghum.
- Areas that fail to establish vegetative cover will be reseeded as soon as such areas are identified and weather permits.
- Present all construction project plans to the Environmental Office for review as far in advance as possible: special permits are required when disturbing federal jurisdictional wetlands or perennial or intermittent streams and will take time to obtain.

Table 5.1: Erosion Control Best Management Practices (BMPs) for LRAM and Construction Projects. Modified from the TDEC Erosion and Sediment Control Handbook (Price and Karesh 2002) http://www.state.tn.us/environment/wpc/sed_ero_controlhandbook/

1. **Construction Management Measures**
    a. Clearing and grubbing must be held to the minimum necessary for grading and equipment operation.
    b. Construction must be sequenced to minimize exposure time of cleared surface area. Grading activities must be avoided during periods of highly erosive rainfall.
    c. Construction must be staged or phased for larger projects. Areas of one phase must be stabilized before another phase can be initiated. Stabilization shall be accomplished by temporarily or permanently protecting the disturbed soil surface from rainfall impacts and runoff.
    d. Erosion and sediment control measures must be in place and functional before earth moving operations begin and must be properly constructed and maintained throughout the construction period.
    e. Regular maintenance is vital to the success of erosion and sediment control systems. All control measures shall be checked twice per week, 72 hours apart, before anticipated storm events, and after each rainfall. During prolonged rainfall, daily checking is necessary.
    f. Construction debris must be kept from entering any stream channel.
    g. Stockpiled soil shall be located far enough from streams or drainage-ways that runoff cannot carry sediment downstream.
    h. A specific individual shall be designated to be responsible for erosion and sediment controls on each project site.
    i. If the area to be disturbed is 1 acre or greater, a Tennessee Construction General Permit is required and a site-specific Storm Water Pollution Prevention Plan (SWPPP) must be developed. The Notice of Intent and SWPPP must be submitted to the State at least 30 days prior to any disturbance of the site. Land disturbing activities shall not start until written approval and Notice of Coverage is obtained from the TDEC Division of Water Pollution Control.

2. **Vegetative Controls**
    a. A buffer strip of vegetation at least as wide as the stream shall be left along any stream bank. Streamside buffer zones at VTS-S will be at least 50 feet on either side of the body of water.
    b. Vegetation ground cover shall not be destroyed, removed, or disturbed more than 15 calendar days prior to grading.
    c. Temporary soil stabilization with appropriate annual vegetation (e.g., annual ryegrass) shall be applied on areas that will remain unfinished for more than 30 calendar days.
    d. Permanent soil stabilization with perennial vegetation shall be applied as soon as practicable after final grading.

3. **Structural Controls**
    a. Staked and entrenched straw bales and/or silt fence must be installed along the base of all fills and cuts, on the downhill sides of stockpiled soil, and along stream banks in cleared areas to prevent transport of sediment into streams. Straw bales and/or silt fence may be

removed at the beginning of the work day but must be replaced at the end of each work day.

b. All surface water flowing toward the construction area shall be diverted around the construction area to reduce erosion potential, using dikes, berms, channels, or sediment traps, as necessary. Temporary diversion channels must be lined to the expected high water level and protected by non-erodible material to minimize erosion. Clean rock, log, sandbag, or straw bale check dams shall be properly constructed to slow runoff and trap sediment.
c. Sediment basins and traps shall be properly designed according to the size of the disturbed or drainage areas. Water must be held in sediment basins until at least as clear as upstream water before it is discharged to surface waters. Water must be discharged through a pipe or lined channel so that the discharge does not cause erosion and sedimentation.
d. Streams shall not be used as transportation routes for equipment. Crossings must be limited to one point. A stabilized pad of clean and properly sized shot rock must be used at the crossing point.
e. All rocks shall be clean, hard rocks containing no sand, dust, or organic materials.

5.3 FACILITIES MANAGEMENT

Maintenance of an attractive, tidy facility is important; however, even activities in a heavily modified cantonment area, such as that at VTS-S, can impact the environment. Mowing, landscaping, and pesticide use in the managed landscape should be undertaken with consideration for this impact.

- Only native species will be used for landscaping and replanting purposes without clearance from the Environmental Office. Native plants are better adapted to local conditions and generally require less fertilizer and herbicide/pesticide input. Use of natives also limits the spread of invasive, exotic species.
- Consider seasonal variables (e.g., timing and quantity of average rainfall, appropriate planting season) in planning and scheduling projects.
- Consider erosion factors when choosing sites for training, construction, or management activities.
- Always include appropriate surface restoration, fertilization, and seeding (or other revegetation practice) as the final stage of any project which disturbs the soil or vegetation.
- Apply Best Management Practices (BMPs) (see Tables 5.1 and 5.2) to all TNARNG projects.
- Use mechanical and biological pest control methods wherever feasible and economical. Only apply pesticides when effective biological or mechanical control methods cannot be found or are prohibitively expensive. See TNARNG Integrated Pest Management Plan for more information.
- Pesticides and herbicides can only be applied by certified applicators and must be reported to the Integrated Pest Management Coordinator (see section 5.1.8 for more information).
- Herbicides will be utilized to control weedy vegetation in the most time- and cost-effective manner. See Table A3.2 in Annex 3 for guidance in selecting the appropriate herbicide for different types of invasive pest plants.
- Within 50 feet of Stewart Creek, J. Percy Priest Lake, wetlands, or other recognized waterway, foliar application of herbicides will be limited to those products labeled for application to water because of the risk of drift. All other herbicide applications within these SMZ areas will be made via stem treatments (cut stump, basal bark, or stem injection). No soil-active herbicides will be

used within Streamside Management Zones (See Figure 3.5).

- Foliar treatments of pesticides will be avoided in any situation where the spray would be carried toward water.
- Removal of invasive pest plant material found within SMZs may occur but will not be done in a manner destructive to the stability of the streambank, waterway, or other aspect of the ecosystem present.
- Where creek bank vegetation is composed of more than 50% invasive species, revegetation and bank stabilization will be conducted immediately following IPP control.

5.4 ROAD CONSTRUCTION AND MAINTENANCE

Roads can be a significant source of sediment, as well as an on-going drain on funds, if poorly designed. Proper placement, design, and construction can alleviate many of the problems associated with unpaved roads, even when utilized by heavy wheeled and track vehicles. The State Forestry Best Management Practices (Table 5.2) deal largely with road construction and should be applied to all road building activities on VTS-S.

No new roads will be constructed at VTS-S below the 508-line (see Figure 3.5), the elevation at which the USACE prohibits any land alteration or construction activities. Should additional materials or excavation be needed to repair existing trails or roads that are located at or below this level, the USACE must be contacted and grant approval before initiating maintenance.

Table 5.2: Forestry Best Management Practices (also apply to construction and rehabilitation of all roads and tank trails). Modified from the Guide to Forestry Best Management Practices (Division of Forestry 2003) (http://www.state.tn.us/agriculture/pulications/forestry/BMPs.pdf)

1. **Access Road Location.** Access roads shall be designed and located to prevent sediment from entering the waters of the State as defined at Tennessee Code Annotated (T.C.A.) § 69-3-102. Methods to prevent sedimentation to streams include, but are not limited to, the following:
    a. Minimize the amount of road to be constructed using existing roads where practical.
    b. Locate roads as far from streams and lakes as possible and practical.
    c. Locate roads as far as practical from streamside management zones (SMZs).
    d. Avoid or minimize stream crossings. If crossings are necessary, an Aquatic Resources Alteration Permit will be needed and may take time to obtain. Complete design and construction plans must be submitted to the Environmental Office as far in advance as possible. Roads should cross streams as close to right angles as possible.
        1. When possible, locate crossings on the straightest section of streams and minimize disruption of normal stream flow.
        2. Design crossings such that disruption of movement of aquatic life is minimized.
        3. Where applicable, approaches to stream crossings should climb away from streams to minimize erosion during high water and should be graveled to prevent washing and rutting.
        4. Where practical, broad-based dips and wing ditch turnouts should be installed to turn water off roads before entering the stream.
        5. When fords are used:
            a. Fords should be located where stream banks are low.
            b. Fords should have a solid bottom; if not, use a pole ford or other

appropriate cover. Cover should be removed after use.

6. When culverts are used:
    a. Culvert size should accommodate the area to be drained.
    b. Installation of culverts should minimize disturbance of stream channels and avoid sloughing of stream banks.
7. When bridges are used:
    a. Bridges should be located across narrow points on firm soils.
    b. Care should be taken to protect banks from sloughing when constructing and removing temporary bridges.

e. Avoid sensitive areas that could interfere with drainage and cause soil compaction or erosion.

2. Access Road Construction. Access roads shall be constructed to prevent sediment from entering the waters of the State. Methods to prevent sedimentation include, but are not limited to:

a. To the extent possible, construct and revegetate new roads several weeks or longer in advance of logging/use.
b. Avoid road construction during periods of wet weather.
c. Construct roads on grades of 2 to 12 percent where possible. Runoff from roads should not directly discharge into a stream channel. Runoff from stream crossings should be minimized. Control runoff from roads using techniques such as varying the slope of the road, crowing, outsloping, wing ditches, sediment traps, sediment control structures, broad-based dips, rolling dips, water bars and cross drain culverts and other measures recommended by the Department of Agriculture. Steeper grades are acceptable for short distances provided additional attention is given to water control/drainage structures.
d. When possible, trees and brush cleared for road corridors should be pushed to the downhill side of the road to assist in trapping sediment.
e. Avoid excessive soil disturbance during road construction.
f. Revegetate exposed soil in potential problem areas (i.e., culverts, stream crossing, fill areas).
g. In association with wetlands:
    1. Design the road fill with bridges, culverts, or other drainage structures to prevent the restriction of expected flood flows.
    2. Remove all temporary fills in their entirety and restore the area to its original elevation.

3. Road Retirement. Access roads shall be retired in such a way as to prevent sediment for entering the waters of the State. Methods to prevent sedimentation include, but are not limited to, the following:

a. Water bars or other drainage structures should be constructed immediately after active logging/road use has ceased. If logging will be delayed for a substantial period of time, temporary drainage and erosion control structures should be constructed.
b. Upon completion of logging/road use, remove temporary bridges, culverts, and pole fords; remove sediment and debris from dips, ditches, and culverts; and revegetate problem areas.
c. Use lime, fertilizer, mulch, and/or seed when needed to prevent soil erosion. Amounts should be based on recommendations from the Department of Agriculture or the University of Tennessee Agricultural Extension Service.

4. Streamside Management Zone (SMZ) (see Section 5.5 below). Streamside management zones shall be designed and managed along perennial and intermittent streams, lakes, and

impoundments to prevent sediment from entering waters of the State. Methods to prevent sedimentation to streams include, but are not limited to, the following:

a. Establish SMZs along any stream or water body where the potential exists for the movement of sediment into stream or water body, this includes waters associated with wetlands.
b. J. Percy Priest Lake and both perennial and intermittent streams will have an SMZ extending a minimum of 50 feet on either side of the channel. In association with wetlands, SMZs will be established at least 50 feet in width along both sides of all associated streams and open water (total minimum width of 100 feet).
c. Do not remove any trees within an SMZ if such removal would result in soil potentially getting into the stream. If trees can be harvested without risk of soil loss, maintain 50 to 75 percent of the vegetation canopy shading a perennial stream.
d. Avoid operating any harvesting equipment or vehicles within and SMZ. Whenever possible, timber harvested within an SMZ should be pulled or winched out.

5.5 WATER RESOURCES

The water resources on VTS-S include several different ecotypes: perennial streams, the Stewart Creek embayment of J. Percy Priest Lake, riparian areas adjacent to the lake and the creek, wetlands, and the bottomland forests bordering J. Percy Priest Lake (see Figure 3.5). While the specific uses and characteristics of these sites can vary widely, they share the key factor of water and a significant role in the water cycle as well as being important habitats for many creatures. Protection of water resources is of the utmost importance, as they are habitats that can be easily damaged by accident or careless action. One of the simplest BMPs for protection of water resources is the establishment and use of Streamside Management Zones (SMZs).

SMZs shall be designed and managed along perennial and intermittent streams, lakes, and impoundments to prevent sediment from entering waters of the State. Methods to prevent sedimentation to streams include, but are not limited to, the following:

- As per the Water Quality Buffer Zone Policy of the Town of Smyrna, SMZs must be maintained 2 times the width of the channel on either side of the channel of all perennial and intermittent stream waterways. However, as Stewart Creek has been impounded by the J. Percy Priest Dam, the current channel width is not that of a true stream, the waterway type for which this guidance was written. Therefore, a continuous SMZ of 50 feet or more will be demarcated and maintained along either side of the Stewart Creek shoreline and along all shores of J. Percy Priest Lake at VTS-S.
- In association with wetlands, establish SMZs at least 50 feet in width surrounding the wetland area.
- There shall be no digging for training purposes, forest management, or construction activities within an SMZ without prior review and permission from the Environmental Office. Certain activities may require state or federal permitting prior to initiation of activity.
- Do not remove any trees within an SMZ if such removal would result in soil potentially getting into stream. If trees can be harvested without risk of soil loss, maintain, at minimum, 50 to 75 percent of the vegetation canopy shading a perennial stream.
- There shall be no stump removal or other soil grubbing activities within SMZs.
- Avoid operating any vehicles or other equipment within an SMZ.

In addition to protection of SMZs, other actions and/or limitations are essential to maintain high water quality and habitat quality:

Streams and Riparian areas

- Training is allowed in the riparian areas outside of SMZs in accordance with guidelines for forestlands. Use extra caution to avoid causing sedimentation or other contamination of the associated waterway.
- There shall be no digging for training purposes, forest management, or construction activities within an SMZ without prior review and permission from the Environmental Office. Certain activities may require a state or federal permit prior to initiation of activity.
- Spills will be immediately contained and reported according to the VTS-S Spill Prevention Control and Countermeasures (SPCC) Plan.
- Dumping of any substance on the training site is not allowed.
- Minimize stream crossings. If regular fording of a creek or seasonal conveyance is necessary, hardened crossings provide more protection. Contact the TNARNG Environmental Office prior to making any alterations to any stream crossing as state and/or federal permitting may be required.
- Monitor for erosion problems along stream and lake banks. Report any erosion, exposed soil, or stream bank collapse to the Environmental Office as soon as possible.
- Utilize native species for plantings to stabilize banks. Vegetative structures are preferable to riprap or concrete structures in most situations.
- Use Erosion Control BMPs during all construction and relocation of roads and during all regularly occurring maintenance activities (see Table 5.1).
- Any activity that will impact a stream or wetland must be presented to the Environmental Office well in advance of the planned action date: special permits are required when disturbing federal jurisdictional wetlands or perennial or intermittent streams, and these permits take time to obtain.

Wetlands

- Foot traffic is allowed in wetlands.
- Vehicular traffic is not allowed in wetlands except on established roads.
- Any non-foot traffic, training, or land management activity to be conducted within a wetland should be coordinated with the Environmental Office.
- There will be no dredging, filling, or dumping of any material within wetland areas. Any exceptions will have to be approved by the Environmental Office and required state and/or federal permits obtained.
- Only herbicides and pesticides labeled for wetland/surface water use will be applied within wetland boundaries (e.g., Rodeo, Aquamaster, Habitat, Accord).
- Within 50 feet of any wetland boundary, foliar application of herbicides will be limited to those products labeled for application to water because of the risk of drift. All other herbicide applications within the SMZ areas will be made via stem treatments (cut stump, basal bark, or stem injection).
- Any ground disturbing activities near wetland areas that might alter the hydrology of the system must be reviewed by the Environmental Office Conservation Branch before any work takes place.
- Implement Erosion and Sediment Controls in construction areas and maneuver areas, streambank stabilization methods, and forestry BMPs to minimize delivery of sediment and chemical pollutants to wetland areas.
- Present all construction plans to the Environmental Office for review as far in advance as possible:

special permits are required when disturbing federal jurisdictional wetlands or perennial or intermittent streams and will take time to obtain.

Ground Water

- Vehicular traffic is not allowed in the sinkhole-prone region in the northeastern portion of TA 2.
- Foot traffic is allowed in this area; however, conducting training exercises beyond posted signs is not recommended due to safety concerns.
- Any non-foot traffic, training, or land management activity to be conducted in this area of the training site should be coordinated with the Environmental Office.

5.6 FORESTRY AND FORESTLAND USE

TNARNG manages VTS-S for multiple use, including military training, natural resource stewardship, and timber. To maintain the health and integrity of the forest ecosystems present, certain key factors should be observed:

- Tracked and wheeled vehicles are restricted to existing maneuver trails, hardened crossings, and designated maneuver corridors when moving between training areas. Transition from travel on trails to off-road maneuver should only occur at predesignated points.
- Cross-country maneuver of tracked and wheeled vehicles through forested areas without existing maneuver corridors must be pre-approved by Range Control.
- Bivouac sites and other forested training areas should be rotated to minimize impact on the soils and vegetation. Site condition should be monitored semi-annually utilizing the long-term vegetation monitoring protocol employed at other TNARNG training sites.
- Clearing or thinning of forest stands to improve or expand training areas will be coordinated through the TNARNG Environmental Office.
- Do not cut vegetation 3 inches in diameter or larger, or any trees with protective coverings or special marks.
- Open burning is not allowed without a permit.
- Accidental fires in training areas will be combated by the unit occupying the area, or the nearest unit to an unassigned area immediately upon discovery. Contact Range Control immediately. See 5.1.1 Training Operations Guidelines for further wildfire information.
- Interaction with wildlife should be avoided due to health and safety concerns.
- Personnel using the area will comply with State Game and Fish Laws.

5.7 GRASSLAND USE

The grasslands on VTS-S are principally managed, man-made grasslands (ranges); however, they can provide valuable habitat in addition to training opportunities. In order to improve the ecosystem value of the grassland area the following guidance should be applied to training and management activities:

- Reseed grassland areas with a native seed mix appropriate to the site and intended use when feasible. Use a non-native seed mix developed in cooperation with the Natural Resources section when necessary for soil retention and resiliency in situations where native seed mixes aren't suited to the need or situation. Discontinue the use of KY 31 tall fescue (Schedonorus phoenix) and the non-native lespedezas (Chinese or sericea lespedeza (Lespedeza cuneata), shrubby lespedeza (L. bicolor), and Korean or kobe lespedeza (Kummerowia stipulacea)) when possible.
- Prescribed fire is a useful tool for maintaining grassland ecosystems. See Annex 2 for details of

the VTS-S Prescribed Burn Plan.

- Tracked and wheeled vehicles are restricted to existing maneuver trails, hardened crossings, and designated maneuver corridors when moving between training areas. Transition from travel on trails to off-road maneuver should only occur at predesignated points. Cross-country maneuver through areas without existing maneuver corridors must be pre-approved by Range Control.
- Avoid mowing open grasslands from April to September for the protection of nesting birds. Areas in which taller growth will not impede training should be mowed in late March and then allowed to grow until November. Where grasslands must be maintained low cut, maintain 25-50 foot buffer strips along the forest edges which will only be mown every 3-5 years.

5.8 PEST MANAGEMENT

Pest management is an important part of maintaining facilities and protecting the health and safety of personnel, as well as the integrity of natural ecosystems. TNARNG pest management activities are regulated by federal and state law and by DoD regulation. These restrictions and the management goals and guidelines for pest control on TNARNG facilities are presented in the Integrated Pest Management Plan.

- All applications of herbicide or pesticide on VTS-S must be by a State- or DOD-certified applicator.
- All applications of herbicide or pesticide must be reported to the TNARNG Integrated Pest Management Coordinator (see Appendix I for reporting forms and contact information).
- Use non-chemical control methods wherever feasible and economical. Only apply pesticides when effective biological or mechanical control methods cannot be found or are prohibitively expensive.
- Pesticides and herbicides should be applied at the time when they will be most effective against the pest in order to achieve maximum control for minimum application. See TNARNG Integrated Pest Management Plan for more information.
- Follow the Forest Service's Management Guide for Invasive Plants in Southern Forests (Miller et al. 2010) guidelines in controlling invasive plant species.
- Only native species will be used in landscaping and in reclamation work.

Contractors who apply pesticides on VTS-S must:

- Show proof of liability insurance.
- Have State commercial certification and licensing in the category or categories of work to be performed.
- Use only EPA registered pesticides or herbicides that are on the "State Pesticide Use List" for use on TNARNG sites (see Appendix I).
- Furnish TNARNG personnel with legible copies of specimen labels and the Material Safety Data Sheets of all pesticides proposed for use.
- Furnish TNARNG personnel with the information required for pest management record keeping (see Appendix I for reporting format).
- Pesticides must be mixed, stored, and disposed of in accordance with Federal, State, and local regulations and with procedures established by the TNARNG.

5.9 RTE MONITORING AND PROTECTION

Currently, there has only been one federally listed species observed at VTS-S. A lone male gray bat was captured in 2013, but was determined to have simply been foraging while passing through due to the lack of

roosting caves, the relatively poor habitat, and location of capture in relation to the water. However, VTS-S is home to the meadow jumping mouse (*Zapus hudsonius*) an organism with Tennessee State status of "in need of management." Four bird species with the same state status have been documented as utilizing habitat on VTS-S: sharp-shinned hawk (*Accipiter striatus*), great egret (*Ardea alba*), cerulean warbler (*Dendroica cerulea*), and yellow-bellied sapsucker (*Sphyrapicus varius*). The presence of these species will be considered in future planning.

Guidance for the protection of any additional RTE species discovered at VTS-S will be developed as needed.

5.10 CULTURAL RESOURCES MANAGEMENT

The TNARNG Cultural Resources Management Policy is defined in the Integrated Cultural Resources Management Plan (ICRMP), Tennessee Facilities. The primary focus of cultural resources management is heritage stewardship. The following are key points in protection of cultural resources:

- The TNARNG will consult the Tennessee Historical Commission so that known historic, archaeological, and palaeontological sites may be avoided.
- Cannon Cemetery will be protected by fencing and left undisturbed.
- For ground disturbing undertakings (ICRMP SOP #5):
  - Prior to any ground disturbance, contact the Cultural Resources Office to verify that the site is clear of known cultural resources.
  - The avoidance or mitigation of adverse effects to NRHP eligible sites shall be proactively incorporated into the design and planning process rather than deferred until archaeological deposits may be discovered during actual construction.
  - All machine-aided excavations or other earth moving projects shall be designed to avoid damage to archaeological sites or other historic properties that may be eligible for inclusion to the NRHP.
  - Until such time as the TN-SHPO has determined an archaeological site to be ineligible or has concurred with a recommendation that an archaeological site is ineligible, any newly discovered sites will be treated as eligible and will be avoided whenever possible.
- In the event of Emergency Discovery of Archaeological Deposits (ICRMP SOP #6)
  - Contact the Cultural Resources Office immediately. Stop all work at the site.
  - Archaeological deposits discovered in the construction of any new undertaking shall be evaluated for their NRHP eligibility.
  - Until such time as the TN-SHPO has determined an archaeological site to be ineligible or has concurred with a recommendation that an archaeological site is ineligible, any newly discovered sites will be treated as eligible and will be avoided whenever possible.
- Treatment of Human Remains and Funerary/Sacred Objects (ICRMP SOP #8)
  - No Native American human remains, funerary objects, or sacred objects from VTS-S will be knowingly kept in government possession without initiating consultation.
  - Consultation regarding the disposition of Native American human remains, funerary objects, or sacred objects shall be initiated as soon as feasible.

5.11 MANAGEMENT SCHEDULE

Seasonality is an important factor in protecting natural resources. Certain activities should only be done at certain times of the year, and other actions have a higher probability of success in some months than in others. Table 5.3 provides a calendar for essential natural resources activities for VTS-S. This calendar will be revised as new needs are identified and further information is gathered.

Table 5.3: Natural Resources Calendar for VTS-Smyrna

Issue	January	February	March	April	May	June
Weed Control			Pre-emergent weed control on gravel lots and roads	Growth regulator on lawn/range area grasses	Contact herbicide on fencelines and other points of concern	
Revegetation			Mow native grass plots	April 15 -> Plant native grass seed	Plant native grass seed	
			Fertilize	Fertilize	Plant warm season grasses	Plant warm season grasses
		Plant cool season grasses	Plant cool season grasses	Plant cool season grasses		
Wetlands		Conduct photo point monitoring				
Erosion control (see Revegetation)		Erosion survey				
Wildlife	Clean out wood duck boxes; repair as needed			Don't mow nesting habitat	Don't mow nesting habitat	Don't mow nesting habitat
Invasive Spp.		Cut-stump treatments of privet, tree of heaven, mimosa, princess tree, olives, white poplar	Basal bark and/or cut stump treat multiflora rose	Basal bark and/or cut stump treat multiflora rose	Basal bark and/or cut stump treat multiflora rose	

Table 5.3, continued:

Issue	July	August	September	October	November	December
Weed Control	Contact herbicide on fencelines and other points of concern					
Revegetation	Plant warm season grasses	Plant cool season grasses Mow native grass plots	Fertilize P&K	Fertilize P&K		
Wetlands	Conduct photo point monitoring					
Erosion control	Erosion survey		Survey SMZ signs; repair, as needed			
Wildlife	Don't mow nesting habitat	Don't mow nesting habitat	Survey SMZ signs; repair, as needed			
Invasive Spp.	Cut-stump treatments of privet, tree of heaven, mimosa, princess tree, olives	Foliar treatments of honeysuckle, winter creeper, and privet on warm days				Foliar treatments of honeysuckle, winter creeper, and privet on warm days

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References and Citations

AMEC Earth and Environmental, Inc. 2007. Vegetation community survey: Volunteer Training Site Smyrna, Rutherford County, Tennessee. Nashville, Tennessee.

AMEC Earth and Environmental, Inc. 2008. Biological survey for birds: Volunteer Training Site-Smyrna, Rutherford County, Tennessee. Nashville, Tennessee.

Armed Forces Pest Management Board. 1987. Installation pest management program guide. Technical Information Memorandum No. 18. 25 pp.

Bailey, R.G. 1980. Description of the ecoregions of the United States. U.S. Department of Agriculture, Miscellaneous Publication No. 1391. 77 pp.

Bailey, R.G. 1996. Ecosystem geography. Springer-Verlag, New York, New York. 204 pp.

Barrett, J., and T. Karpynec. 2005. Phase II archaeological testing of sites 40RD231, 40RD232, and 40RD235 at the Tennessee Army National Guard Grubbs/Kyle Training Center, Rutherford County, Tennessee. Prepared by TRC, Inc., Nashville, Tennessee, for EDGE Group, Inc., Nashville, Tennessee.

Brahana, J.V., and M.W. Bradley. 1986. Preliminary delineation and description of the regional aquifers of Tennessee (the Central Basin aquifer system). Water Resources Investigations Report 82-4002, prepared for the U.S. Geological Survey, Tennessee District, Nashville, Tennessee.

Boyd, J., A. Benson, C. Montgomery, D. Hoover, J. Odell, G. Raymond, and L. Russo. 2014. Invasive non-native plant species survey and assessment, Tennessee Army National Guard Volunteer Training Site, Smyrna, Tennessee. Department of Biological and Environmental Sciences, University of Tennessee at Chattanooga.

Clayton, W.W. 1880. History of Davidson County, Tennessee. J. W. Lewis Publishing, Philadelphia, Pennsylvania.

Cleveland, T., R.D. Nichols, and J. Tomberlin. 2001. Historic building inventory, Catoosa Training Center, Catoosa County, Georgia, Milan Training Center, Carroll and Gibson Counties, Tennessee, Volunteer Training Site—Smyrna, Rutherford County, Tennessee. Prepared by TRC Garrow Associates, Inc., Atlanta, Georgia for Science Applications International Corporation, Oak Ridge, Tennessee.

Conservation Management Institute, Military Lands Division. 2005. Planning level mammal survey, Volunteer Training Site Smyrna, Tennessee Army National Guard. Virginia Polytechnic Institute, Blacksburg, Virginia.

Dynamic Solutions, LLC. 2005a. Final biological survey report: invasive plant species for Tennessee Army National Guard Volunteer Training Site Smyrna, Rutherford County, Tennessee. Knoxville, Tennessee.

Dynamic Solutions, LLC. 2005b. Final karst survey report, Tennessee Army National Guard Training Site Smyrna, Tennessee. Knoxville, Tennessee.

Ecological Society of America. 1996. The report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management.

Environmental Protection Agency (EPA). 1998. Total Maximum Daily Loads for impaired waters in Tennessee. Available at: http://oaspub.epa.gov/tmdl/enviro.control?p_list_id=TN05130203010&p_cycle=1998 (Accessed June 2007).

Environmental Protection Agency (EPA). 2007. Stones River watershed profile. Available at: http://cfpub.epa.gov/surf/huc.cfm?huc_code=05130203 (Accessed February 2007).

Environmental Services, Inc. 2013. Bat survey: acoustic and mist-net sampling at Smyrna VTS. Jacksonville, Florida.

Environmental Services, Inc. 2015. Biological survey report for herpetofauna and mammal species survey at Tennessee Army National Guard Volunteer Training Site Smyrna, Rutherford County, Tennessee. Jacksonville, Florida.

Goetz, R.C., and D.W. Sharp. 1980. The effect of orientation and light intensity on utilization of artificial wood duck nest boxes. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 34:591-97.

The Goodspeed Publishing Company. 1887. A history of Tennessee from the earliest times to the present, together with an historical and a biographical sketch of Maury, Williamson, Rutherford, Wilson, Bedford and Marshall Counties. Nashville, Tennessee.

Hardeman, W.D. 1966. Geologic map of Tennessee. Tennessee Division of Geology, Nashville, Tennessee.

Kirby, R.E. 1990. Wood duck nonbreeding ecology: fledging to spring migration. Pp. 61-76 *In* L. H. Fredrickson et al., eds. Proceedings of the 1988 Wood Duck Symposium, St. Louis, Missouri.

Lose and Associates, Inc. 1994. Phase I natural resource survey, Grubbs/Kyle Training Center. Prepared for the Tennessee Army National Guard. Nashville, Tennessee.

McNab, W.H., and P.E. Avers, eds. 1994. Ecological subregions of the United States. Prepared for the U. S. Forest Service in cooperation with regional compilers and the ECOMAP team of the Forest Service. Available at: http://www.fs.fed.us/land/pubs/ecoregions/.

Miller, J.H., S.T. Manning, and S.F. Enloe. 2010. A management guide for invasive plants in southern forests. General Technical Report SRS-131. Asheville, NC: US Department of Agriculture, Forest Service, Southern Research Station. 120 pp.

NOAA National Centers for Environmental information, Climate at a Glance: U.S. Time Series. 2017. National Climatic Data Center, Asheville, North Carolina. Available at: https://www.ncdc.noaa.gov/cag/ (Accessed September 2017).

Natural Resources Conservation Service. 2007. The PLANTS database. National Plant Data Center, Baton Rouge, Louisiana. Available at: http://plants.usda.gov (Accessed July 2007).

NatureServe. 2004. Species at risk on Department of Defense installations. Prepared for the U.S.

Department of Defense and the U.S. Fish and Wildlife Service. Available at: https://www.denix.osd.mil/denix/Public/Library/NCR/Documents/DOD_SAR_report_FINAL.pdf.

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available at: http://www.natureserve.org/explorer (Accessed June 2007).

NatureServe. 2017. *Myotis grisescens*. Available at: http://explorer.natureserve.org/index.htm (Accessed September 2017)

Price, J.C., and R. Karesh . 2002. Tennessee erosion and sediment control handbook. Tennessee Department of Environment and Conservation Division of Water Pollution Control, Nashville, Tennessee.

Quarterman, E. 1989. Structure and dynamics of the limestone cedar glade communities in Tennessee. J. Tenn. Acad. Sci. 64:155-158.

Riordan, J.L. 1998. U.S. Army National Guard cultural resources planning level survey—Tennessee. U.S. Army Engineer, St. Louis District, Mandatory Center of Expertise for the Curator and Management of Archaeological Collections.

Robinson, J.C. 1990. An annotated checklist of the birds of Tennessee. University of Tennessee Press, Knoxville.

Science Applications International Corporation. 1999. Natural resource aquatic survey at the Grubbs/Kyle Training Site, Smyrna, Tennessee. Oak Ridge, Tennessee.

Science Applications International Corporation. 2000. Phase II natural resource terrestrial survey final report, Grubbs/Kyle Training Site, Smyrna, Tennessee. Oak Ridge, Tennessee.

Shea, A.B. 1999. The return of native grasses to Tennessee. Tennessee Department of Environment and Conservation Division of Natural Heritage. Available at: http://www.tennessee.gov/environment/tn_consv/archive/grass.htm (Accessed March 2008).

Sims, C.C. 1947. A history of Rutherford County. No publisher data available, 236 pp.

SpecPro, Inc. 2008. Targeted floristic survey for: Stones River bladderpod (*Lesquerella stonensis*) at Volunteer Training Site-Smyrna. San Antonio, Texas.

Stanyard, W.F, and R. Lane. 1999. Phase I cultural resource survey of the Grubbs/Kyle Training Center, Rutherford County, Tennessee. Prepared by TRC Garrow Associates, Inc., Atlanta, Georgia for Science Applications International Corporation, Oak Ridge, Tennessee.

Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Unpublished data. Stewart Creek water quality data, 2001-2007. Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Nashville, Tennessee.

Tennessee Department of Environment and Conservation, Division of Water Pollution Control. 2007. General water quality criteria. Chapter 1200-4-4 in: Rules of Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Nashville, Tennessee.

Available at: http://www.state.tn.us/sos/rules/1200/1200-04/1200-04-03.pdf (Accessed February 2008).

Tennessee Department of Environment and Conservation, Division of Water Pollution Control. 2008. Final: Year 2008 303(d) list. Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Nashville, Tennessee. Available at: http://www.tennessee.gov/environment/wpc/publications/2008_303d.pdf (Accessed March 2009).

Tennessee Department of Environment and Conservation, Division of Water Resources. 2017. Final YEAR 2016 303(d) LIST. Tennessee Department of Environment and Conservation, Division of Water Resources, Nashville, Tennessee. Available at: https://www.tn.gov/content/dam/tn/environment/water/.../wr_wq_303d-2016-final.pdf

Tennessee Division of Employment Security. 2007. Labor market analysis, May 2007 county unemployment rates. Tennessee Department of Labor and Workforce Development, Division of Employment Security, Nashville, Tennessee. Available at: http://thesource.tnui.net/ (Accessed January 2008).

Tennessee Division of Forestry. 2003. Guide to forestry best management practices in Tennessee. Tennessee Department of Agriculture, Division of Forestry, Nashville, Tennessee. 50 pp.

Tennessee Division of Geology/U.S. Geological Survey. 2004. Map of principal mineral producing localities. Available at: http://minerals.usgs.gov/minerals/pubs/state/2004/tnstmyb04.pdf (Accessed June 2007).

Tennessee Division of Natural Heritage. 2004a. Tennessee Natural Heritage Program rare plant list. Tennessee Department of Environment and Conservation, Division of Natural Heritage, Nashville, Tennessee. Available at: http://www.state.tn.us/environment/na/pdf/plant_list.pdf (Accessed January 2007).

Tennessee Division of Natural Heritage. 2004b. Tennessee Natural Heritage Program rare animal list. Tennessee Department of Environment and Conservation, Division of Natural Heritage, Nashville, Tennessee. Available at: http://www.state.tn.us/environment/na/pdf/animal_list_2004.pdf (Accessed January 2007).

Tennessee Exotic Pest Plant Council. 2004. Invasive exotic pest plants in Tennessee. Nashville, Tennessee.

Tennessee Military Department. 1999. Facilities plan for FY1999 to FY2005, Volunteer Training Site-Smyrna. On file, Tennessee Army National Guard, Nashville, Tennessee.

Thompson Engineering, Forest Management Group, and Aerostar Environmental Services. 2006. Volunteer Training Site-Smyrna Forest Management Plan. Crystal Springs, Mississippi.

Tippit, R. 1998. Water quality data for Stones and Harpeth River Basins. CELRN-EP-H (1110-2-1150a). Memorandum for Sherry Wang. Aquatic Resources Center, Franklin, Tennessee.

Town of Smyrna. 2001. Official website for the town of Smyrna, Tennessee. Available at: http://www.townofsmyrna.org

True, J.C., W.C. Jackson, E.P. Davis, C.F. Wharton, and O.G. Sprouse. 1977. Soil survey of Rutherford County, Tennessee. United States Department of Agriculture Soil Conservation Service, in Cooperation with the Univ. of Tenn. Agricultural Experiment Station.

United States Army Corps of Engineers. 1987. Corps of Engineers wetlands delineation manual. Technical report Y-87-1. Prepared by Environmental Laboratory, Department of the Army, Waterways Experiment Station, Vicksburg, Mississippi.

United States Army Corps of Engineers. 2006. Value to the nation: J. Percy priest "Fast Facts." Available at: http://www.vtn.iwr.usace.army.mil/recreation/reports/lake.asp?ID=195 (Accessed January 2008).

United States Army Corps of Engineers. 2010. After Action Report. May 2010 Flood Event, Cumberland River basin. 1-3 May 2010. Great Lakes and Ohio River Division.

United State Bureau of Labor Statistics (USDL). 2007. National and state unemployment rates. Available at: http://www.bls.gov (Accessed January 2008). United States Census Bureau. 2007a. National, state, and county population estimates. Available at: http://www.census.gov/popest/estimates.php (Accessed January 2008).

United States Census Bureau. 2007b. Small income and poverty estimates. Available at: http://www.census.gov/hhes/www/saipe/ (Accessed January 2008).

United States Federal Emergency Management Agency. 2007. Flood risk assessment. Available at: http://www.floodsmart.gov (June 2007).

United State Fish and Wildlife Service. 1995. Strategic plan for conservation of USFWS service trust resources in the Lower Tennessee-Cumberland ecosystem. Available at: http://www.fws.gov/ltce/Ltcplan.html (Accessed March 2008).

United States Geological Survey, Earthquake Hazards Program. 2002. Earthquake probability mapping. Available at: http://www.usgs.gov/laws/accessibility.html (Accessed February 2007).

URS Corporation. 2009. Surface water planning level survey, Volunteer Training Site-Smyrna, Tennessee Army National Guard. Franklin, Tennessee.

URS Corporation. 2011. Wetland survey and characterization report, Volunteer Training Site- Smyrna, Tennessee Army National Guard. Franklin, Tennessee.

Weeks, T. 1992. Heart of Tennessee: the story and images of historic Rutherford County. Courier Printing Co., Nashville, TN, 205 pp.

APPENDIX A

Record of Environmental Consideration
of the
Revised Integrated Natural Resources Management Plan
for the Volunteer Training Site – Smyrna
Tennessee Army National Guard

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REC

RECORD OF ENVIRONMENTAL CONSIDERATION

2011 IMPLEMENTATION Revised Integrated Natural Resources Management Plan

VTS-SMYRNA

PREPARED BY:

CFMO ENVIRONMENTAL OFFICE

PREPARED FOR:

CFMO MANAGEMENT OFFICE

15 OCTOBER 2011

ARNG RECORD OF ENVIRONMENTAL CONSIDERATION

1. PROJECT NAME:

2011 INRMP IMPLEMENTATION VTS-Smyrna

2. PROJECT NUMBER:	**3. DATE:**
N/A	15-Oct-11
4. PROJECT START DATE (dd-mmm-yy):	Nov 1 2011
5. PROJECT END DATE (dd-mmm-yy):	Nov 1 2012

6. DESCRIPTION AND LOCATION OF THE PROPOSED ACTION:

Location: VTS-Smyrna, Smyrna, TN Description: REC is for the revision of the 2001 INRMP, which includes an attached EA. There have been no significant changes to this document, as reviewed by NGB Legal. INRMP includes all current RTE listed species, as well as all pertinent Section 7 information. INRMP shall be made available to all related tribes, as well as to the SHPO and adjoining state agencies.

7. CHOOSE **ONE** OF THE FOLLOWING:

☐ An existing **Environmental Assessment** adequately covers the scope of this project.

EA Date (dd-mmm-yy) Conducted By:

☐ An existing **Environmental Impact Statement** adequately covers the scope of this project.

EIS Date (dd-mmm-yy Conducted By:

☑ After reviewing the screening criteria and completing the ARNG Environmental Checklist, this project qualifies for a **Categorical Exclusion** (select one below).

Categorical Exclusion Code: B-3: Preparation of regulations, procedures, manuals, and other...

See 32 CFR 651 App. B

☐ This project is exempt from NEPA requirements under the provisions of:

Cite superseding law:

8. REMARKS:

No environmental issues are noted as part of this proposed action.

REGISTERED ENVIRONMENTAL MANAGER ★ RALPH R. HARDER REM 10542 NREP

CERTIFIED HAZARDOUS MATERIALS MANAGER RALPH R. HARDER 09766 CHMM EXPIRES DEC 31, 2015

REGISTERED ENVIRONMENTAL PROPERTY ASSESSOR ★ RALPH R. HARDER REPA 5933 NREP

Signature of Proponent (Requester)

Concurrence:

Environmental Program Manager

Ralph R. Harder CHMM, REM, NREP

Printed Name of Proponent (Requester)

Printed Name of Env. Program Manager

15 Oct 2011

Date Signed

25 Oct 2011

Date Signed

ARNG ENVIRONMENTAL CHECKLIST

Enter information in the yellow shaded areas.

PART A - BACKGROUND INFORMATION

1. PROJECT NAME:
2011 INRMP IMPLEMENTATION VTS-Smyrna

2. PROJECT NUMBER:	3. DATE:
N/A	15-Oct-11

4. DESCRIPTION AND LOCATION OF THE PROPOSED ACTION:
Location: VTS-Smyrna, Smyrna, TN Description: REC is for the revision of the 2001 INRMP, which includes an attached EA. There have been no significant changes to this document, as reviewed by NGB Legal. INRMP includes all current RTE listed species, as well as all pertinent Section 7 information. INRMP shall be made available to all related tribes, as well as to the SHPO and adjoining state agencies.

5. START DATE (dd-mmm-yy): Nov 1 2011		6. END DATE (dd-mmm-yy): Nov 1 2012	
7. STATE/ORGANIZATION: TN-ARNG		8. SERVICE COMPONENT: ARNG	
9. ADDRESS: 3041 Sidco Drive Nashville, TN 37204			
10. PROPONENT/UNIT NAME: AGTN-CFMO		11. POC: Ralph Harder - Env. Engineer	
12. PROPONENT/UNIT ADDRESS: 3041 Sidco Dr RM 314 Nashville, TN 37204			
13. COMM VOICE: 615-313-0607	14. COMM FAX: 313-0766	15. DSN VOICE: 683-0607	
16. DSN FAX: 683-0766	17. EMAIL: ralph.harder@tn.ngb.army.mil		

18. Was the project adequately addressed in a separate environmental review? **Do not include Environmental Baseline Surveys (EBSs).** ☐ YES ☑ NO

If YES, fill out and attach copy of the decision document:	Document Title:
	Reviewing Agency:
	Date of Review: (dd-mmm-yy):

PART B - HISTORICAL INFORMATION

1. Is the agency undergoing, or has it undergone, legal action for NEPA issues?	☐ YES ☑ NO
2. Has there been previous ARNG training, construction, or similar proposals on the site?	☑ YES ☐ NO
3. Are there any known contentious environmental issues currently associated with the site?	☐ YES ☑ NO

Explain any **YES** answers.
Construction and training have previously been conducted at this site.

4. Has the proposed type of equipment (tracked or wheeled) been operated on the site before? ☑ YES ☐ NO

If NO, what NEPA document covers this action? Provide copy of REC, FNSI, or ROD. **This does not include EBSs.**	Document Title:	EA for Implementation of INRMP Management Plan
	Preparing Agency:	TNARNG
	Date (dd-mmm-yy):	Sep-09

5. Describe the environmental setting, including past and present use of the site.
The site has been used as an active military facility for over the past 60 years. This revision to the exisitng INRMP, will have no effect on existing environmental setting of property.

PART C - DESCRIPTION OF PROPOSED PROJECT/ACTION

Include a map with the site clearly marked

1. The proposed action will involve (check all that apply):
☐ Training Activities/Areas ☐ Construction ☐ Reorganization/Restationing
☐ Maintenance/Repair/Rehabilitation ☐ Lease or License ☐ Environmental Plans/Surveys
☐ EBS Preparation
☑ Other (Explain): INRMP Revision

2. Has any related real estate action been addressed in a separate environmental document within the last 5 years? ☐ YES ☑ NO
If YES Document Title: Date (dd-mmm-yy):

3. Number of acres to be disturbed: none

4. How is the site currently zoned?
☐ Residential ☐ Commercial ☐ Industrial ☐ Park
☑ Other (Explain): Federal Military Training Facility

5. Briefly describe the surrounding area land uses (e.g., undeveloped, recreation, residential, etc):
The site is bordered to the north by Percy Priest Lake (recreational), to the west by the Smyrna-Rutherford County Airport (commercial), and to the south and east by light commerical, as well as residential properties.

6. Provide distances to **ALL** environmentally sensitive areas:

TYPE	Distance	Unit	TYPE	Distance	Unit
a. Prime/Unique Farmland	N/A		e. Wild/Scenic River	<15	miles
b. Wilderness Area/National Park	<25	miles	f. Coastal Zones	>400	miles
c. Sole-Source Aquifer	NA		g. Floodplain	<3	miles
d. Wetlands	<1	mile			

PART D - ENVIRONMENTAL IMPACT ANALYSIS

1. AIR

a. Is the proposed action in a non-attainment/maintenance area? ☐ YES ☑ NO
Attach a General Conformity Determination or Record of Non-Applicability (RONA) for Military Construction activities in non-attainment/maintenance areas.

b. Will the proposed action require an air emissions permit, registration, license, etc?
During proposed action ☐ YES ☑ NO
During normal operations after proposed action is completed ☐ YES ☑ NO

c. Will the proposed action release objectionable odors, smoke, dust, suspended particles, or noxious gases into the air?
During proposed action ☐ YES ☑ NO
During normal operations after proposed action is completed ☐ YES ☑ NO

d. Will the proposed action expose sensitive receptors (threatened or endangered plants or animals, or children) to pollutants?
During proposed action ☐ YES ☑ NO
During normal operations after proposed action is completed ☐ YES ☑ NO

Explain any **YES** answers and/or planned mitigation here.

2. TRAFFIC

a. Will the proposed action result in generation of or increase in aircraft activity/traffic? ☐ YES ☑ NO

b. Will the proposed action result in the generation of or increase in vehicular traffic? ☐ YES ☑ NO

c. Will the proposed action use and/or construct unimproved roads?	During proposed action During normal operations after proposed action is completed	☐ YES ☐ YES	☑ NO ☑ NO

Explain any **YES** answers and/or planned mitigation here. Include aircraft types, number of sorties, and flight schedules (if applicable).

3. NOISE

a. Will the proposed action result in an increase in noise levels?	During proposed action During normal operations after proposed action is completed	☐ YES ☐ YES	☑ NO ☑ NO

b. Is the proposed action close to any civilian activity where noise might affect the population (add any not listed in the spaces provided)? Include distances for all types: ☐ YES ☑ NO

TYPE	Distance	Unit	TYPE	Distance	Unit
(1) Residence/Home			(5) Library		
(2) Church			(6) Wilderness Area		
(3) School					
(4) Hospital					

c. Will the proposed action involve aircraft?		☐ YES	☑ NO
d. Will the proposed action involve night (10 pm to 7 am) operations?	During proposed action During normal operations after proposed action is completed	☐ YES ☐ YES	☑ NO ☑ NO

Explain any **YES** answers.

4. EARTH

a. Will the proposed action result in long-term disruptions, displacements, compaction, or overcovering of soil, a permanent change in topography, or ground surface relief features?	☐ YES	☑ NO
b. Will the proposed action result in a long-term increase in wind or water soil erosion, on or off the site, after the proposed action is completed?	☐ YES	☑ NO

Explain any **YES** answers.

5. NATURAL RESOURCES

NOTE- A **subject matter expert** from the State/Territory ARNG Environmental Office must confirm the answers to these questions by signing the signature page.

a. Will the proposed action change the diversity or numbers of any species including mammals, birds, reptiles, amphibians, fish, trees, shrubs, grasses, crops, microflora, or aquatic plants?	☐ YES	☑ NO
b. Will the proposed action introduce any non-native species into the area?	☐ YES	☑ NO
c. Will the proposed action impact any plants or animals that are listed or candidates for threatened, unique, rare, or endangered status?	☐ YES	☑ NO
d. Will the proposed action create barriers to prevent the migration or movement of animals?	☐ YES	☑ NO

e. Will the proposed action deteriorate, alter, or destroy existing fish or wildlife habitat?	☐ YES	☑ NO
f. Will the proposed action deplete any non-renewable natural resources?	☐ YES	☑ NO
g. Will the proposed action alter, destroy, or significantly impact environmentally sensitive areas (wetlands, coastal zones, etc.)?	☐ YES	☑ NO
Explain any **YES** answers.		

6. LAND USE

a. Will the proposed action alter the present land use of the site?	☐ YES	☑ NO
b. Who owns the property? ☑ Federal/DOD ☐ State ☐ City/Town/County ☐ Private ☐ Other (Explain): Military Facility		
c. Does the proposed action involve a real estate action (e.g., purchase, lease, permit, or license)?	☐ YES	☑ NO
Answer the following if you answered YES above: (1) Has an EBS been completed? **If YES,** attach the EBS.	☐ YES	☐ NO
(2) Require an increase of acreage/amendment to an existing lease or license?	☐ YES	☐ NO
(3) Require new purchase of additional acres using federal, state, or other funds?	☐ YES	☐ NO
(4) Require a new lease, license, and/or land use permit?	☐ YES	☐ NO
(5) Replace or dispose of existing facilities?	☐ YES	☐ NO
Explain any **YES** answers.		

7. SOLID WASTE

a. Will the proposed action generate solid wastes that must be disposed of on or off site?	☐ YES	☑ NO
Explain a **YES** answer.		

8. HAZARDOUS WASTE

a. Will the proposed action generate hazardous waste?		☐ YES	☑ NO
b. Will the proposed action store and/or prepare for the disposal of hazardous waste or materials?	During proposed action	☐ YES	☑ NO
	During normal operations after proposed action is completed	☐ YES	☑ NO
c. Does the proposed action require a permit to accumulate hazardous waste or materials at the site?	During proposed action	☐ YES	☑ NO
	During normal operations after proposed action is completed	☐ YES	☑ NO
d. Does the proposed action have an increased risk for explosion, spill, or the release of hazardous waste or materials (including but not limited to pesticides, chemicals, or radiation)?	During proposed action	☐ YES	☑ NO
	During normal operations after proposed action is completed	☐ YES	☑ NO
e. Will the proposed action require the presence of trained personnel to handle and dispose of hazardous	During proposed action	☐ YES	☑ NO
	During normal operations after	☐ YES	☑ NO

f. Will the proposed action involve the opportunity for hazardous material minimization and recycling?	During proposed action During normal operations after proposed action is completed	☐ YES ☐ YES	☑ NO ☑ NO
Explain any **YES** answers.			
g. Do you have a plan describing procedures for the proper handling, storage, use, disposal, and cleanup of hazardous and/or toxic materials?	During proposed action During normal operations after proposed action is completed	☑ YES ☑ YES	☐ NO ☐ NO
Explain any **NO** answers.			

9. WATER

a. Will the proposed action change currents, course, or direction of water movements in marine or fresh waters?		☐ YES	☑ NO
b. Will the proposed action discharge sediments, liquids, or solid wastes into surface waters, or alter the surface water quality?	During proposed action During normal operations after proposed action is completed	☐ YES ☐ YES	☑ NO ☑ NO
c. Will the proposed action change the quality and/or quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?		☐ YES	☑ NO
d. Does the proposed action have the potential to accidentally spill hazardous or toxic materials in or near a body of water?	During proposed action During normal operations after proposed action is completed	☐ YES ☐ YES	☑ NO ☑ NO
e. Does the proposed action have the need for a Spill Control and Countermeasure Plan, and/or Installation Spill Contingency Plan (SPCC and/or ISCP)?	During proposed action During normal operations after proposed action is completed	☐ YES ☐ YES	☑ NO ☑ NO
f. Will the proposed action construct facilities or implement actions within floodplains and/or wetlands?	During proposed action During normal operations after proposed action is completed	☐ YES ☐ YES	☑ NO ☑ NO
g. Does the proposed action require an NPDES stormwater or wastewater discharge permit?		☐ YES	☑ NO
h. Does the proposed action involve the construction of a water or wastewater treatment system (oil water separators, grease traps, etc)?		☐ YES	☑ NO
Explain any **YES** answers.			

10. CULTURAL RESOURCES

a. Does the proposed action involve an undertaking (Reference: 36 CFR 800.161[y]) to a building/structure 50 years or older?	☐ YES	☑ NO
If YES to Question a, has an architectural inventory/evaluation been completed to determine eligibility for the National Register of Historic Places?	☐ YES	☐ NO
b. Does the proposed action involve ground disturbance? (Reference: 36 CFR 800.161[y])	☐ YES	☑ NO
If YES to Question b, has an archaeological inventory been completed to determine if there are any archaeological sites present?	☐ YES	☐ NO
If YES to Question b, did the state contact any Federally-recognized Tribes to comment on the proposed action?	☐ YES	☐ NO
c. Does the proposed action fall under any Federal or Nationwide Programmatic Agreement or Programmatic Comment? **If YES**, reference it below.	☐ YES	☑ NO
d. Has the state contacted the SHPO for comments?	☑ YES	☐ NO
e. Does the proposed action have the potential to affect any traditional cultural properties or sacred sites? **If YES,** attach coordination with Federally-recognized Tribes.	☐ YES	☑ NO

Explain any **YES** answers.
SHPO will be contacted as well as all related Indian Tribes as part of this action.

11. POPULATION

a. Will the proposed action alter the location, distribution, density, or growth rate of the human population of an area?		☐ YES	☑ NO
b. Will the proposed action affect children? Reference: Executive Order 13045	During proposed action	☐ YES	☑ NO
	During normal operations after proposed action is completed	☐ YES	☑ NO
c. Are there any Environmental Justice issues associated with the proposed action? Reference: Executive Order 12898.		☐ YES	☑ NO

Explain any **YES** answers.

12. INFRASTRUCTURE

a. Will the proposed action result in the need for new systems or substantial alterations to the following utilities:

(1) Electrical power, fossil fuel or other (specify):	☐ YES	☑ NO
(2) Drinking water?	☐ YES	☑ NO
(3) Wastewater treatment?	☐ YES	☑ NO
(4) Sewer collection system?	☐ YES	☑ NO
(5) Wash racks?	☐ YES	☑ NO
(6) Solid waste disposal?	☐ YES	☑ NO

Explain any **YES** answers.

N/A

PART E - INNOVATIVE READINESS TRAINING (IRT)

Skip this portion if this is not an IRT Project

1. REQUESTER INFORMATION

a. REQUESTER NAME:	b. TITLE:	
c. AGENCY NAME:		
d. AGENCY ADDRESS:		
e. COMM VOICE:	f. COMM FAX:	g. DSN VOICE:
h. DSN FAX:	i. EMAIL:	

j. TYPE: ☐ FEDERAL ☐ STATE ☐ LOCAL/MUNICIPAL ☐ YOUTH/CHARITABLE

k. SUPPORT TYPE REQUESTED:

☐ ENGINEER ☐ TRANSPORTATION ☐ TECH ASSISTANCE ☐ LOGISTICAL

☐ COMMUNICATION ☐ ADMINISTRATIVE ☐ CEREMONIAL ☐ PARADE

☐ OTHER (SPECIFY):

2. ASSIGNED UNIT INFORMATION (Filled out by assigned National Guard unit)

a. UNIT ASSIGNED PROJECT:	b. SERVICE COMPONENT:
c. UNIT ADDRESS:	
d. PROJECT OFFICER RANK: NAME:	
e. SITE VISIT DATE (dd-mmm-yy	

f. PROJECT ASSESSMENT (Give detailed assessment of project requirements. Review project requirements against the screening criteria in Section 651.29 of 32 CFR Part 651. If the project qualifies for a Categorical Exclusion, indicate the Categorical Exclusion code).

g. ESTIMATED NUMBER OF HOURS REQUIRED TO COMPLETE PROJECT:	h. PERSONNEL REQUIRED:	OFFICER	ENLISTED

PART F - DETERMINATION

a. Does the proposed action have the potential to degrade the quality of the environment, or curtail the diversity of the environment? ☐ YES ☑ NO

b. Does the proposed action have the potential for cumulative impacts on environmental quality when the effects are combined with those of other Federal/State actions, or when the action is of lengthy duration? ☐ YES ☑ NO

c. Does the proposed action have environmental effects that will cause substantial adverse effects on the human or natural environment, either directly or indirectly? ☐ YES ☑ NO

On the basis of this initial evaluation, the following is appropriate (check one):

- ☐ An **Environmental Baseline Survey (EBS)** and a **new checklist** once the EBS is completed.
- ☐ IAW 32 CFR 651 Appendix B, the proposed action qualifies for a **Categorical Exclusion (CX)** that does not require a Record of Environmental Consideration.
- ☑ A **Record of Environmental Consideration (REC).**
- ☐ An **Environmental Assessment (EA).**
- ☐ A **Notice of Intent (NOI)** to prepare an **Environmental Impact Statement (EIS).**

Signature of Proponent (Requester)

Printed Name of Proponent (Requester)

19 Oct 2011
Date Signed

Concurrence:

Environmental Program Manager

Printed Name of Env. Program Manager

Oct 25, 2011
Date Signed

Concurrence (as needed):

Signature of Landowner

Printed Name of Landowner

Date Signed

Signature of Commander

Printed Name of Commander

Date Signed

Signature of Facilities Officer

BISHOP JAMES B.
Printed Name of Facilities Officer

25 Oct 11
Date Signed

Signature of Plans & Operations Officer

Printed Name of Plans & Operations Officer

Date Signed

APPENDIX B

Upcoming INRMP Natural Resources Projects

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Natural Resources Projects for Revised INRMP

Many natural resources and training site improvement projects are planned for the upcoming years. Most are identified either in Chapter Four of this plan or in the ITAM 5-year plan. Table B-1 lists the projects from this INRMP, sorted according to management sphere (ecosystem management, endangered species, wetlands, etc.), goal, and objective.

An estimated cost is provided for projects which are expected to involve any expenditure beyond manpower. Some projects are expected to be developed/planned and funds requested when the need is identified by evaluations and other observations. Status Tool for the Environmental Program (STEP) project numbers associated with projects that are recurring or already planned and funds requested are provided. An N/A in the STEP column indicates that the project is to be accomplished in-house and doesn't require additional funds, or no project needs have been identified at this time. While most of these projects have been entered into the appropriate budget system (STEP or other) implementation is of course subject to funding availability. The anticipated method of conducting the work is given as either contract (C) or in-house (IH). The "proponent" is identified in accordance with the Sustainable Range/Installation Environmental Activities Matrix as either the Environmental office (ENV), Facilities (FAC), or the ITAM program. In certain cases, two entities are identified. For these projects, it is anticipated that funding will be provided by one source, but that the other proponent will provide subject matter expertise. "SITE" represents work to be done by the training site staff, rather than funding.

Table B-1: VTS-Smyrna Natural Resources Projects

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin[1]	Year	Est. Cost& Method[2]	Proponent[3]	Status	STEP Project Number
1. Ecosystem Management	**Goal 1**	**Provide the ecosystem types needed for training.**						
	1-1	**Manage for mission-suitable habitats or "missionscape".**						
	1a	Missionscape statement review and update	R	Annual	IH	ENV	Ongoing	N/A
	1b	Missionscape plan review and update	R	Annual	IH	ENV	Ongoing	N/A
	1c	Develop mgmt. actions to improve mission habitats.	R	As need	IH	ENV		As need
	Goal 2	**Maintain or improve ecosystem, habitat, and species diversity.**						
	1-2	**Identify ecotypes present on the training site and maintain up to date information regarding those systems.**						
	1d	Vegetation community planning level survey every 10 years	R	2022	C $40,000	ENV		TNONG190004
	1e	Wetland survey to include quality assessment every 10 years	R	2022	C $58,000	ENV	Complete	TNONG160007
	1f	Surface water quality assessment every 5 years	R	2020	C $30,000	ENV		TNONG190003
	1-3	**Characterize the species composition, ecosystem health, and wildlife use of the significant habitats on VTS-S.**						
	1g	RTE planning level survey (PLS) every 5 years.	R	2019	C $96,600	ENV		TNONG180001
	1h	Bat PLS survey every 5 years.	R	2021	C $80,000	ENV	Complete 2017	TNONG160010
	1i	Avian PLS every 5 years.	R	2018	C $37,500	ENV	In prog.	TNONG160005
	1j	Insect baseline survey then every 5 years.	N	2018	C $38,000	ENV	In prog.	TNONG160002
	1k	Aquatic fauna PLS every 5 years.	R	2020	C $50,000	ENV		TNONG190003
	1l	Mammal survey every 10 years	R	2025	C $25,000	ENV		TNONG160004
	1m	Herpetofauna survey every 10 years	R	2025	C $35,000	ENV		TNONG160004
	Goal 3	**Protect unique communities.**						
	1-4	**Develop management strategies to protect ecotypes/habitats of importance**						

Whether the project appeared in the earlier INRMP: N = new to this INRMP; C = carried over from previous INRMP; R = repeat of past survey.
[2] Probable method of conducting project: C = contract; IH = in-house; OA = Outside Agency. Cost is estimate only and is not guarantee of available funding.
[3] Party responsible for funding and/or conduct of action: ENV = environmental office; FAC = facilities maintenance funds; ITAM = training funds; SITE = training site staff.

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin[1]	Year	Est. Cost& Method[2]	Proponent[3]	Status	STEP Project Number
	1n	Map and priority list of extant ecosystems	N	2022	IH	ENV		N/A
	1o	Identify threats to significant habitats.	N	Annual	IH	ENV	Ongoing	N/A
	1p	Collect threat and training use details	N	2022	IH	ENV	Ongoing	N/A
	1q	Habitat protection plan development	N	2023	IH	ENV		N/A
	1-5	**Manage for ecosystem health, wildlife, and improved habitat quality**						
	1r	Eliminate invasive species where feasible	R	Ongoing	IH	ENV	In prog.	TNONG160011
	1s	Implement conservation/restoration of natural vegetation communities.	R	Ongoing				As need
	1t	Identify locations for native species restoration	N	2022	IH	ENV		N/A
	1u	Develop restoration plan	N	2023	IH	ENV		N/A
	1v	Implement restoration plan when feasible	N	As feasible	IH	ENV		As need
	1w	Institute prescribed fire to meet management needs	R	As feasible		ENV		TN525180001
	1x	Implement measures of biodiversity to evaluate habitat health	R	As feasible	IH	ENV		N/A
2. RTE Management	**Goal 1**	**Prevent accidental take of federally listed species and ensure ESA compliance.**						
	2-1	**Quantify and monitor populations of state and federal RTE species on VTS-S.**						
	2a	RTE PLS every 5 years, (same as Target 1g)	1g	2019	See 1g	ENV		See Target 1g
	2b	Develop or incorporate newly detected or listed species into an Endangered Species Mgmt. Component as needed	R	As needed	IH	ENV		N/A
	2c	Develop monitoring protocols for newly discovered RTE species as needed	C	As needed	IH / C	ENV		N/A
	2d	Regular communication with TWRA & USFWS, including consultation on major projects	2h	As needed	See 2h	ENV		N/A
	Goal 2	**Monitor for federally listed bat species on VTS-S.**						
	2-2	**Monitor and characterize use of federally listed bats species on VTS-S.**						
	2e	Survey bat species every 5 years. (same as target 1h)	R	2021	See 1h	ENV		See Target 1h
	2f	Develop/update ESMC for RTE bat species management as needed.	N	As needed	IH	ENV		N/A
	Goal 3	**Maintain or enhance native plant communities that support listed species.**						

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin[1]	Year	Est. Cost& Method[2]	Proponent[3]	Status	STEP Project Number
	2-3	**Identify and manage native plant communities currently or potentially supporting RTE species.**						
	2g	Develop community-based RTE habitat mgmt. plans as needed	N	As needed	IH	ENV		N/A
	2h	Control invasive plants where impacting RTE habitats as needed	N	As needed	IH	ENV		See Target 1r
	2i	Monitor community health through long-term vegetation monitoring (in conjunction with 1d)	N	2023	IH	ENV		See Target 1d
3. Reclamation / Mitigation	**No projects at this time.**							
4. Erosion control	**Goal 1**	**Prevent, identify, and minimize the development of erosion and sedimentation problems on VTS-S.**						
	4-1	**Prevent erosion issues from occurring.**						
	4a	Restrict vehicle traffic in 50 ft. SMZs along all stream and lake shores.	C	Ongoing		ENV		N/A
	4b	Post and maintain signs identifying SMZs	C	As Needed	IH $300	ENV		TNONG180004
	4c	Maintain all SMZs during all timber harvest and clearing activities, retaining all trees in SMZs	C	Ongoing		ENV		See
	4d	Monitor erosion at boat ramp in TA 4 and repair as needed.		Ongoing		ENV		As need
	4e	BMP training module	N	2013	IH $1,000	ENV		Complete
	4f	Develop erosion repair guide	N	2012	IH $2,000	ENV		Complete
	4-2	**Identify and minimize potential erosion problems early on**						
	4g	Monitor for potential erosion issues during regular site visits	R	Ongoing		ENV	On-going	N/A
	4h	Develop reporting form for soldiers and staff	N	2019	IH	ENV	Complete	N/A
	4i	Place reporting form on ENV website for easy access	N	2019	IH	ENV	Complete	N/A
	4j	Erosion report tracking system	N	2019	IH	ENV	Complete	N/A
	4k	Annual erosion surveys	R	Annual	IH	ENV/SITE	On-going	N/A
	Goal 2	**Identify and rehabilitate existing erosion problems.**						
	4-3	**Repair identified/existing erosion issues.**						
	4l	Coordinate repair of erosion issues (typically facility responsibility) including plan development	R	Ongoing		ENV/Site		N/A

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin[1]	Year	Est. Cost& Method[2]	Proponent[3]	Status	STEP Project Number
	4m	Implement erosion control methods in plan	R	As Needed		ENV/Site		N/A
	4n	Revegetate erosion sites in accordance with plan	R	As Needed		ENV/Site		As need
5. Watershed Management	**Goal 1**	**Improve understanding of ecosystem dynamics and stressors within watersheds.**						
	5-1	**Improve knowledge of riparian areas and their conditions.**						
	5a	Conduct vegetation community and aquatic fauna surveys as noted in Section 4.2.1	1d & 1k	2022 & 2020		ENV		See Targets 1d & 1k
	5b	Survey streams as part of regular erosion surveys as noted in Section 4.2.4	4g	Annual	IH	ENV		N/A
	5c	Implement water quality monitoring every 5 years	1f	2020	C	ENV		TNONG190003
	5d	Conduct karst feature survey every 10 years	R	2022	C $25,000	ENV		TN255140001
	Goal 2	**Minimize nutrient, sediment, and non-point source pollution entering streams.**						
	5-2	**Improve buffering quality of the riparian areas**						
	5e	Riparian habitat assessments	N	2019	IH $5,000	ENV		TNONG160009
	5f	Restore degraded buffers with appropriate native vegetation, as needed	R	As needed		ENV		As need
	5g	Repair erosion and sedimentation problems as identified, in accordance with Section 4.2.4	R	As needed		ENV		As need
	5h	Control invasive species in the riparian communities	R	Ongoing	Funds Available	ENV		See Target 1r
	5i	Monitor riparian ecosystems to determine effects of management (Section 4.2.11)	1d, R	2022		ENV		See Target 1d
	5-3	**Protect shoreline of Stewart Creek and all riparian areas from potential causes of erosion.**						
	5j	Restrict all vehicular traffic in SMZ	R	Ongoing	IH	ENV		N/A
	5k	Post SMZs and maintain biennially	N	2019	IH $5,000	ENV	Ongoing	See Target 4b
	5l	Maintain SMZs during timber harvest and clearing	N	As need	IH	ENV		See Target 4b
	5m	SMZ training module	N	20121	IH $1,000	ENV	Complete	N/A
6. Wetlands Protection	**Goal 1**	**Manage for healthy resilient wetlands with no net loss of acreage, function, or values.**						
	6-1	**Improve knowledge of existing wetlands and their conditions.**						
	6a	Wetland surveys every 10 years as noted in Section 4.2.1.	1e	2022		ENV		See Target 1e
	6b	Wetland floristic study	1d	2022		ENV		See Target 1d
	6c	Wetland fauna study	1k	2020		ENV		See Target 1k

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin[1]	Year	Est. Cost& Method[2]	Proponent[3]	Status	STEP Project Number
	6-2	**Implement and enforce buffer areas around wetlands.**						
	6d	Post signs identifying 50' buffer zones	R	2019	IH $3,000	ENV		See Target 4b
	6e	Identify areas around wetlands requiring vegetative buffer or filter strip for protection	R	Ongoing		ENV		N/A
	6f	Buffer zone vegetative/compliance assessment	N	2019	IH	ENV		N/A
	6g	Wetland buffer training module	C	2019	IH $1,000	ENV		N/A
7. Forest Management	**Goal 1**	**Provide optimum forestland training opportunities for TNARNG.**						
	7-1	**Improve training areas by selected timber harvesting techniques.**						
	7a	Consult with training site staff	C	Annual	IH	ENV		N/A
	7b	Identify appropriate management practices to create desired training conditions, as needed.	R	As needed	IH/COE	ENV		N/A
	7c	Implement timber management to support training, as needed.	R	As needed	IH	ENV		N/A
	Goal 2	**Manage for forest health, and habitats of RTE, wildlife, and native plant species and communities.**						
	7-2	**Maintain needed forest information.**						
	7d	Repeat forest inventory every 10 years.	R	2024	C $50,000	ENV		TNONG160012
	7e	Conduct PLSs as noted in Section 4.2.1	R	Ongoing	Variable	ENV		See Targets 1d-1m
	7-3	**Improve forest health and habitat quality.**						
	7f	Review inventory and PLS data and update forest management plan	R	As needed	C	ENV		N/A, Program On Hold
	7g	Perform timber stand improvement activities.	R	As need	C	ENV		N/A
	7h	Conduct prescribed burning when feasible	R	When feasible	C	ENV		See Target 8f
	7i	Control invasive exotic species where needed IAW Annex 3	R	As need	IH/C	ENV		N/A
	7j	Maintain appropriate stand conditions near waterways	R	As need	IH	ENV		N/A
	7k	Monitor changes to biodiversity and species composition through long-term vegetation monitoring	1d	2022		ENV		See Target 1d
8. Fire Management	**Goal 1**	**Control and minimize threats to property and personnel associated with wild and prescribed fire.**						
	8-1	**Ensure effective fire break system.**						
	8a	ID additional fire break needed	C	2018	IH & C	ENV, FAC	In Prog.	N/A
	8b	Create firebreaks where and when needed	C	Ongoing	IH	ENV, FAC		N/A
	8c	Maintain firebreaks as needed.	C	Ongoing	FAC	ENV, FAC		N/A
	8-2	**Implement prescribed fire program.**						

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin[1]	Year	Est. Cost& Method[2]	Proponent[3]	Status	STEP Project Number
	8d	Obtain required training for TNARNG personnel	C	Annual	C $1,000 per year	ENV, FAC		N/A
	8e	Obtain equipment required for prescribed burning	C	Annual	IH	ENV		N/A
	8f	Coordinate with TNFC or others for burn boss and to conduct prescribed burns when needed.	C	As need	IH	ENV		TN525180001
	8g	Conduct postburn evaluations and monitoring	C	Annual	IH	ENV		N/A
	8h	Review and update WFMP annually, revise every 5 years	C	Annual & 2022	C $47,000	ENV		TNONG160001
9. Fish & Wildlife Management	**Goal 1**	**Maintain fish and wildlife populations through maintenance of healthy vegetative communities, habitats, and ecosystems.**						
	9-1	**Gain updated and complete data on wildlife use of VTS-S.**						
	9a	Perform PLSs for species groups as outlined in Section 4.2.1.	C	Ongoing	IH & C	ENV		See Targets 1g-1m
	9-2	**Manage habitats for all native species.**						
	9b	Maintain SMZs and wetland buffers	R	Ongoing	IH	ENV		See Target 6d
	9c	Install nest boxes and maintain annually as needed	R	As need	IH $1,000	ENV		N/A
	9d	Restore grasslands to native plants where feasible. See Section 4.2.1.	R	Where feasible	IH	ENV		As need
	9e	Monitor vegetation community condition through PLS. See Section 4.2.1.	1d	2022	C	ENV		See Target 1d
	9f	Implement vegetative community/habitat management actions as needed.	R	As need	IH	ENV		As need
	9g	Wildlife training module	C	2013	IH $1,000	ENV	Completed	N/A
	9-3	**Manage animal pests to protect training land availability, ecosystem health, and RTE species.**						
	9h	Conduct population counts for deer or other species as needed.	R	As need	IH	ENV		N/A
	9i	Consult with TWRA on species carrying capacity	R	As need	IH	ENV		N/A
	9j	Implement population control when needed	R	As need	Out agency & C	ENV		As need
10. Pest Management	**Goal 1**	**Ensure pest management on VTS-S accomplishes the intent and requirements of the TNARNG IPMP.**						
	10-1	**Implement the TNARNG IPMP**						
	10a	Accomplish required pesticide application reporting.	N	Quarterly	FAC	ENV		N/A
	10b	Review program to ensure legal compliance.	N	Annual	IH	ENV		N/A

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin[1]	Year	Est. Cost& Method[2]	Proponent[3]	Status	STEP Project Number
	10c	Review program for proper IPMP procedures are followed.	N	Annual	IH	ENV		N/A
	Goal 2	**Control animal and plant pests as needed to achieve training and environmental objectives.**						
	10-2	**Control IPP for ecosystem health.**						
	10d	Invasive pest plant survey every 5 years	R	2012	C $35,000	ENV		TNONG160006
	10e	Implement appropriate pest plant control plans	R	As need	IH/C $10,000	ENV		N/A
	10f	Monitor IPP change through long-term vegetation monitoring	C	2022	C	ENV		See Targets 1d & 10d
	10-3	**Control pest species for training area improvement.**						
	10g	Identify problem IPPs and develop control plans	R	As need	IH	ENV		N/A
	10h	Implement control plans.	R	As need	FAC	ENV/FAC		N/A
	10i	Monitor IPP change through long-term vegetation monitoring	C	2022	C	ENV		See Targets 1d & 10d
	10-4	**Control pests for training site user safety and comfort.**						
	10j	Install and maintain bat boxes and bird nest boxes	C	Annual	IH $1,000	ENV		N/A
	10k	Annual fire ant survey	N	Annual	IH	ENV		N/A
	10l	Control pest animal populations as needed.	R	Ongoing	FAC	ENV		N/A
	10-5	**Control pest animals for the protection of natural communities and RTE species and to minimize loss of training land.**						
	10m	Gather information about game and other species populations.	R	Ongoing	IH	ENV		See Targets 1g-1m
	10n	Consult with TWRA about species carrying capacities and weather population control is needed when necessary	R	As need	OA	FAC		N/A
11. Long-term Monitoring	**Goal 1**	**Use analyses of data collected through long-term vegetation plots to monitor effects of training and land management activities on VTS-S.**						
	11-1	**Develop and implement a vegetation monitoring program.**						
	11a	Develop vegetation monitoring protocol	C	2023	C $10,000	ITAM		N/A
	11b	Establish permanent vegetation monitoring plots	C	2024	IH	ITAM		N/A
	11c	Resample monitoring plots as appropriate	C	As need	IH	ITAM		N/A
12. Grounds Maintenance	**Goal 1**	**Apply environmentally beneficial grounds maintenance techniques to maintain an attractive and functional landscape that meets training and other TNARNG needs.**						
	12-1	**Utilize regionally native species for plantings whenever feasible.**						

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin[1]	Year	Est. Cost& Method[2]	Proponent[3]	Status	STEP Project Number
	12a	Use native grasses to seed exposed soils when compatible with area use	R	Ongoing	IH	ENV		As need
	12b	Use native shrubs, trees, and wildflowers for aesthetic plantings	R	Ongoing	IH	ENV		As need
	12c	Develop native planting guide	N	2011	IH $500	ENV	Complete	N/A
	12-2	**Blur the "edge" between maintained and natural areas.**						
	12d	Survey for transition areas needing improvement	C	Ongoing	IH	ENV		N/A
	12e	Develop and implement plans to improve transition zones where needed	C	Ongoing	IH $500	ENV		As need
	12-3	**Adjust maintenance schedule to benefit environment.**						
	12f	Create list of values impacted by ground maintenance and determine appropriate scheduling.	C	2022	IH	ENV		N/A
	12g	Modify maintenance calendar in INRMP to achieve needed protections.	C	2022	IH	ENV		N/A
13. Recreational Use Management	**Goal 1**	**Take precautions to minimize conflicts with off post recreational use to prevent interference with training and hazardous situations for the public or TNARNG personnel.**						
	13-1	**Identify and make known legal public access restrictions on VTS-S**						
	13a	Identify locations with unclear access limitations, especially along facility shorelines.	C	Ongoing	FAC	FAC & ENV		N/A
	13b	Post and maintain regulations and signs to inform public of site access restrictions as needed	C	Ongoing	FAC	FAC & ENV		As need
14. Environmental Hazards	**Goal 1**	**Protect site staff, soldiers, and other personnel from naturally-occurring features that present a risk on VTS-S.**						
	14-1	**Identify and make known sinkholes occurring on VTS-S.**						
	14a	Conduct karst feature survey every 10 years. (same as 5d)	R	2022	C $25,000	ENV		See Target 5d
	14b	Mark sinkholes as needed.	R	Ongoing	FAC	FAC & ENV		As need
15. Cultural Resources	**All aspects defined in TNARNG ICRMP.**							
16. GIS	**Goal 1**	**Maintain, update, and expand the GIS database to make accurate data available for training and management planning.**						
	16-1	**Maintain constantly improving GIS.**						
	16a	Identify the data layers captured and still needed.	C	Ongoing	IH	ENV		N/A

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin[1]	Year	Est. Cost& Method[2]	Proponent[3]	Status	STEP Project Number
	16b	Update or create data layers as needed.	C	Ongoing	IH	ENV		N/A
	16c	Make data available through interactive web applications.	C	Ongoing	IH	ENV	Available	N/A
	16d	Review contract wording as needed	C	As need	IH	ENV		N/A
17. EMS	**EMS in development.**							
18. Climate Change	**Goal 1**	**Develop and implement a climate change response plan.**						
	18-1	**Conduct necessary research to predict likely local influences of climate change.**						
	18a	Review climate change predictions.	N	2022	IH	ENV		N/A
	18-2	**Develop and implement a climate change response plan**						
	18b	Determine which changes TNARNG can practically affect through management actions.	N	2022	IH	ENV		N/A
	18c	Identify functional approaches to manage change.	N	2022	IH	ENV		N/A
	18d	Develop a climate change management plan	N	2022	IH	ENV		N/A
	18e	Implement the climate change management plan.	N	2023	IH	ENV		As need
19. Pollinator Management	**Goal 1**	**Determine pollinator use and habitat condition on site.**						
	19-1	**Conduct necessary research to identify pollinators using the site, and the condition of their habitat.**						
	19a	Conduct a comprehensive survey of terrestrial macroinvertebrates.	N	2018	C $109,000	ENV		See Target 1j
	19b	Survey pollinator habitat conditions on site.	N	2022	IH			N/A & 1j
	Goal 2	**Develop and implement a pollinator management plan.**						
	19-2	**Develop and implement a pollinator management plan.**						
	19c	Identify specific issues with pollinator species composition and habitat conditions.	N	2022	IH	ENV		N/A
	19d	Identify appropriate and practicable management approaches to address identified issues.	N	2022	IH	ENV		N/A
	19e	Develop/implement pollinator management plan.	N	2023	IH	ENV		N/A

APPENDIX C

Agency Correspondence

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MILITARY DEPARTMENT OF TENNESSEE
Environmental Division
Houston Barracks
P.O. Box 41502
Nashville, Tennessee 37204-1502

November 27, 2017

Mary E. Jennings
Field Supervisor
U.S. Fish and Wildlife Service
Tennessee Field Office
446 Neal Street
Cookeville, TN 38501

Ms. Jennings,

The Tennessee Army National Guard (TNARNG) is in the process of revising and updating the Integrated Natural Resource Management Plan (INRMP) for Volunteer Training Site - Smyrna (VTS-S), located in Rutherford County, Tennessee. The Sikes Act and Army Regulation 200-1 require TNARNG to develop an INRMP for each of its Training sites. The INRMP must be revised every five years to ensure it remains current and relevant to managing the site under planed and existing uses and conditions. The original VTS-S INRMP covered the period 2002-2006. This third revision of the INRMP will cover the years 2018-2022. We hope to have the INRMP completed by February 28, 2018.

I am contacting you to inform you of this revision effort and request your agencies participation in the process. The USFWS and Tennessee Wildlife Resource Agency are important cooperators in our task of appropriately managing TNARNG lands and are required signatories of the plan. Your agency made many valuable contributions to the last revision, and your input and contributions will be greatly appreciated in this revision as well.

VTS-S is located next to the Smyrna/Rutherford County Regional Airport in Smyrna, about 22 miles southeast of Nashville, TN. The training site occupies 857 acres on the shores of Stewart Creek and J. Percy Priest Lake. The maps in Chapter 2 of the INRMP you have been provided show the general location and exact boundaries of the training site. The land is licensed from the Army Corps of Engineers. Natural resources on VTS-S include mixed hardwood and redcedar forests on the uplands, bottomland hardwood forest along the waterways, and areas of maintained grassland. The only federally listed species documented on VTS-S was a lone male gray bat captured during a 2013 bat survey. Through coordination with USFWS, it was determined that given the lack of karst features for roosting or hibernating on post, the generally poor to moderate habitat conditions, the location of capture, and the tendency of gray bats to forage and commute over and along open water and other water features, the bat was simply foraging while commuting through VTS-S. A bat survey was conducted on VTS-S this summer, and we are expecting the report soon.

There have not been any significant changes in the intended use of VTS-S, or in existing conditions. The draft INRMP has been updated to incorporate information from resource area, species group, and individual species surveys conducted since the previous INRMP revision. The draft also updates information on existing facilities. Further, there have been some formatting changes to make the document more user-friendly and functional.

Two minor functional changes to the INRMP involve the addition of sections addressing long-term adaptation to climate change and pollinator management in Chapter 4 (Resource Management). These sections primarily address the need for data collection and development of plans to address related issues.

Our overall VTS-S management goals of maintaining healthy native plant communities and wildlife habitats/populations, while ensuring the continued availability of a quality environment for military training, have remained the same. The INRMP accomplishes this through an ecosystem management approach. The objectives of our approach to ecosystem management are achieved by balancing military activities with habitat and vegetation management, protection of RTE species, preventing and repairing soil disturbance/erosion, and protecting creeks, wetlands and riparian areas from training and construction damage.

We hope to receive your comments by January 15, 2018. Please contact me with any questions or comments at (615) 313-0945 or brian.e.knapp.nfg@mail.mil. Your participation, insights, and comments in the revision of the VTS-S INRMP are greatly appreciated.

Sincerely,

Brian Knapp
Natural Resource Manager
Tennessee Army National Guard
JFHQ-TN-FMO-ENV
3041 Sidco Drive
Nashville, TN 37204

Enclosure

MILITARY DEPARTMENT OF TENNESSEE
Environmental Division
Houston Barracks
P.O. Box 41502
Nashville, Tennessee 37204-1502

November 27, 2017

Richard Kirk
Region 2 Wildlife Manager
Tennessee Wildlife Resources Agency
P.O. Box 41489
Nashville, TN 37204

Mr. Kirk,

The Tennessee Army National Guard (TNARNG) is in the process of revising and updating the Integrated Natural Resource Management Plan (INRMP) for Volunteer Training Site - Smyrna (VTS-S), located in Rutherford County, Tennessee. The Sikes Act and Army Regulation 200-1 require TNARNG to develop an INRMP for each of its Training sites. The INRMP must be revised every five years to ensure it remains current and relevant to managing the site under planed and existing uses and conditions. The original VTS-S INRMP covered the period 2002-2006. This third revision of the INRMP will cover the years 2018-2022. We hope to have the INRMP completed by February 28, 2018.

I am contacting you to inform you of this revision effort and request your agencies participation in the process. The Tennessee Wildlife Resource Agency and USFWS are important cooperators in our task of appropriately managing TNARNG lands and are required signatories of the plan. Your input and contributions will be greatly appreciated in this revision.

VTS-S is located next to the Smyrna/Rutherford County Regional Airport in Smyrna, about 22 miles southeast of Nashville, TN. The training site occupies 857 acres on the shores of Stewart Creek and J. Percy Priest Lake. The maps in Chapter 2 of the INRMP you have been provided show the general location and exact boundaries of the training site. The land is licensed from the Army Corps of Engineers. Natural resources on VTS-S include mixed hardwood and redcedar forests on the uplands, bottomland hardwood forest along the waterways, and areas of maintained grassland. The only federally listed species documented on VTS-S was a lone male gray bat captured during a 2013 bat survey. Through coordination with USFWS, it was determined that given the lack of karst features for roosting or hibernating on post, the generally poor to moderate habitat conditions, the location of capture, and the tendency of gray bats to forage and commute over and along open water and other water features, the bat was simply foraging while commuting through VTS-S. A bat survey was conducted on VTS-S this summer, and we are expecting the report soon.

There have not been any significant changes in the intended use of VTS-S, or in existing conditions. The draft INRMP has been updated to incorporate information from resource area, species group, and individual species surveys conducted since the previous INRMP revision. The draft also updates information on existing facilities. Further, there have been some formatting changes to make the document more user-friendly and functional.

Two minor functional changes to the INRMP involve the addition of sections addressing long-term adaptation to climate change and pollinator management in Chapter 4 (Resource Management). These sections primarily address the need for data collection and development of plans to address related issues.

Our overall VTS-S management goals of maintaining healthy native plant communities and wildlife habitats/populations, while ensuring the continued availability of a quality environment for military training, have remained the same. The INRMP accomplishes this through an ecosystem management approach. The objectives of our approach to ecosystem management are achieved by balancing military activities with habitat and vegetation management, protection of RTE species, preventing and repairing soil disturbance/erosion, and protecting creeks, wetlands and riparian areas from training and construction damage.

We hope to receive your comments by January 15, 2018. Please contact me with any questions or comments at (615) 313-0945 or brian.e.knapp.nfg@mail.mil. Your participation, insights, and comments in the revision of the VTS-S INRMP are greatly appreciated.

Sincerely,

Brian Knapp
Natural Resource Manager
Tennessee Army National Guard
JFHQ-TN-FMO-ENV
3041 Sidco Drive
Nashville, TN 37204

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Tennessee ES Office
446 Neal Street
Cookeville, Tennessee 38501

February 21, 2018

Mr. Brian Knapp
Natural Resource Manager
Tennessee Army National Guard
JFHQ-TN-ENV
3041 Sidco Drive
Nashville, Tennessee 37204

Subject: FWS# 2018-CPA-0296. Draft Revision of the 2017-2018 Integrated Natural Resources Management Plan for the Tennessee Army National Guard Volunteer Training Site – Smyrna in Rutherford County, Tennessee.

Dear Mr. Knapp:

U. S. Fish and Wildlife Service (Service) personnel from the Tennessee Field Office have reviewed the third revision of the Integrated Natural Resources Management Plan (INRMP) for the Tennessee Army National Guard Volunteer Training Site – Smyrna (VTS-S) in Rutherford County, Tennessee. We offer the following comments.

The revised INRMP adequately describes the resources within the project area and the proposed actions impact on these resources. VTS-S appears to be proactive in surveys for rare, threatened, and endangered species at the facility. Bat surveys appear to be proposed every five (5) years. Our office considers a bat survey valid for two full survey seasons, therefore additional surveys may be needed if timber management practices are proposed. Also, it appears that tri-colored bats (*Perimyotis subflavus*) were detected during acoustic surveys, as well as captured in mist net surveys. The Service is currently reviewing the status of this species, and it is possible that it could become listed in the future.

We support VTS-S's initiative to insure that the Service's trust resources such as federally listed species, wetlands, migratory birds, and stream habitats are protected without undue interference with the overall mission of the installation. We also support the efforts of VTS-S in incorporating pollinator management into the revised INRMP.

Thank you for the opportunity to comment on the revised INRMP. If you have any questions regarding the information which we have provided, please contact Robbie Sykes of my staff at 931/525-4979, or at *robbie_sykes@fws.gov*.

Sincerely,

Robert E. Sykes for

Mary E. Jennings
Field Supervisor

From: Richard Kirk
To: Knapp, Brian E NFG NG TNARNG (US)
Subject: [Non-DoD Source] RE: VTS-Smyrna INRMP Revision Review (UNCLASSIFIED)
Date: Monday, February 26, 2018 3:27:06 PM
Attachments: image001.png

Brian,
The Smyrna INRMP looks good and I do not have additional recommendations.
Thanks for the opportunity
RK

From: Knapp, Brian E NFG NG TNARNG (US) [mailto:brian.e.knapp.nfg@mail.mil]
Sent: Tuesday, February 20, 2018 3:01 PM
To: Richard Kirk
Subject: VTS-Smyrna INRMP Revision Review (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Hi Richard,

I haven't heard anything back from you on the review of the VTS-Smyrna INRMP and just wanted to touch base to see where things stand with the review. I know things are hectic this time of year, but hope to receive your comments soon. It is OK if you don't have any comments. You can just send a letter/e-mail saying all looks good and you have no comments/recommendations. I really appreciate your efforts with this.

Have an awesome day.

Brian

Brian Knapp
Natural Resource Manager
JFHQ-TN-FMO-ENV
3041 Sidco Dr.
Nashville, TN 37204-1502

Office: 615-313-0945
Cell: 615-339-5814

CLASSIFICATION: UNCLASSIFIED

APPENDIX D

Public Comment

The final Integrated Natural Resources Management Plan for the Volunteer Training Site – Smyrna was submitted for public review from 1 February to 2 March 2012. No comments were received.

LIFESTYLES

Reminder: JLM to host informational event at Five Senses

The Daily News Journal

MURFREESBORO — Junior League of Murfreesboro is hosting an informational event in February for anyone who is interested in learning more about the nonprofit charitable organization.

The social will begin at 6 p.m. Feb. 20 at Five Senses restaurant, located at 1602 W. Northfield Blvd.

Five Senses will provide appetizers and a cash bar while information is presented regarding activities JLM is currently participating in throughout the community.

Junior League of Murfreesboro began 20 years ago with 24 charter members. The dedicated group of local women came together to develop an organization for the burgeoning community of Murfreesboro.

Currently Junior League of Murfreesboro has grown to an active membership of 155 women, with more than 70 sustainers, and members help serve many areas of need in this community.

Junior League members are committed to promoting voluntarism, developing the potential of women and improving communities through action and leadership of trained volunteers for charitable purposes.

The Junior League of Murfreesboro New Member program will begin in March and activation into the chapter is in September.

If you are interested in learning more about Junior League of Murfreesboro and plan to attend the informational social, contact Ann Elizabeth Rucker at aerucker@gmail.com or call 615-332-1939.

AKA celebrates silver anniversary

SUBMITTED PHOTO

The Murfreesboro Graduate Chapter (Pi Nu Omega) of Alpha Kappa Alpha Sorority Inc. recently celebrated its 25th anniversary. The chapter, which was chartered July 6, 1986, by 16 young ladies, currently has 80-plus members. The celebration was held at First Baptist Church on Castle Street Dec. 11. The program chair was Sernetta Bufford with co-chair Kenesha Harper. Brenda McKinney is president of the local AKA chapter. Charter members, seated, are, from left, Nolia Newsom, Patricia Smith (represented by her daughter Anetra Smith), Phyllis Washington, Linda Jordan, Kreda Yokley, Carolyn Davidson, Joan Simmons and Tanya Henderson. Charter members not present were the late Cora Addison, Phyllis Campbell, Clydell Clark, Rhonda Frazier, Janet Jones, Mary Scales, Connie Wade and the late Luvenia Webb.

--- NOTICE ---

Officials of the Tennessee Army National Guard announce the availability of the Integrated Natural Resources Management Plan for Smyrna Training Site, Smyrna, TN

The Integrated Natural Resources Management Plan is available for public review beginning February 1, 2012, and ending on March 2, 2012 at:

Smyrna Public Library
400 Enon Springs Road West
Smyrna, Tennessee 37167

The Integrated Natural Resources Management Plan was prepared by the Department of Defense, Tennessee Army National Guard and the National Guard Bureau in Washington, DC and provides guidance on the protection and management of natural resources on the Smyrna Training Site, Smyrna, TN. The document includes a list of projects to be implemented in coming years, as funding allows, to support military training and conserve the natural environment on the facility.

Comments on the Integrated Natural Resources Management Plan are invited, and they should be addressed to:

Tennessee Army National Guard
ATTN: Laura Lecher
PO Box 41502
Nashville, Tennessee 37204-1502
Telephone: 731-222-5321
www.tnmilitary.org

TN-0000779963

WEATHER

AccuWeather.com

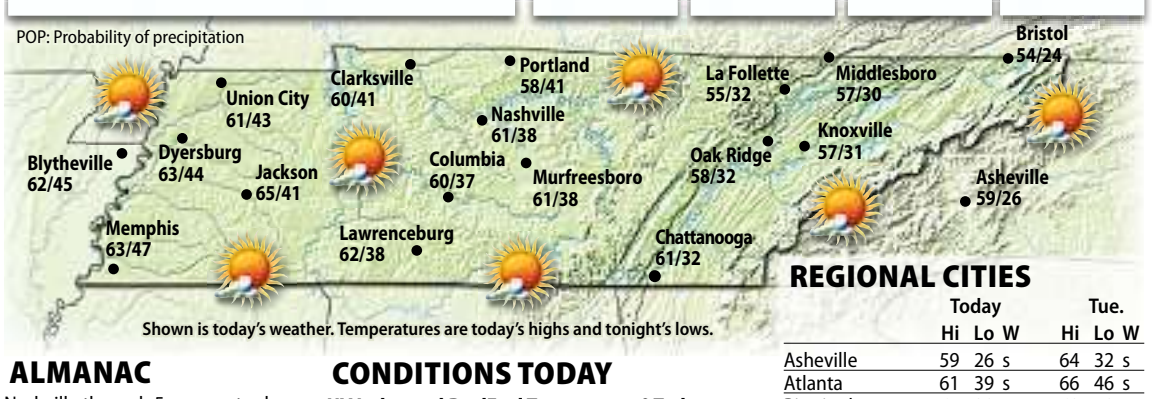
TODAY'S FORECAST

6 A.M.	NOON	6 P.M.	MIDNIGHT
31°	55°	52°	42°
POP: 0%	POP: 0%	POP: 0%	POP: 5%

Mostly sunny and comfortable today. Clear tonight.
High 61° / Low 38°

EXTENDED FORECAST

TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
65° 48°	62° 38°	59° 39°	56° 35°
POP: 10%	POP: 30%	POP: 30%	POP: 35%
Nice with periods of sun	Chance of a shower	Rain and drizzle possible	Mostly cloudy, rain possible

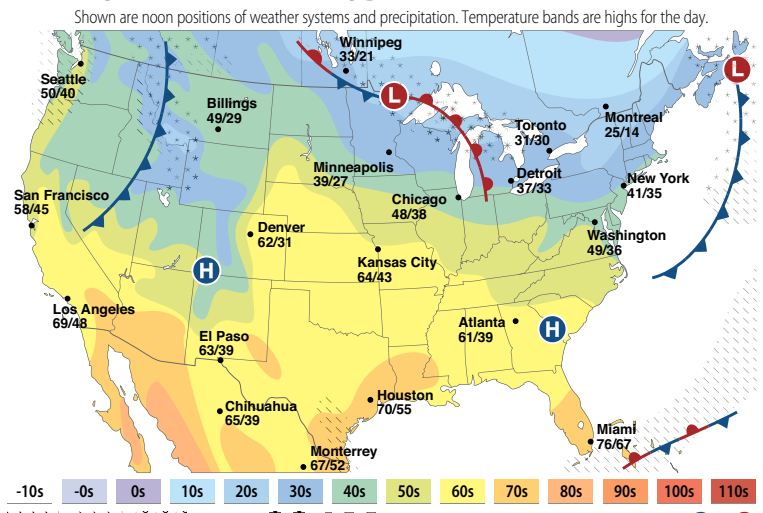


REGIONAL CITIES

	Today Hi	Lo	W	Tue. Hi	Lo	W
Asheville	59	26	s	64	32	s
Atlanta	61	39	s	66	46	s
Birmingham	64	39	s	69	49	pc
Chattanooga	61	32	s	67	40	s
Jackson, MS	69	44	s	72	52	pc
Little Rock	69	42	s	68	52	c
Louisville	56	41	pc	64	50	c
Memphis	63	47	s	68	56	c
Nashville	61	38	s	68	51	pc

NATIONAL WEATHER TODAY

Shown are noon positions of weather systems and precipitation. Temperature bands are highs for the day.



While a seasonably chilly day unfolds across the Northeast and snow pushes through the Great Lakes, milder air will funnel into the Midwest today. Comfortable temperatures will grace the South and Plains. Gusty winds will whip the northern Rockies as snow falls in the mountains. Showers will dot the Pacific Northwest.

Yesterday's National Extremes: (for the 48 contiguous states)
High: 82° in Fullerton, CA **Low:** -18° in Fosston, MN

ALMANAC

Nashville through 5 p.m. yesterday

Temperature

	High	Low
Yesterday	55°	22°
Last year	66°	29°
Normals	48°	29°
Records	78° (1911)	-1° (1966)

Precipitation

24 hours ending 5 p.m. yest.	0.00″
Month to date	5.13″
Year to date	5.13″
Normal month to date	3.48″
Normal year to date	3.48″
Annual normal	47.25″

Sun and Moon

Sunrise today	6:48 a.m.
Sunset tonight	5:10 p.m.
Moonrise today	10:27 a.m.
Moonset today	none

First	Full	Last	New
Jan 30	Feb 7	Feb 14	Feb 21

Forecasts and graphics provided by **AccuWeather, Inc.** ©2012

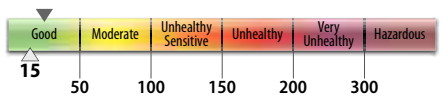
CONDITIONS TODAY

UV Index and RealFeel Temperature® Today

6 a.m.	8 a.m.	10 a.m.	Noon	2 p.m.	4 p.m.	6 p.m.
0	0	2	3	2	0	0
29	32	46	54	58	54	47

The higher the **AccuWeather.com UV Index™** number, the greater the need for eye and skin protection. 0-2 Low; 3-5 Moderate; 6-7 High; 8-10 Very High; 11+ Extreme. The patented AccuWeather.com RealFeel Temperature is an exclusive index of effective temperature based on eight weather factors.

AIR QUALITY INDEX



Yesterday's main offender: Particulates
Source: Nashville.gov ▼Today △Yesterday

WEATHER HISTORY

The temperature at La Junta, Colo., rose from 5 degrees on the morning of Jan. 30, 1991, to a high of 50 degrees in the afternoon. Pueblo, Colo., began the day at 2 degrees but ended up with a comfortable high temperature of 58 degrees.

RIVER LEVELS

Levels as of 7 a.m. yesterday

West Fork Stones River	Gauge Height	Flood Stage	24 hr. Chg.
near Murfreesboro	3.53	---	-0.31

Lake	Level	Full Pool	24 hr. Chg.
Lake Barkley	355.90	356	none
Kentucky Lake (upper)	355.83	356	+0.13
Kentucky Lake (lower)	325.44	302	+0.44
Old Hickory Lake	444.00	445	+0.02
Percy Priest Lake	485.25	---	-0.95
Center Hill Lake	632.95	648	+0.57

WEATHER TRIVIA™

Q: What weather phenomenon is referred to as a "bowling ball"?

A: An upper-level storm separated from the main jet stream.

NATIONAL CITIES

	Today Hi	Lo	W	Tue. Hi	Lo	W
Boston	39	28	pc	44	37	c
Charleston, SC	64	38	s	70	47	pc
Chicago	48	38	pc	49	32	r
Cleveland	40	34	c	52	40	r
Detroit	37	33	c	47	38	r
Evansville	56	40	s	63	47	c
Honolulu	81	68	s	81	66	s
Indianapolis	50	37	pc	58	43	c
Las Vegas	63	41	s	61	43	s
Los Angeles	69	48	s	69	51	s
Miami	76	67	pc	79	70	c

	Today Hi	Lo	W	Tue. Hi	Lo	W
New Orleans	68	54	s	73	60	pc
New York	41	35	pc	53	45	pc
Phoenix	73	46	pc	68	48	s
Pittsburgh	40	34	pc	55	42	pc
Providence	42	27	pc	47	38	pc
Richmond	54	34	pc	68	41	s
Sacramento	61	38	pc	60	34	pc
St. Louis	65	43	pc	67	43	c
San Francisco	58	45	pc	58	42	pc
Tampa	74	55	s	78	60	pc
Washington, DC	49	36	pc	61	42	pc

WORLD CITIES

	Today Hi	Lo	W	Tue. Hi	Lo	W
Amsterdam	32	25	c	33	22	s
Baghdad	61	47	pc	61	47	sh
Barbados	83	74	sh	83	74	s
Cairo	63	51	sh	65	50	s
Dublin	43	39	r	41	37	r
Frankfurt	34	25	c	34	20	s
Geneva	34	25	sf	35	20	c
Hong Kong	63	55	pc	64	57	s
Jerusalem	54	45	sh	53	42	s
Kabul	38	18	sn	43	21	s

	Today Hi	Lo	W	Tue. Hi	Lo	W
Kuwait	64	50	s	65	56	r
London	37	30	c	37	28	c
Mexico City	64	43	t	68	46	c
Moscow	1	-4	pc	-1	-9	c
Paris	36	27	c	33	23	pc
Rome	55	39	c	48	39	r
San Jose	81	61	sh	81	61	pc
Sydney	88	73	pc	90	66	t
Tokyo	43	32	pc	45	36	pc
Vancouver	45	41	r	47	42	r

Weather (W): **s**-sunny, **pc**-partly cloudy, **c**-cloudy, **sh**-showers, **t**-thunderstorms, **r**-rain, **sf**-snow flurries, **sn**-snow, **i**-ice.

APPENDIX E

Annotated Summary of Key Legislation Related to Natural Resources Management

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United States Code

Sikes Act, as amended; *16 U.S.C. 670(a) et seq.*	Authorizes military installations to carry out programs for the conservation and rehabilitation of natural resources. Requires preparation and implementation of Integrated Natural Resources Management Plans for all military installations in U.S. except those lacking significant natural resources.
National Environmental Policy Act of 1969 (NEPA), as amended; *P.L.91-190, 42 U.S.C. 4321 et seq.*	Requires Federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts to the environment.
Leases: Non-excess Property of Military Departments, 10 U.S.C. 2667, as amended	Authorizes DoD to lease to commercial enterprises Federal land that is not currently needed for Public use. Covers agricultural outleasing programs.
Federal Land Use Policy and Management Act, *43 U.S.C. 1701-1782*	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values; as well as to preserve and protect certain lands in their natural condition for fish and wildlife habitat. This act also requires consideration of commodity production such as timbering.
Clean Air Act, *42 U.S.C. 7401-7671q,* *July 14, 1955, as amended*	This Act, as amended, is known as the Clean Air Act of 1990. The amendments made in 1990 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country which do not meet Federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Federal Water Pollution Control Act (Clean Water Act), *33 U.S.C. 1251-1387*	The Clean Water Act is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Primary authority for the implementation and enforcement rests with the U.S. Environmental Protection Agency (USEPA).
Migratory Bird Treaty Act *16 U.S.C. 703-712*	The Migratory Bird Treaty Act implements various treaties and for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful.
Endangered Species Act of 1973, as amended; *P.L. 93-205, 16 U.S.C.1531 et seq.*	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no Federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The Endangered Species Act also requires consultation with the USFWS and the National Marine Fisheries Service and the preparation of a biological assessment when such species are present in an area that is affected by government activities.
National Historic Preservation Act; 16 U.S.C. 470 et seq.	Requires Federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the National Register), and protection of historical and cultural properties of significance.
Federal Noxious Weed Act of 1974; 7 U.S.C. 2801-2814	The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.
Sale of certain interests in land; logs; 10 U.S.C. 2665	Authorizes sale of forest products and reimbursement of the costs of management of forest resources.

Federal Insecticide, Fungicide, and Rodenticide Act, as amended (FIFRA);	Controls pesticide distribution, sale, and use. Requires licensing/certification for commercial applications and for sales of pesticides.
Archaeological and Historical Preservation Act of 1974; 16 U.S.C. 469 et seq.	Provides for the preservation of historical and archaeological data which might otherwise be lost or destroyed as a result of alteration of the terrain caused by any Federal construction project or federally licensed activity or program.
Archaeological Resources Protection Act of 1979; (16 U.S.C. 470 et seq.) 32 CFR 22 and 229	Protects archeological resources and sites on public lands and Indian lands.

Federal Public Laws and Executive Orders

National Defense Authorization Act of 1989, *Public Law (P.L.) 101-189;* *Volunteer Partnership Cost-Share Program*	Amends two acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, P.L. 101-511; *Legacy Resource Management Program*	Establishes a program for the stewardship of biological, geophysical, cultural, and historic resources on DoD lands.
Executive Order (EO) 11988, Floodplain Management	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state and Federal review agencies for any construction within a 100-year floodplain.
EO 11990, Protection of Wetlands	Requires Federal agencies to avoid undertaking or providing assistance for new construction located in wetlands unless there is no practicable alternative, and all practicable measures to minimize harm to wetlands has been implemented.
EO 11514, Protection and Enhancement of Environmental Quality	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, Protection and Enhancement of the Cultural Environment	All Federal agencies are required to locate, identify, and record all cultural and natural resources. Cultural resources include sites of archaeological, historical, or architectural significance. Natural resources include the presence of endangered species, critical habitat, and areas of special biological significance.
EO 11990, Protection of Wetlands	Each Agency shall take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.
EO 11987, Exotic Organisms	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters that they administer.
EO 12088, Federal Compliance With Pollution Control Standards.	This EO 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 the Environmental Protection Agency authority to conduct reviews and inspections to monitor Federal facility compliance with pollution control standards.
EO 12898, Environmental Justice	This EO requires certain Federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.

EO 13112, Exotic and Invasive Species	This EO strives to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13045, Protection of Children from Environmental Health and Safety Risks	This EO makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. It also directs agencies to ensure that policies, programs, activities, and standards address such risks if identified.
EO 13007, Indian Sacred Sites	Directs protection of Indian sacred sites Federal lands and guarantees access to and ceremonial use of Indian sacred sites on Federal lands by Indian religious practioners.
EO 13175, Consultation and Coordination with Indian Tribal Governments	Establishes requirement of and process for Nation-to-Nation consultation with Indian tribal governments with regards to the development of Federal policies that have tribal implications.

DoD Policy, Directives and Instructions

DoD Directive 4700.4, Natural Resources Management Program	Requires that the ARNG implement and maintain a balanced and integrated program for the management of natural resources.
DoD Directive 4715.1, Environmental Security	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This directive also ensures that environmental factors are integrated into DoD decision-making processes that may impact the environment, and are given appropriate consideration along with other relevant factors.
DoD Annotated Policy on Indian Tribes and Alaska Natives	Establishes DoD American Indian and Alaska Native Policy for interacting and working with federally recognized American Indian and Alaska Native governments (hereinafter referred to as "tribes"). It defines: protected tribal resources, tribal rights, and Indian lands.
DoDI 4715.03, Environmental Conservation Program	Implements policy, assigns responsibility, and prescribes procedures under *DoD Directive* 4715.1 for the integrated management of natural and cultural resources on property under DoD control.

Army Instructions and Directives

AR 200-1, Environmental Protection and Enhancement	As of 28 August 2007, this document supersedes all previous iterations of AR 200-1, AR 200-3, AR 200-4, and AR 200-5. Provides policies, standards and procedures for the following resource areas: NEPA, Natural Resources Management, Cultural Resources Management, Natural Resource Damage Assessment (NRDA), Real Property Acquisition, Outgrant and Disposal Transactions, Environmental Agreements, Environmental Compliance Assessments, Environmental Quality Control Committee (EQCC), Army Environmental Training Program, Installation/State Environmental Training Plans, ITAM, and Pest Management Program
AR 350-19, The Army Sustainable Range Program (superceded AR 210-21)	Assigns responsibilities and provides policy and guidance for managing and operating U.S. Army ranges and training lands to support their long-term viability and utility to meet the National defense mission.
HQDA INRMP Policy Memorandum (21 March 1997), *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)*	Provides guidance to ensure that natural resource conservation measures and Army activities on mission land are integrated and are consistent with Federal stewardship requirements.

Tennessee State Code

Tennessee Water Quality Control Act of 1977; TCA 69-3-101 et seq.	Establishes the Tennessee Water Quality Control Board to establish standards for various uses of the waters of the state.
Tennessee Insecticide, Fungicide, and Rodenticide Act; TCA 43-8-101 et seq.	Controls pesticide distribution, sale, and use in Tennessee.
Tennessee Hazardous Substances Act; TCA 68-131-101 et seq.	Defines, establishes regulations for the handling of, and sets penalties for the mishandling of hazardous substances in the state of Tennessee.
Tennessee Air Quality Act; TCA 68-201-202 et seq.	Establishes an Air Pollution Control Board to create and maintain rules and regulations for the purpose of protecting Tennessee's air quality.
Tennessee Safe Drinking Water Act of 1983; TCA 68-221-701 et seq.	Defines the duties and responsibilities of the Tennessee Water Quality Board and the Commissioner of the Tennessee Department of Environment and Conservation with regards to protection of the drinking water supply of the state of Tennessee. Also identifies prohibited acts and defines penalties and legal processes for prosecuting violations thereof.
Fish and Wildlife Regulations; TCS 70-4-101	Establishes rules and regulations for hunting, fishing, and protection of wildlife.
Nongame Species Regulations; TCA 70-8-104	Gives the executive director of the Tennessee Wildlife Resources Agency the responsibility for establishing regulations to protect non-game species.
Tennessee Archaeological Statutes; TCA 11-6-101 et seq.	Establishes a state Division of Archaeology and defines its role in research on and protection of archaeological features, sites, and artifacts in the state of Tennessee.

APPENDIX F

Animal and Plant Species found on VTS-Smyrna

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VERTEBRATE SPECIES

BIRDS

Order Family	Common Name	Scientific Name	State Conservation Status
GAVIFORMES – loons and divers			
Gaviidae (loons and divers)			
	common loon	*Gavia immer*	none
PODICIPEDIFORMES – GREBES			
Podicipedidae (grebes)			
	pied-billed grebe	*Podilymbus podiceps*	imperiled
PELICANIFORMES –			
Phalacrocoradae (cormorants)			
	double-crested cormorant	*Phalacrocorax auritus*	imperiled
CICONIIFORMES – herons, storks, and allies			
Ardeidae (herons, bitterns, and egrets)			
	great egret	*Ardea alba*	imperiled
	great blue heron	*Ardea herodias*	apparently secure
	green heron	*Butorides virescens*	apparently secure
	black-crowned night heron	*Nycticorax nycticorax*	imperiled
ANSERIFORMES – ducks, geese, and swans			
Anatidae (ducks, geese, and swans)			
	wood duck	*Aix sponsa*	secure
	northern pintail	*Anas acuta*	none
	northern shoveler	*Anas clypeata*	none
	green-winged teal	*Anas crecca*	none
	blue-winged teal	*Anas discors*	imperiled
	mallard	*Anas platyrhyncos*	secure
	gadwall	*Anas strepera*	none
	Canada goose	*Branta canadensis*	secure
	bufflehead	*Bucephala albeola*	none
	snow goose	*Chen caerulescens*	none
	hooded merganser	*Lophodytes cucullatus*	none
CHARADRIIFORMES - shorebirds			
Charadriidae (plovers)			
	killdeer	*Charadrius vociferous*	secure
Scolopacidae (sandpipers and phalaropes)			
	spotted sandpiper	*Actitis macluria*	imperiled
	western sandpiper	*Calidris mauri*	none
	pectoral sandpiper	*Calidris melanotos*	none
	least sandpiper	*Calidris minutilla*	none
	Wilson's snipe	*Gallinago delicate*	none
	hooded merganser	*Lophodytes cucullatus*	none
	American woodcock	*Scolopax minor*	apparently secure
	lesser yellowlegs	*Tringa flavipes*	none
	greater yellowlegs	*Tringa melanoleuca*	none
	solitary sandpiper	*Tringa solitaria*	none
Laridae (gulls, terns, and skimmer)			
	ring-billed gull	*Larus delawarensis*	none
	Bonaparte's gull	*Larus philidelphia*	none
	Caspian tern	*Sterna caspia*	none
FALCONIFORMES - diurnal birds of prey			
Cathartidae (vultures)			
	turkey vulture	*Cathartes aura*	secure

Order Family	Common Name	Scientific Name	State Conservation Status
FALCONIFORMES cont'd			
	black vulture	*Coragyps atatus*	apparently secure
Accipitridae (hawks, kites, eagles, and falcons)			
	Cooper's hawk	*Accipiter cooperii*	vulnerable
	sharp-shinned hawk	*Accipiter striatus*	vulnerable
	red-tailed hawk	*Buteo jamaicensis*	secure
	red-shouldered hawk	*Buteo lineatus*	apparently secure
	broad-winged hawk	*Buteo platypterus*	apparently secure
	osprey	*Pandion haliaetus*	vulnerable
Falconidae (falcons)	American kestrel	*Falco sparverius*	secure
GALLIFORMES - chicken-like birds			
Phasianidae (quails, pheasants, and turkeys)			
	northern bobwhite	*Colinus virginianus*	imperiled
	wild turkey	*Meleagris gallopavo*	secure
GRUIFORMES – (coots, cranes, and rails)			
Rallidae (rails, gallinules, and coots)			
	sora	*Porzana carolina*	critically imperiled
	American coot	*Fulica Americana*	imperiled
COLUMBIFORMES - doves and pigeons			
Columbidae (doves and pigeons)			
	rock pigeon	*Columba livia*	EXOTIC
	Eurasian collared dove	*Streptopelia decaocto*	EXOTIC
	mourning dove	*Zenaida macroura*	secure
CUCULIFORMES - cuckoos and relatives			
Cuculidae (cuckoos, roadrunners, et al.)			
	yellow-billed cuckoo	*Coccyzus americanus*	apparently secure
STRIGIFORMIS - owls			
Strigidae (owls)			
	great horned owl	*Bubo virginianus*	secure
	eastern screech owl	*Otus asio*	secure
	barred owl	*Strix varia*	secure
CAPRIMULGIFORMES – nightbirds			
Caprimulgidae (goatsuckers)			
	common nighthawk	*Chordeiles minor*	apparently secure
APODIFORMES – hummingbirds and swifts			
Apodidae (swifts)			
	chimney swift	*Chaetura pelagic*	secure
Trochilidae (hummingbirds)			
	ruby-throated hummingbird	*Archilochus colubris*	secure
CORACIIFORMES - kingfishers and allies			
Alcedinidae (kingfishers)			
	belted kingfisher	*Ceryle alcyon*	secure
PICIFORMES - woodpeckers			
Picidae (woodpeckers)			
	northern flicker	*Colaptes auratus*	secure
	pileated woodpecker	*Dryocopus pileatus*	apparently secure
	red-bellied woodpecker	*Melanerpes carolinus*	secure
	downy woodpecker	*Picoides pubescens*	secure
	hairy woodpecker	*Picoides villosus*	apparently secure
	yellow-bellied sapsucker	*Sphyrapicus varius*	critically imperiled
PASSERIFORMES – passerines			
Tyrannidae (tyrant flycatchers			
	eastern wood-pewee	*Contopus virens*	secure

Order	Family	Common Name	Scientific Name	State Conservation Status
PASSERIFORMES cont'd		Acadian flycatcher	*Emoidonax virescens*	secure
		great crested flycatcher	*Myiarchus cinerascens*	secure
		eastern phoebe	*Sayornis phoebe*	secure
		eastern kingbird	*Tyrnnus tyrannus*	secure
	Hirundinidae (swallows)			
		barn swallow	*Hirundo rustica*	secure
		purple martin	*Progne subis*	secure
		northern rough-winged swallow	*Stelgidopteryx serripennis*	secure
		tree swallow	*Tachycineta bicolor*	apparently secure
	Corvidae (crows and jays)			
		blue jay	*Cyanocitta cristata*	secure
		American crow	*Corvus brachyrhynchos*	secure
	Paridae (titmice and chickadees)			
		Carolina chickadee	*Parus carolinensis*	secure
		Tufted titmouse	*Parus bicolor*	secure
	Sittidae (nuthatches)			
		white-breasted nuthatch	*Sitta carolinensis*	secure
	Certhiidae (treecrepers)			
		brown creeper	*Certhia Americana*	imperiled
	Troglodytidae (wrens)			
		Carolina wren	*Thyrothorus ludovicianus*	secure
		house wren	*Troglodytes aedon*	apparently secure
		winter wren	*Troglodytes troglodytes*	vulnerable
	Polioptilidae (gnatcatchers)			
		blue-grey gnatcatcher	*Polioptila caerulea*	secure
	Reguliidae (kinglets)			
		ruby-crowned kinglet	*Regulus calendula*	none
		golden-crowned kinglet	*Regulus satrapa*	vulnerable
	Turdidae (thrushes, robins, and wheatears)			
		hermit thrush	*Catharus guttatus*	imperiled
		Swainson's thrush	*Catharus ustulatus*	none
		wood thrush	*Hylocichla mustelina*	apparently secure
		eastern bluebird	*Sialia sialis*	secure
		American robin	*Turdus migratorius*	secure
	Mimidae (mockingbirds and thrashers)			
		grey catbird	*Dumetella carolinensis*	apparently secure
		northern mockingbird	*Mimus polyglottos*	secure
		brown thrasher	*Toxostoma rufum*	secure
	Bombycillidae (waxwings)			
		cedar waxwing	*Bombycilla cedrorum*	apparently secure
	Sturnidae (starlings and mynas)			
		European starling	*Sturnus vulgaris*	EXOTIC
	Vireonidae (vireos)			
		yellow-throated vireo	*Vireo flavifrons*	apparently secure
		white-eyed vireo	*Vireo griseus*	apparently secure
		Philadelphia vireo	*Vireo philadelphicus*	none
		red-eyed vireo	*Vireo olivaceus*	secure
	Emberizidae (warblers, sparrows, et al.)			
	Subfamily Parulinae (wood-warblers)			
		cerulean warbler	*Dendroica cerulean*	vulnerable
		yellow-rumped warbler	*Dendroica coronate*	none
		prairie warbler	*Dendroica discolor*	vulnerable
		yellow-throated warbler	*Dendroica dominica*	apparently secure

Order	Family	Common Name	Scientific Name	State Conservation Status
PASSERIFORMES cont'd		magnolia warbler	*Dendroica magnolia*	critically imperiled
		palm warbler	*Dendroica palmarum*	none
		chestnut-sided warbler	*Dendroica pennsylvanica*	apparently secure
		yellow warbler	*Dendroica petechia*	secure
		pine warbler	*Dendroica pinus*	secure
		blackpoll warbler	*Dendroica striata*	none
		Cape May warbler	*Dendroica tigrina*	none
		black-throated green	*Dendroica virens*	secure
		common yellowthroat	*Geothlypis trichas*	secure
		yellow-breasted chat	*Icteria virens*	secure
		black and white warbler	*Mniotilta varia*	apparently secure
		Kentucky warbler	*Oporonis formosus*	apparently secure
		northern parula	*Parula Americana*	secure
		prothonotary warbler	*Protonotaria citrea*	apparently secure
		oven bird	*Seiurus aurocapillus*	apparently secure
		Louisiana waterthrush	*Seiurus motacilla*	secure
		northern waterthrush	*Seiurus noveboracensis*	none
		American redstart	*Setophaga ruticilla*	apparently secure
		orange-crowned warbler	*Vermivora celata*	none
		Tennessee warbler	*Vermivora peregrine*	none
		Nashville warbler	*Vermivora ruficapilla*	none
		Canada warbler	*Wilsonia canadensis*	vulnerable
		hooded warbler	*Wilsonia citrine*	apparently secure
	Subfamily Thraupinae (tanagers)			
		scarlet tanager	*Piranga olivacea*	secure
		summer tanager	*Piranga rubra*	apparently secure
	Subfamily Cardinalidae (cardinals, grosbeaks, et al.)			
		northern cardinal	*Cardinalis cardinalis*	secure
		blue grosbeak	*Guiraca caerlea*	apparently secure
		indigo bunting	*Passerina cyanea*	secure
		rose-breasted grosbeak	*Pheucticus ludovicianus*	apparently secure
	Subfamily Emberizinae (towhees, sparrows, and longspurs)			
		dark-eyed junco	*Junco hyemalis*	secure
		song sparrow	*Melospiza melodia*	apparently secure
		fox sparrow	*Passerella iliaca*	none
		eastern towhee	*Papilo erythrophthalmus*	secure
		chipping sparrow	*Spizella passerine*	secure
		field sparrow	*Spizella pusilla*	apparently secure
		white-throated sparrow	*Zonotrichia albicollis*	none
	Subfamily Icteridae (blackbirds)			
		red-winged blackbird	*Agelaius phoeniceus*	secure
		orchard oriole	*Icterus spurious*	apparently secure
		brown-headed cowbird	*Molothrus ater*	secure
		common grackle	*Quiscalus quiscula*	secure
		eastern meadowlark	*Sturnella magna*	secure
		Baltimore oriole	*Icterus galbula*	secure
	Fringillidae (cardueline finches)			
		American goldfinch	*Carduelis tristis*	secure
		house finch	*Carpodacus mexicanus*	EXOTIC
	Passeridae (old world sparrows)			
		house sparrow	*Passer domesticus*	EXOTIC

MAMMALS

Order Family	Common Name	Scientific Name
DIDELPIMORPHIA – American marsupials		
Didelphidae (opossums)	Virginia opossum	*Didelphis virginianus*
SORICOMORPHIA – insectivores		
Soricidae (shrews)	short-tailed shrew	*Blarina brevicauda*
Talipidae (desmans, moles, and relatives)	eastern mole	*Scalopus aquaticus*
CHIROPTERA – bats		
Vespertilionidae (evening and vesper bats)	red bat	*Lasiurus borealis*
	eastern pipistrelle	*Pipistrellus subflavus*
LAGOMORPHA - hares, pikas, and rabbits		
Leporidae (hares and rabbits)	eastern cottontail	*Sylvilagus floridanus*
RODENTIA – rodents		
Cricetidae (new world rats and mice)	prairie vole	*Microtus ochrogaster*
	common pine vole	*Microtus pinetorum*
	white-footed mouse	P*eromyscus leucopus*
	hispid cotton rat	*Sigmodon hispidus*
	muskrat	*Ondatra zibethicus*
Dipodidae (jerboas and jumping mice)	meadow jumping mouse	*Zapus hudsonius*
Sciuridae (squirrels)	groundhog	*Marmota monax*
	eastern grey squirrel	*Scurius carolensis*
	fox squirrel	*Scurius niger*
	southern flying squirrel	*Glaucomys volans)*
Castoridae (beavers)	American beaver	*Castor canadensis*
CARNIVORA – carnivores		
Canidae (dogs)	domestic dog	*Canis familiaris*
	coyote	*Canis latrans*
	grey fox	*Urocyon cinereoargenteus*
Felidae (cats)	domestic cat	*Felis domesticus*
Mephitidae (skunks and stink badgers)	striped skunk	*Mephitis mephitis*
Procyonidae (raccoons and allies)	raccoon	*Procyon lotor*
Mustelidae (weasels and allies)	mink	*Mustela vison*
ARTIDACYTYLA - even-toed ungulates		
Cervidae (deer)	white-tailed deer	*Odocoileus virginianus*

AMPHIBIANS AND REPTILES

Order	Family	Common Name	Scientific Name
AMPHIBIA - amphibians			
	Bufonidae (true toads)		
		American toad	*Anaxyrus americanus*
		Fowler's toad	*Anaxyrus fowleri*
	Hylidae (tree frogs)		
		Eastern cricket frog	*Acris crepitans*
		Cope's grey treefrog	*Hyla chrysoscelis*
		green treefrog	*Hyla cinerea*
		upland chorus frog	*Pseudaacris feriarum*
	Ranidae (true frogs)		
		American bullfrog	*Lithobates catesbeianus*
		green frog	*Lithobates clamitans*
		southerne leopard frog	*Lithobates sphenocephalus*
	Microhylidae (narrow-mouthed frogs)		
		eastern narrow-mouthed toad	*Gastrophryne carolinensis*
	Plethodontidae (lungless salamanders)		
		cave salamander	*Eurycea lucifuga*
SQUAMATA - scaled reptiles			
	Iguanidae (iguanas)		
		eastern fence lizard	*Sceloporus undulatus*
	Scincidae (skinks)		
		five-lined skink	*Plestiodon fasciatus*
		broad-headed skink	*Plestiodon laticeps*
		little brown skink	*Scincella lateralis*
	Colubridae (colubrids)		
		black racer	*Coluber constrictor*
		black kingsnake	*Lampropeltis nigra*
		eastern milksnake	*Lampropeltis t. triangulum*
		grey ratsnake	*Pantherophis spiloides*
	Natricidae (keeled snakes)		
		northern watersnake	*Nerodia sipedon*
TESTUDINES - turtles			
	Emydidae (pond turtles)	common map turtle	*Graptemys geographica*
		eastern box turtle	*Terrapene carolina*
		pond slider	*Trachemys scripta*
	Chelydridae (snapping turtles)		
		snapping turtle	*Chelydra serpentina*
	Trionychidae (softshelled turtles)		
		spiny softshell	*Apalone spinifera*

FISH

Order	Family	Common Name	Scientific Name
CYPRINODONTIFORMES			
	Poeciliidae (livebearers and topminnows)		
		mosquito fish	*Gambusia affinis*
	Fundulidae (topminnows)		
		blackstripe topminnow	*Fundulus notatus*
CLUPLEIFORMES			
	Clupeidae (herrings and shads)		
		gizzard shad	*Dorosoma cepedianum*
		threadfin shad	*Dorosoma pentenense*
CYPRINIFORMES			
	Cyprinidae (minnows)		
		stoneroller	*Campostoma anomalum*
		steelcolor shiner	*Cyprinella whipplei*
		common carp	*Cyprinus carpio*
		golden shiner	*Notemigonus crysoleucas*
		spotfin shiner	*Notropis spilopterus*
		bluntnose minnow	*Pimephales notatus*
	Catostomidae (suckers)		
		spotted sucker	*Minytrema melanops*
		golden redhorse	*Moxostoma erythrurum*
SILURIFORMES			
	Ictaluridae (North American freshwater catfishes)		
		channel catfish	*Ictalurus punctatus*
		flathead catfish	*Pylodictis olivaris*
ANTHERINIFORMES			
	Anterinidae (silversides)		
		brook silverside	*Labidesthes sicculus*
PERCIFORMES			
	Centrarchidae (sunfishes)		
		rock bass	*Ambloplites repestris*
		redbreast sunfish	*Lepomis auritus*
		green sunfish	*Lepomis cyanellus*
		warmouth	*Lepomis gulosus*
		bluegill	*Lepomis macrochirus*
		longear sunfish	*Lepomis megalotis*
		redear sunfish	*Lepomis microlophus*
		largemouth bass	*Micropterus salmoides*
		white crappie	*Pomoxis annularis*
	Moronidae		
		white bass	*Morone chrysops*
	Percidae (perches)		
		fantail darter	*Etheostoma flabellare*
		logperch	*Percina carprodes*
		walleye	*Stizostedion vitreum*
	Sciaenidae (drums)		
		freshwater drum	*Aplodinotus grunniens*

AQUATIC INVERTEBRATES

Phylum	Class	Order	Family	Species
ANNELIDA (segmented worms)				
	Clitellata			
	Subclass Oligochaeta (earthworms, night crawlers, and relatives)			
			Enchytraeidae	undetermined sp.
		Haplotaxida		
			Naididae	*Dero* sp.
				Nais sp.
			Tubificidae w.h.c.	undetermined sp.
			Tubificidae w.o.h.c.	undetermined sp.
		Rhynchobdellida		
			Glossiphoniidae	*Helobdella* sp.
				Helobdella staginalis
CNIDARIA (cnidarians)				
	Hydrozoa			
		Hydroida (medusae)		
			Hydridae	*Hydra* sp.
ARTHROPODA (crustaceans, insects, spiders, and relatives)				
	Crustaceae			
		Cladocera (water fleas)		
			Sididae	*Sida crystalline*
	Subclass Ostracoda			undetermined spp.
	Insecta			
		Coleoptera (beetles)		
			Dytiscidae	undetermined sp.
			Elmidae	*Ancyronyx* sp.
				Dubiraphia sp.
				Stenelmis sp.
			Haliplidae	*Peltodytes* sp.
			Scirtidae	*Scirtes* sp.
		Diptera (true flies)		
			Ceratopogonidae	*Alluaudonyia* sp.
				Bezzia/Palpomyia gp.
				Sphaeromias sp.
			Chaoboridae	*Chaoborus punctipennis*
			Chironomidae	*Ablabesmyia mallochi*
				Chironomus sp.
				Cladopelma sp.
				Cladotanytarsus sp.
				Cryptochironomus fulvus
				Dicrotendipes lucifer
				Glyptotendtpes sp.
				Polypedilum halterale
				Procladius bellus
				Tanytarsus sp.
			Ephydridae	undetermined sp.
			Tipulidae	undetermined sp.
		Ephemeroptera (mayflies)		
			Baetidae	undetermined spp.
			Caenidae	*Caenis* sp.
			Ephemeridae	*Hexagenia limbata*

Phylum	Class	Order	Family	Species
ARTHROPODA cont'd				
	Insecta			
		Hemiptera (true bugs)		
			Corixidae	undetermined sp.
		Odonata (dragonflies and damselflies)		
			Coenagrionidae	*Enallagma* sp.
			Corduliidae	*Epitheca* sp.
		Trichoptera (caddisflies)		
			Hydropsychidae	*Cheumatopsyche* sp.
			Hydroptilidae	*Hydroptila* sp.
				Orthotrichia sp.
			Leptoceridae	undetermined sp.
			Polycentropodidae	*Cyrnellus fraternus*
	Malacostraca			
		Amphipoda (amphipods)		
			Cragonyctidae	*Cragonyx* sp.
			Gammaridae	*Gammarus* sp.
			Hyalallediae	*Hyella azteca*
		Isopoda (pillbugs and sowbugs)		
			Asellidae	*Lirceus* sp.
MOLLUSCA (mollusks)				
	Bivalvia (bivalves and clams)			
		Veneroida		
			Corbiculidae	*Cobicula flaminea*
			Pisidiidae	*Pisidium* sp.
	Gastropoda (slugs and snails)			
		Basommatophora		
			Ancylidae	*Ferrissia rivularis*
			Lymnaeidae	*Pseudosuccinea* sp.
			Physidae	*Physa* sp.
			Planorbidae	*Helisoma* sp.
		Neotaenioglossa		
			Pleuroceridae	*Goniobasis* sp.
PLATYHELMINTHES (flatworms)				
	Turbellaria (planarians)			
		Tricladida		
			Planariidae	undetermined sp.

VASCULAR PLANTS

Family	Scientific Name	Common Name
Acanthaceae	*Justicia americana*	American water willow
Aceraceae	*Acer negundo*	boxelder
	Acer rubrum	red maple
	Acer saccharinum	silver maple
	Acer saccharum	sugar maple
Agavaceae	*Yucca flaccida*	weak-leaf yucca
Anacardiaceae	*Rhus copallinum*	winged sumac
	Rhus glabra	smooth sumac
	Toxicodendron radicans	eastern poison ivy
Apiaceae	*Angelica venenosa*	hairy angelica
	Chaerophyllum tainturieri	southern chervil
	Daucus carota **	Queen Anne's lace
	Sanicula canadensis var. canadensis	Canada-sanicle
	Thaspium trifoliatum var. aureum	smooth meadow-parsnip
	Zizia aurea	golden Alexanders
Apocynaceae	*Amsonia tabernaemontana*	eastern bluestar
	Apocynum cannabinum	indian hemp
	Vinca minor **	lesser periwinkle
Araceae	*Arisaema dracontium*	green dragon
	Arisaema triphyllum	Jack in the pulpit
	Peltandra virginica	green arrow arum
Aristolochiaceae	*Aristolochia serpentaria*	Virginia snakeroot
Asclepiadaceae	*Asclepias tuberosa ssp. tuberosa*	butterfly weed
	Asclepias variegata	redring milkweed
Aspleniaceae	*Asplenium platyneuron*	ebony-spleenwort
	Woodsia obtusa	blunt-lobed woodsia
Asteraceae	*Ageratina altissima*	white snakeroot
	Ambrosia artemisiifolia var. elatior	common ragweed
	Ambrosia psilostachya	Cuman ragweed
	Antennaria neglecta	field pussytoes
	Antennaria plantaginifolia	woman's tobacco
	Bidens coronata	crowned beggars ticks
	Cirsium arvense **	Canada thistle
	Conyza canadensis	horseweed
	Coreopsis major	greater tickseed
	Coreopsis tinctoria	plains tickseed
	Erigeron annuus	eastern daisy fleabane
	Erigeron philadelphicus	Philadelphia daisy
	Erigeron strigosus	rough fleabane
	Hieracium venosum	rattlesnake weed
	Lactuca biennis	tall blue lettuce
	Leucanthemum vulgare **	oxeye daisy
	Packera aurea	golden ragwort
	Packera glabella	cressleaf groundsel
	Rudbeckia hirta	black-eyed Susan
	Rudbeckia triloba	browneyed Susan

Family	Scientific Name	Common Name
Asteraceae cont'd		
	Sericocarpus linifolius	narrowleaf whitetop aster
	Silphium spp.	rosinweed
	Smallanthus uvedalius	hairy leafcup
	Solidago altissima	late goldenrod
	Solidago canadensis var. hargeri	common goldenrod
	Tragopogon lamottei *	Jack-go-to-bed-at-noon
	Verbesina alternifolia	wingstem
	Vernonia gigantea	tall ironweed
Balsaminaceae	*Impatiens capensis*	spotted touch-me-not
	Impatiens pallida	pale touch-me-not
Berberidaceae	*Podophyllum peltatum*	mayapple
	Berberis thunbergii *	Japanese barberry
Bignoniaceae	*Bignonia capreolata*	crossvine
	Campsis radicans	trumpet creeper
	Catalpa speciosa	northern catalpa
Boraginaceae	*Buglossoides arvensis* *	corn gromwell
	Myosotis verna	spring forget-me-not
Brassicaceae	*Barbarea vulgaris* *	winter cress
	Capsella bursa-pastoris *	shepherd's purse
	Nasturtium officinale *	watercress
Cactaceae	*Opuntia humifusa*	prickly-pear cactus
Campanulaceae	*Lobelia cardinalis*	cardinal flower
	Lobelia puberula	downy lobelia
	Triodanis perfoliata	clasping-leaf Venus' looking-glass
Cannabaceae	*Humulus lupulus* *	common hop
Caprifoliaceae	*Lonicera japonica* **	Japanese honeysuckle
	Sambucus canadensis	common elderberry
	Symphoricarpos orbiculatus	coralberry
	Viburnum prunifolium	smooth blackhaw
Caryophyllaceae	*Cerastium nutans var. nutans*	nodding chickweed
	Dianthus armeria *	Deptford pink
	Silene virginica	fire pink
Chenopodiaceae	*Chenopodium album* *	lamb's quarters
Clusiaceae	*Hypericum prolificum*	shrubby St. Johnswort
	Hypericum punctatum	spotted St. Johnswort
Commelinaceae	*Commelina communis* *	Asiatic dayflower
	Commelina virginica	Virginia dayflower
Cornaceae	*Cornus amomum*	silky dogwood
	Cornus drummondii	rough-leaved dogwood
	Cornus florida	flowering dogwood
	Nyssa sylvatica	black tupelo
Crassulaceae	*Sedum pulchellum*	widow's-cross
Cupressaceae	*Juniperus virginiana*	eastern red cedar
	Taxodium distichum	bald cypress
Cuscutaceae	*Cuscuta compacta*	compact dodder
	Cuscuta gronovii	scaldweed
Cyperaceae	*Carex annectens*	yellow-fruit sedge
	Carex cephalophora	oval-leaf sedge

Family	Scientific Name	Common Name
Cyperaceae cont'd		
	Carex communis	fibrousroot sedge
	Carex flaccosperma	thin-fruit sedge
	Carex frankii	Frank's sedge
	Carex grayi	Gray's sedge
	Carex laxiflora var. laxiflora	broad looseflower sedge
	Carex lupulina	hop sedge
	Carex lurida	sallow sedge
	Carex pennsylvanica	Pennsylvania sedge
	Carex retroflexa	reflexed sedge
	Carex rosea	rosy sedge
	Carex scoparia	broom sedge
	Carex stipata var. stipata	owlfruit sedge
	Carex tribuloides	blunt broom sedge
	Carex vulpinoidea	fox sedge
	Eleocharis spp.	spike rush
	Scirpus atrovirens	dark-green bulrush
	Scirpus cyperinus	cottongrass bulrush
	Scirpus polyphyllus	leafy bulrush
Dioscoreaceae	*Dioscorea villosa*	wild yam
Dipsacaceae	*Dipsacus fullonum* **	Fuller's teasel
Dryopteridaceae	*Onoclea sensibilis*	sensitive fern
	Polystichum acrostichoides	Christmas fern
Ebenaceae	*Diospyros virginiana*	common persimmon
Elaeagnaceae	*Elaeagnus pungens* **	thorny olive
	Elaeagnus umbellata **	autumn olive
Equisetaceae	*Equisetum hyemale*	scouringrush horsetail
Euphorbiaceae	*Euphorbia corollata*	flowering spurge
Fabaceae	*Albizia julibrissin* **	mimosa
	Amphicarpaea bracteata	American hogpeanut
	Cercis canadensis	eastern redbud
	Chamaecrista fasciculata	partridge pea
	Desmanthus illinoensis	prairie bundleflower
	Desmodium nudiflorum	naked-flower ticktrefoil
	Desmodium paniculatum	panicledlead ticktrefoil
	Desmodium rotundifolium	prostrate ticktrefoil
	Gleditsia triacanthos	honeylocust
	Lespedeza cuneata **	Chinese bush-clover, sericea lespedeza
	Lespedeza procumbens	trailing bush-clover
	Lespedeza violacea	violet bush-clover
	Lespedeza virginica	slender bush-clover
	Medicago sp. *	alfalfa
	Melilotus officinalis **	yellow sweet-clover
	Robinia pseudoacacia	black locust
	Stylosanthes biflora	sidebeak pencilflower
	Trifolium dubium *	suckling clover
	Trifolium repens *	white clover
	Vicia sativa ssp, nigra *	garden vetch
Fagaceae	*Quercus alba*	northern white oak
	Quercus coccinea var. coccinea	scarlet oak

Family	Scientific Name	Common Name
Fagaceae cont'd		
	Quercus falcata	southern red oak
	Quercus imbricaria	shingle oak
	Quercus macrocarpa	bur oak
	Quercus muehlenbergii	chinquapin oak
	Quercus prinus	chestnut oak
	Quercus rubra	northern red oak
	Quercus shumardii	Shumard oak
	Quercus stellata	post oak
	Quercus velutina	black oak
Geraniaceae	*Geranium carolinianum*	Carolina geranium
Hamamelidaceae	*Liquidambar styraciflua*	sweetgum
Hippocastanaceae	*Aesculus glabra*	Ohio buckeye
Hydrangeaceae	*Philadelphus hirsutus*	hairy mock-orange
Iridaceae	*Belamcanda chinensis* *	blackberry lily
	Sisyrinchium mucronatum	needletip blue-eyed grass
Juglandaceae	*Carya alba*	mockernut hickory
	Carya cordiformis	bitternut hickory
	Carya glabra	pignut hickory
	Carya ovata	shagbark hickory
	Juglans nigra	black walnut
Juncaceae	*Juncus debilis*	weak rush
	Juncus diffusissimus	slim-pod rush
	Juncus effusus	soft rush
	Luzula echinata	hedgehog woodrush
	Juncus tenuis	poverty rush
Lamiaceae	*Glechoma hederacea* *	ground ivy
	Lamium amplexicaule *	henbit
	Lamium purpureum *	deadnettle
	Lycopus virginicus	Virginia water horehound
	Physostegia virginiana	obedient plant
	Prunella vulgaris *	common selfheal
	Pycnanthemum incanum	hoary mountainmint
	Pycnanthemum tenuifolium	narrowleaf mountainmint
	Salvia lyrata	lyre-leaf sage
	Stachys tenuifolia	smooth hedge nettle
	Teucrium canadense	Canada germander
Lauraceae	*Lindera benzoin*	northern spicebush
	Sassafras albidum	sassafras
Liliaceae	*Allium canadense var. canadense*	meadow garlic
	Eythonium americanum	yellow trout lily
	Hemerocallis fulva *	orange daylily
	Maianthemum racemosum	feathery false lily of the valley
	Polygonatum biflorum	smooth Solomon's seal
	Trillium cuneatum	little sweet Betsy
	Trillium flexipes	nodding wakerobin
	Uvularia sessilifolia	sessile-leaf bellwort
Lycopodiaceae	*Lycopodium dendroidium*	tree groundpine
Magnoliaceae	*Liriodendron tulipifera*	tuliptree
Malvaceae	*Hibiscus moscheutos ssp. moscheutos*	crimsoneyed rose-mallow

Family	Scientific Name	Common Name
Moraceae	*Maclura pomifera*	Osage orange
	Morus alba *	white mulberry
	Morus rubra	red mulberry
Oleaceae	*Fraxinus americana*	white ash
	Fraxinus pennsylvanica	green ash
	Ligustrum sinense **	Chinese privet
	Ligustrum vulgare **	European privet
Onagraceae	*Ludwigia alternifolia*	seedbox
	Oenothera biennis	common evening primrose
Ophioglossaceae	*Botrychium virginianum*	rattlesnake fern
Orchidaceae	*Goodyera pubescens*	downy rattlesnake plantain
	Spiranthes vernalis	spring ladies tresses
Oxalidaceae	*Oxalis stricta*	upright tellow woodsorrel
	Oxalis violacea	violet woodsorrel
Passifloraceae	*Passiflora incarnata*	purple passion flower
	Passiflora lutea	yellow passion flower
Phytolaccaceae	*Phytolacca americana*	American pokeweed
Pinaceae	*Pinus taeda*	loblolly pine
Plantaginaceae	*Plantago aristata*	large bract plantain
	Plantago lanceolata *	English plantain
	Plantago major	great plantain
Platanaceae	*Platanus occidentalis*	American sycamore
Poaceae	*Andropogon virginicus*	broomsedge bluestem
	Arundinaria gigantea	giant cane
	Bromus arvensis *	field brome
	Bromus secalinus **	rye brome
	Chasmanthium latifolium	indian wood-oats
	Danthonia spicata	poverty wild oat grass
	Dichanthelium boscii	Bosc's rosette grass
	Dichanthelium commutatum	variable rosette grass
	Digitaria ciliaris	southern crabgrass
	Digitaria sanguinalis	hairy crabgrass
	Elymus riparius	riverbank wildrye
	Elymus virginicus	Virginia wildrye
	Festuca subverticillata	nodding fesque
	Glyceria striata	fowl manna grass
	Leersia orzyoides	rice cutgrass
	Lolium perenne *	perennial ryegrass
	Melica mutica	two-flower melic grass
	Microstegium vimineum **	Nepalese browntop, Japanese grass
	Panicum flexile	wiry panic grass
	Poa pratensis	Kentucky bluegrass
	Schedonorus phoenix *	tall fescue
	Schedonorus pratensis *	meadow fescue
	Sorghum halepense **	Johnson grass
Polemoniaceae	*Phlox divaricata*	wild blue phlox
	Polemonium reptans var. reptans	Greek valerian
Polygonaceae	*Polygonum hydropiper*	mild water pepper
	Polygonum hydropiperoides	swamp smartweed

Family	Scientific Name	Common Name
	Polygonum lapathifolium	dock-leaf smartweed
	Rumex crispus *	curly dock
Portulacaceae	*Claytonia virginica*	Virginia springbeauty
Ranunculaceae	*Actaea pachypoda*	white baneberry
	Actaea racemosa	black baneberry
	Anemone virginiana	thimbleweed
	Clematis virginiana	devil's-darning needles
	Ranunculus bulbosus *	St. Anthony's turnip
	Ranunculus sardous *	hairy buttercup
	Ceanothus americanus	New Jersey tea
Rhamnaceae	*Frangula caroliniana*	Carolina buckthorn
Rosaceae	*Agrimonia gryposepala*	tall hair agrimony
	Crataegus crus-galli	cockspur hawthorne
	Crataegus mollis	downy hawthorne
	Geum canadense	white avens
	Potentilla canadensis	dwarf cinquefoil
	Potentilla simplex	oldfield cinquefoil
	Prunus americana	American plum
	Prunus serotina	black cherry
	Rosa carolina	Carolina rose
	Rosa multiflora **	rambler rose, multiflora rose
	Rubus allegheniensis	Allegheny blackberry
	Rubus argutus	saw-tooth blackberry
	Rubus flagellaris	whiplash dewberry
	Rubus occidentalis	black raspberry
	Spiraea tomentosa	steeplebush
Rubiaceae	*Cephalanthus occidentalis*	common buttonbush
	Diodia virginiana var. virginiana	Virginia-buttonweed
	Galium aparine	sticky-willy
	Galium circaezans var. circaezans	licorice bedstraw
	Galium pilosum var. pilosum	hairy bedstraw
	Houstonia caerulea	Quaker-ladies
	Houstonia purpurea	Venus' pride
Salicaceae	*Populus alba* **	white poplar
	Populus deltoides ssp. deltoides	cottonwood
	Salix caroliniana	Carolina willow
	Salix exigua	sandbar willow
	Salix nigra	black willow
Saururaceae	*Saururus cernuus*	lizard's-tail
Scrophulariaceae	*Verbascum thapsus* **	common mullein
Simaroubaceae	*Ailanthus altissima* **	tree of heaven
Smilacaceae	*Smilax bona-nox*	fringed greenbrier
	Smilax rotundifolia	horsebrier
Solanaceae	*Physalis heterophylla*	clammy groundcherry
	Solanum carolinense var. carolinense	Carolina horsenettle
Typhaceae	*Typha latifolia*	broad leaf cat tail
Ulmaceae	*Celtis laevigata*	sugarberry
	Celtis occidentalis	common hackberry
	Ulmus alata	winged elm

Family	Scientific Name	Common Name
	Ulmus americana	American elm
	Ulmus rubra	slippery elm
Urticaceae	*Boehmeria cylindrica*	small spike false nettle
	Pilea pumila	Canadian clearweed
Valerianaceae	*Valerianella radiata*	beaked cornsalad
Verbenaceae	*Phyla nodiflora*	turkey tangle fogfruit
	Verbena simplex	narrow-leaf vervain
	Viola pedata	bird-foot violet
Violaceae	*Viola sororia*	hooded blue violet
Vitaceae	*Ampelopsis cordata*	heartleaf peppervine
	Parthenocissus quinquefolia	Virginia-creeper
	Vitis aestivalis	summer grape
	Vitis labrusca	fox grape
	Vitis rotundifolia	muscadine

*Non-Native Plants
** Invasive Pest Plants

APPENDIX G

Natural Areas Near VTS-Smyrna

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Natural Areas within a 15 mile radius of VTS-Smyrna

Name	County	Area (acres)	Notable Features
Cedars of Lebanon State Forest	Wilson	9420	A National Natural Landmark containing two federally endangered plant species, Tennessee coneflower and leafy prairie clover. Additionally, several state-listed species are present.
Long Hunter State Park	Davidson, Rutherford	2400	Located along the eastern shores of J. Percy Priest Lake. Contains Couchville Lake, a 110 acre body of water that formed shortly after the impoundment of the reservoir when water filled underlying karst features. The park boasts cedar glades, forested areas, and a variety of recreational and educational opportunities.
Couchville Cedar Glade	Davidson, Wilson	122	Lies adjacent to the eastern boundary of Long Hunter State Park. Supports one of the largest known populations of Tennessee coneflower.
Elsie Quarterman Cedar Glade	Rutherford	185	Part of the J. Percy Priest Reservoir and is managed by both the USACE and TWRA. Named for Elsie Quarterman, a pioneering cedar glade researcher, who was a professor at Vanderbilt University.
Fate Sanders Barrens	Rutherford	230	Located on the eastern shore of J. Percy Priest Lake. Supports a diverse barrens community of grasses and plants typical of cedar glades, both of which require periodic burning for long term survival.
Gattinger's Cedar Glade	Rutherford, Wilson	57	Supports very large community of Tennessee coneflower a well as a host of other rare, cedar glade endemic species. Named for Augustin Gattinger, a well-known botanist who published the first descriptions of Tennessee coneflower and many other plant species native to Tennessee.
Mount View Cedar Glade	Davidson	9	Contains cedar glade habitat that is surrounded by intensive suburban development.
Stones River Cedar Glade	Rutherford	185	Located within the boundaries of the Stones River National Battlefield. Site of rigorous cedar glade and grassland restoration projects as well as aggressive invasive pest plant management.
Sunnybell Cedar Glade	Rutherford	36	Named for the sizable population of yellow sunnybells, a state-listed threatened plant found in calcareous washes in cedar glades, which are located on the site.

Natural Areas within a 15 mile radius of VTS-Smyrna

Name	County	Area (acres)	Notable Features
Vesta Cedar Glade	Wilson	150	Partially located within the boundaries of Cedars of Lebanon State Forest. Contains a variety of habitats including: cedar glades, barrens, and mixed cedar hardwood forests.
Vine Cedar Glade	Wilson	35	Located in the southeastern corner of Cedars of Lebanon State Forest. Supports a large population of Tennessee coneflower.
Walterhill Flood Plain	Rutherford	34	Situated in an agricultural field found on the floodplain of Stones River. Supports a large, healthy population of Stones River bladderpod, an extremely rare plant species that thrives in disturbed agricultural field habitat. Field management is the responsibility of Middle Tennessee State University's College of Agriculture.
	Approximate Total Acreage[1]	12863	

[1] Portions of Vesta Cedar Glade and Vine Cedar Glade are located within the perimeter of Cedars of Lebanon State Forest

APPENDIX H

American Indian Tribes Consulted by Tennessee Army National Guard

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APPENDIX I

Pest Management at VTS-S:

General Information

List of Approved Pesticide Chemicals for Use on VTS-S

Format for Reporting Pesticide/Herbicide Applications

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GENERAL PEST MANAGEMENT INFORMATION

- All pest management activities on TNARNG properties must be in accordance with the TNARNG Integrated Pest Management Plan.

- Only certified applicators may apply any herbicide or pesticide (general use or restricted use) on TNARNG facilities. Applicator must have either a DoD Pesticide Applicator Certification or a Tennessee Commercial Applicator Certification for the appropriate category of pesticide.

- All pesticide/herbicide applications made by contractor or TNARNG staff will be reported to the Integrated Pest Management Coordinator (IPMC). The reporting form to be used is included in this Appendix. Contact information for the IPMC is located at the bottom of the forms.

- Control of pests of facilities (e.g., termites, spiders, mice) is handled through contract by the training site maintenance office. Contract exterminators may only apply the approved pesticides listed below. Contract exterminators will fill out a Pest Control Treatment Record completely for each chemical utilized on a visit. The training site will submit a copy of this form to the IPMC (see bottom of reporting form for contact information).

- Weed control and turf maintenance applications may be made be state certified applicators on staff. All in-house applications of herbicides and pesticides must be reported to the IPMC quarterly.

- In certain situations, a non-certified person may apply a pesticide on a self-help basis for personal protection on a job site. The following limitations apply to self-help pesticide applications:

  - Self-help applications will include only those products listed for self-help. Applications of these products must be reported to the IPMC annually.

  - Self-help applications are for personal safety and comfort within the workplace and as such will be made only to small areas. Applications to an entire building or armory do not qualify as self-help. If a large portion of the facility requires treatment, a contracted pesticide applicator is needed.

  - Food preparation areas are NOT to be treated with self-help applications. Kitchens and related areas require professional treatment.

SELF-HELP PRODUCTS:

Product description	Brand name examples	Active ingredient (s)	EPA Reg. #
Cockroach bait station	Combat Source Kill Max R1 (Quick Kill Formula 1) (small roach)	Fipronil	64240-33
Roach, Spider, & Ant	Eliminator Ant, Roach & Spider Killer	Cypermethrin	9688-320
Roach & Ant	Raid Ant & Roach 26	Imiprothrin	4822-596
Ant Baits	Raid Ant Baits III	Abamectin	4822-529
Fire Ant	Amdro Pro Fire Ant Insecticide	Hydramethylnon	241-322
Fire Ant	Amdro (Probait) Fire Ant Bait	Hydramethylnon	73342-1
Fire Ant	Eliminator Fire Ant Killer Granuals (Talstar One/PL Granular) Insecticide	Bifenthrin	279-3168
Wasp & Hornet	Raid Wasp & Hornet Killer	Cypermethrin	4822-553
Wasp & Hornet	PT Waso-Freeze II Wasp & Hornet Insecticide	Prallethrin	499-550
Wasp & Hornet	Chemisco (Spectricide/Hot Shot) Wasp & Hornet Killer (LE)	lambda-Cyhalothrin	9688-190-8845
Indoor Fly Catcher, cylindrical sticky trap	NA	NA	NA
Insect Fly Catcher, sticky strips	NA	NA	NA
Rodent Sticky Traps	Trapper Rat Glue/Trapper Mouse Glue/Trapper Bulk Glue/Trapper Pro Pack	NA	MECH-6
Spring mouse trap	NA	NA	NA
Weed & Grass Killer	Roundup Weed & Grass Killer Ready-to-Use Plus	Glyphosate-isopropylammonium	71995-33

For more information on self-help applications, contact the IPMC.

APPROVED PESTICIDES FOR USE
ON TENNESSEE ARMY NATIONAL GUARD PROPERTIES

Generic formulations of identical chemical composition may be substituted for these trade-name approved pesticides.

Product Name	Chemical Name	% of A.I.	EPA Reg. #
Mosquito - Larvae			
Agnique MMF	POE isooctadecanol	100	53263-28
Altosid	S-Methoprene	8.62	2724-375
Altosid LL	S-Methoprene	20	2724-446
Altosid Pellets	S-Methoprene	4.25	2724-448
Altosid XR	S-Methoprene	2.1	2724-421
Bactimos Briquets/Mosquito Dunks	Bti	10.31	6218-47
Vectolex-CG	Bacillus sphaericus	7.5	73049-20
Mosquito - Adults			
Aqua-Reslin	Permethrin Piperonyl butoxide	20 20	432-796
Bio-Mist 1.5 + 7.5	Permethrin Piperonyl butoxide	1.5 7.5	8329-40
Fyfanon	Malathion	96.5	67760-34
Kontrol 4,4	Permethrin Piperonyl butoxide	4.6 4.6	73748-4
Mosquito Beater	Naphthalene Butoxypolypropylene glycol	4.5 0.5	4-123
Permanone 10%EC	Permethrin	10	432-1132
Scourge 4+12	Resmethrin Piperonyl butoxide	4.14 12.42	432-716
ULD BP-100	Pyrethrin Piperonyl butoxide Octacide-264	1 2 2.94	499-452
ULD BP-300	Pyrethrin Piperonyl butoxide Octacide-264	3 6 10	499-450
Fire Ants			
Amdro Pro	Hydramethylnon	0.73	241-322
Avenger	Deltamethrin	0.05	40208-6
Award Fire Ant Bait	Fenoxcarb	1	100-722
Chipco Top Choice Fire Ant Bait	Fipronil	0.0143	432-1217
Maxforce Fire Ant Bait	Hydramethylnon	1	432-1265
Filth Flies			
Golden Malrin	Methomyl Muscamone	1.1 0.049	2724-274
Stimukil Fly Bait	Methomyl Muscamone	1 0.04	53871-3

Product Name	Chemical Name	% of A.I.	EPA Reg. #
Termites			
Bora-Care	Boron sodium oxide	40	64405-1
Dursban TC	Chlorpyrifos	44.9	62719-47
Premise 75	Imidacloprid	75	3125-455
Termidor 80WG	Fipronil	80	7969-209
Termidor SC	Fipronil	9.1	7969-210
Tim-Bor Professional	Boron sodium oxide	98	64405-8
Bees & Wasps			
Prescription Treatment Wasp-Freeze	D-Phenothrin D-trans-Allethrin	0.12 0.129	499-362
General Arthropod Control			
Advance Ant Bait	Abamectin	0.011	499-370
Borid	Boric acid	99	9444-129
Catalyst	Propetamphos	18.9	2724-450
CB-80 Extra	Pyrethrin Piperonyl butoxide	0.5 4	9444-175
Cynoff EC	Cypermethrin	24.8	279-3081
DeltaDust	Deltamethrin	0.05	432-772
DeltaGard G	Deltamethrin	0.1	432-836
Demand CS	Lamda-cyhalothrin	9.7	100-1066
Demon EC	Cypermethrin	25.3	100-1004
Drax Ant Bait	Boric Acid	5	9444-131
Drione	Pyrethrin Piperonyl butoxide Silica gel	1 10 40	432-992
Dual Choice Ant Bait	Sulfluramid	0.5	499-459
Gentrol Point Source	Hydropene	90.6	2724-469
Kicker	Pyrethrin Piperonyl butoxide	6 60	432-1145
Maxforce Gel	Hydramethylnon	2.15	432-1254
Maxforce Roach Bait	Fipronil	0.05	432-1460
Niban Bait	Boric acid	5	64405-2
Nylar IGR	Nylar	1.3	11715-307-57076
PCO Fogger	Nylar Belmark Prallethrin	0.6 0.1 0.04	9444-168
Perma-Dust	Boric acid	35.5	499-384
PI Contact	Pyrethrin Piperonyl butoxide	0.5 4	499-444
Precor Plus Fogger	Permethrin	0.58	2724-454
PT565 Plus XLO	Pyrethrin Piperonyl butoxide Octacide-264	0.5 1 1	499-290
R Value's Roach Kill	Boric acid	99	9444-130
Saga WP	Tralomethrin	40	432-755
Sevin 80S	Sevin	80	264-316

Product Name	Chemical Name	% of A.I.	EPA Reg. #
General Arthropod, Cont.			
Suspend SC	Deltamethrin	4.75	432-763
Tempo SC Ultra	Cyfluthrin		3125-498
Tempo 20WP	Cyfluthrin		3125-377
ULD BP-100	Pyrethrin Piperonyl butoxide Octacide-264	1 2 2.94	499-452
ULD BP-300	Pyrethrin Piperonyl butoxide Octacide-264	3 6 10	499-450
Ultracide	Nylar Pyrethrin Permethrin Octacide-264	0.1 0.05 0.4 0.4	499-404
Zero-In 797-A	Pyrethrin Piperonyl butoxide Silica gel	1 10 40	432-992-70799
Rodents and Other Vertebrates			
Contrac Rodenticide	Bromadiolone	0.005	12455-69
Ditrac Blox	Diphacinone	0.005	12455-80
Fastrac Pacs	Bromethalin	0.01	12455-97
Final All-Weather Blox	Brodifacoum	0.005	12455-89
Talon-G Pellets	Brodifacoum	0.005	100-1052
WeatherBlok XT	Brodifacoum	0.005	100-1055
4-the-Birds	Polybutene	93	8254-5-56
All Vegetation – Bare Ground			
Arsenal	Imazapyr	27.6	241-273
Escort	Metsulfuron	60	352-439
Hyvar XL	Bromacil	21.9	352-346
Krovar IDF	Bromacil Diuron	40 40	352-505
Oust XP	Sulfometuron	75	352-601
Outrider	Sulfosulfuron	75	524-500
Reward Aquatic Herbicide	Diquat dibromide	37.3	100-1091
Round-up Pro	Glyphosate	41	524-475
Round-up Ultra	Glyphosate	41	524-475
Round-up UltraDry	Glyphosate	71.4	524-504
Sahara DG	Imazapyr Diuron	7.78 62.22	241-372
Pre-emergent Herbicide			
Balan 2.5G	Benfluralin	2.5	62179-96
Banvel + 2,4-D	Dicamba 2,4-D	12.4 35.7	66330-287

Product Name	Chemical Name	% of A.I.	EPA Reg. #
Pre-emergent, Cont.			
Gordon's Pro Turf & Ornamental Barrier	Dychlobenil	4	2217-675
Surflan A.S.	Oryzalin	40.4	70506-44
MSMA	Monosodium methanearsonate	47.6	19713-42
Pennant (grasses)	S-Metolachor	83.7	100-950
Selective Post-emergent			
MSMA (grasses)	Monosodium methanearsonate	47.6	19713-42
Poast (grasses)	Sethoxydim	18	7969-58
Gordon's Pro Trimec Plus (broadleaf)	Dicamba MSMA 2,4 D Mecoprop-p	1.46 18 5.83 2.93	2217-808
Cool Season Grasses			
Plateau	Imazipic-ammonium	23.6	241-365
Plant Growth Regulator			
Cutless 50W	Flurprimidol	50	67690-15
Embark	Mefluidide	28	2217-759
Primo	Cimectacarb	12	100-729
Brush & Forestry			
Accord Site Prep	Glyphosate	41	62719-322
Arsenal	Imazapyr	27.6	241-273
Garlon 3A	Triethylamin triclopyr	44.4	62719-37
Garlon 4	Butoxyethyl triclopyr	61.6	62719-40
Escort	Metsulfuron	60	352-439
Oust XP	Sulfometuron	75	352-601
Round-up Pro	Glyphosate	41	524-475
Tordon K	Picloram	24.4	62719-17
Velpar L	Hexazinone	25	352-392
Velpar ULW	Hexazinone	75	352-450
Aquatic Weeds & Algae			
Aquashade	Acid Blue 9 Acid Yellow 23	23.63 2.39	33068-1
Cutrine Ultra Algaecide	Copper	9	8959-53
Reward	Diquat dibromide	37.3	100-1091
Rodeo	Glyphosate	53.8	62719-324
Sonar AS	Fluoridone	41.7	67690-4
2,4-D amine 4	2,4-D	47.3	1381-103

Pest Control Treatment Record

(Have the contractor fill this form out or provide a printed receipt providing all information.)

Site:_____ Treatment Date:_____

Location of Treatment:_____

Type of Pest Problem:_____

Indicators of Pest Problem:_____
(What did you observe and where? Number of pests seen, signs of damage,…)

Chemical Pesticide/Herbicide Application
Pest control contractors must be state-certified for commercial application – include copy of certification if not on file with contract.

Pesticide/Herbicide Trade Name:_____

EPA Registration Number:_____

Active Ingredient(s) and % Concentration: _____ _____%

_____ _____%

_____ _____%

Quantity of Concentrate Used (if applicable):_____

Quantity of Finished Pesticide Applied:_____

% Active Ingredient as Applied:_____%

Size of Treated Area: _____

Application Rate:_____

Applicator Name:_____ Certification #_____

Man Hours Used:_____ Category(s)_____

Pest Control Company:_____ License #_____

Maintain copies of this form on site.
Send copies quarterly to: TNARNG
Attn: Courtney Rogers
JFHQ-TN-FMO-ENV
3041 Sidco Dr.
Nashville, TN 37204-1502

For more information call: (615) 313-0603 or email: courtney.a.rogers3.nfg@mail.mil

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APPENDIX J

Annual Review of the INRMP

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INRMP ANNUAL REPORT

To:

From:

Subject: ARNG Annual Report on Implementation Status of the Integrated Natural Resource Management Plan (INRMP)

Date:

Reporting Period:
(Period report covers, i.e. 1 May 06 – 1 May 07.)

Annual Coordination Meeting: *(Identify the date and attendees of annual coordination. Indicate if this correspondence will be used in lieu of 'face-to-face' meetings. Use the following headers to document review findings)*

Program Overview: *(Short paragraph addressing the goals and objectives of the plan, the status of the mission requirements relative to the current plan and the issue of "no net loss" to training.)*

Current Implementation Status: *(List all projects for the current reporting period, those completed or on-going, and those that were planned but not initiated. Also indicate if any projects were rescheduled and the proposed new timeline. If a table is already available, paste in or submit as separate sheet and reference here.)*

Proposed Implementation: *(List all projects and actions planned for the next reporting period. If a table is already available, paste in or submit as a separate sheet and reference here.)*

Installation Personnel: *(List by title natural and cultural resource management personnel involved with implementation of the INRMP.)*

USFWS Regional Office Contact Information: *(Enter Point of Contact and contact information.)*

USFWS Field Office Contact Information: *(Enter Point of Contact and contact information.)*

State Fish and Game Agency Contact Information: *(Enter Point of Contact and contact information as applicable. Include all agencies or division involved.)*

Annex 1
FOREST MANAGEMENT PLAN

TABLE OF CONTENTS

1.0 INTRODUCTION

The forestlands of VTS-S were inventoried in 2005, and this management plan was developed based on military needs and forest health goals. It presents the recommended forest management prescriptions for the forest stands occurring within the Cantonment Area and each of the 6 training areas that comprise VTS-S (see Figure A1.1). Details of timber volumes and other stand characteristics are available in the Forest Inventory (Thompson Engineering 2006).

Individual forestry management prescriptions are provided for the forest stands occurring within each training area. The forest management prescriptions are generally focused on actions that would improve training facilities or enhance the habitat quality and health of the forestry resources on VTS-S. The use of prescribed fire is also addressed for each forest stand. Recommendations for prescribed burning

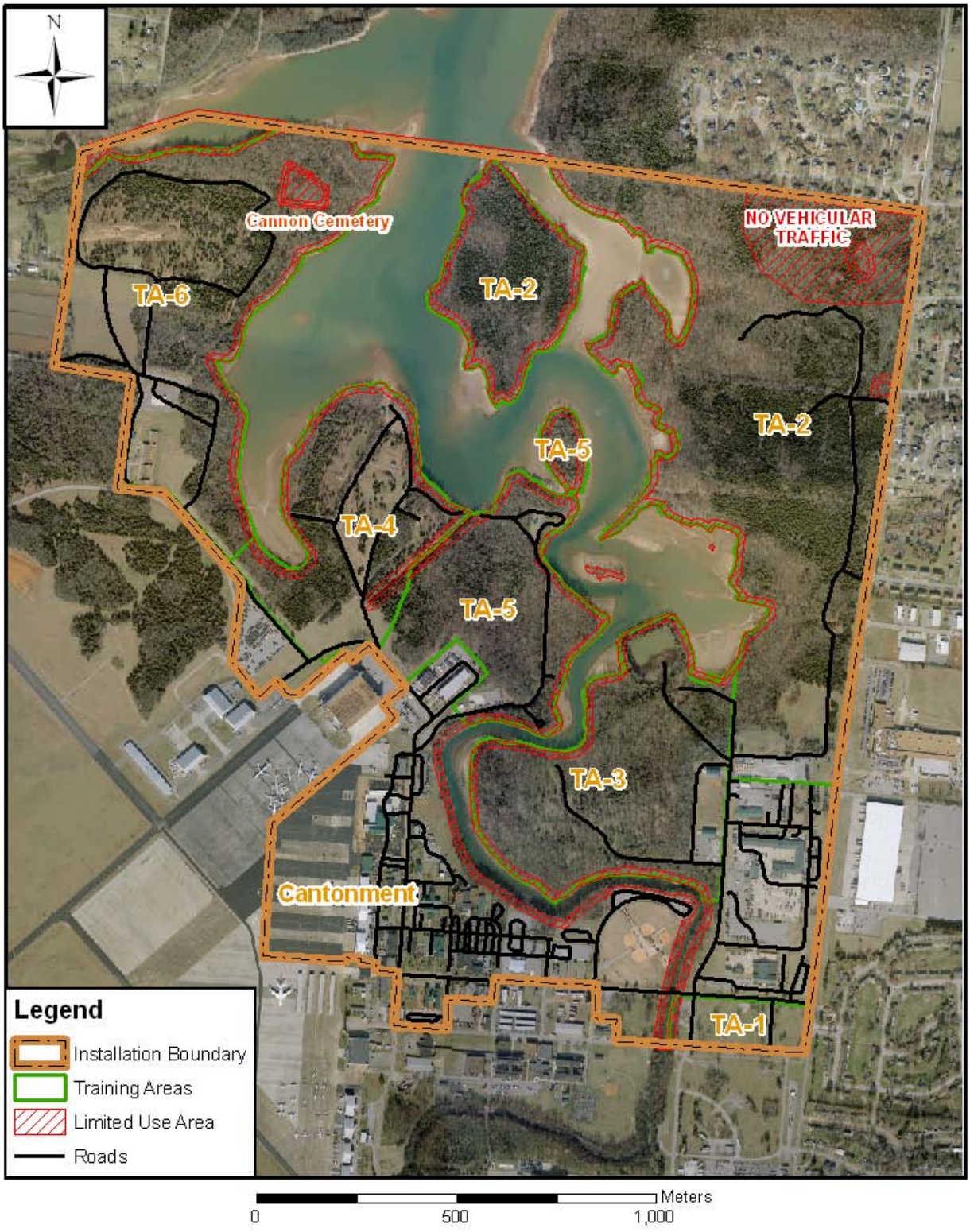

Figure A1.1: Training areas as used for forest stand delineation on the VTS-Smyrna.

are almost exclusively restricted to burns that would to reduce excessive accumulations of fuels to reduce wildfire risks and, in most cases, would be conducted infrequently on a 6-year rotation, unless otherwise specified. Annex 2 provides more details on the prescribed burning program at the VTS-S.

2.0 FOREST INVENTORY

The forest inventory for VTS-S was conducted in April 2005 by Forest Management Group, Inc., based in Hattiesburg, Mississippi. The forest inventory was developed using the established training areas and cantonment area to serve as the basic forestry management units. Figure A1.1 shows the locations of the Cantonment Area and the 6 training areas that make up the VTS-S.

The forest resources occurring within the forestry management units were inventoried. Each management unit was subdivided as appropriate into individual forest stands based on the sharing of common characteristics that served to define each stand. Among the parameters considered to delineate the forest stands were species composition, age, size, and condition. Delineation of the stands was accomplished by both the use of aerial imagery and ground observations of the different timber types and ages. A consistent forest stand numbering system was used throughout the inventory to identify each stand based on the major land features and forest types that characterized each stand.

The forest inventory provides the volumes of sawtimber (in tons and board feet) and pulpwood (in tons and cords) that was available within each stand at the time the inventory was performed in April 2005. The sawtimber is apportioned between pine, pine poles, CNS (chip-n-saw: pine timber that can yield both 2x4s and chips), spruce pine, red oak, white oak, hickory, poplar, cedar, ash, walnut, and miscellaneous hardwood (i.e., all other hardwood species that may be present). The pulpwood is apportioned between pine and hardwoods. The timber volume data is presented on both a per acre basis and as a total per stand for each product class.

The forest inventory also provides supplementary information to better understand the major characteristics of each stand. That information includes:

- Dominant and co-dominant tree species occurring within each stand
- Average basal area and DBH of trees within each stand on a per acre basis
- Average number of snags per acre; the minimum and maximum age of the trees
- A general assessment of the overall health of the stand
- An evaluation of the current condition of the stand
- General remarks on other major characteristics of the stand where appropriate and useful.

The forest inventory determined that a total of 456 acres of VTS-S was covered in forests at the time the forest inventory was conducted in April 2005. Table A1.1 presents summary volume data for the inventoried timber products on a per acre basis and for the entire installation.

The Forest Inventory also revealed that the overall average diameter at breast height (DBH) of trees on the entire installation was 8.3 inches and that the installation had an average basal area of 56.1 square feet per acre. The forest stands on VTS-S are typically dominated by eastern redcedar, red oaks, and other miscellaneous hardwoods such as maples and hackberries, with a substantial amount of green ash in some stands. Red oaks are co-dominant in some stands, as are hickory, sycamore, and black willow. Most stands were characterized by trees ranging from 5-30 years old, but some had trees approaching 40 years in age, while a few stands were dominated by very young trees. The overall health of the forest stands was observed to be good during the April 2005 Forest Inventory.

Table A1.1 Forest Product Volume Summary for VTS-Smyrna Based on the April 2005 Forest Inventory

Timber Product	Per Acre		Installation Total	
	Tons	Board feet	Tons	Board feet
Sawtimber				
Pine	1.5	178.2	685	81,348
Pole	0	0	0	0
CNS	0.1	13.6	46	6,208
Cedar	0.1	13.7	46	6,254
Red Oak	0.8	107.7	365	49,165
Hickory	0.2	19.9	91	9,084
White Oak	0.2	26.5	91	12,097
Ash	0.1	8.8	46	4,017
Poplar	0.5	53.4	228	24,377
Walnut	0.1	16.3	46	7,441
Misc. Hardwood	2.4	316.3	1,096	144,391
Pulpwood				
Pine	0	0	0	0
Hardwood	14.9	5.5	6,082	2,511

Army guidance requires all installations with a forestry program to keep their forest inventories current (i.e., not older than 10 years) when such forests are essential to the mission and/or capable of commercial use. Since the existing forest inventory for VTS-S was conducted in April 2005, the forest resources should be re-inventoried no later than 2015. The inventory intensity should be appropriate at that time to reflect the planned use of the forest and for monitoring the long-term health and sustainability of the forest. In addition to determining the volume of merchantable forest products available on the installation in 2015, the inventory should be directed at evaluating the overall health and characteristics of the forest community and to assessing the effectiveness of the forest management prescriptions that have been implemented during the intervening 10-year period.

3.0 FOREST MANAGEMENT GUIDELINES

Based on the results of the 2005 forest inventory, the health of most of the VTS-S forest stands is judged to be good to excellent. However, despite the relative good health of the majority of the forest stands considered, the stem density in several of the installation's forest communities is so thick that effective military training has become extremely difficult on portions of some of the training areas (i.e., Training Areas 2, 4, and 6) and without significant thinning, the health of many of the forest stands on the installation is expected to begin exhibiting signs of decline within the next 10 years.

The Management Prescriptions section presents the recommended forestry management prescriptions developed for each forest stand occurring within the cantonment area and each of the 6 training areas that comprise VTS-S. The management recommendations are intended to improve conditions for training and

enhance forest resource quality and habitat value. All planned harvests at this time will be thinning to remove smaller trees.

In all harvest activities, pre-commercial or commercial, there will be no timber removal within 100 feet of creek or lake shorelines. A 100 ft buffer will also be maintained along property boundaries except for the 25 ft security line of site clearing required along the fence-line itself.

Generally, no more than 60 acres will be harvested in a given year. In the event that the island portion of TA 2 is harvested, the entire 70 acres (minus buffer zones) will be harvested at one time to minimize impacts on the mudflat that will have to be crossed to access the island. Stands less than 60 acres may be subdivided and harvested in multiple years if training needs dictate on-going access to a portion of the stand.

The use of prescribed fire is also addressed for each forest stand. Recommendations for prescribed burning are almost always restricted to burns that would be directed toward reducing excessive accumulations of fuels to reduce wildfire risks and would be conducted infrequently at intervals of no less than 6 years. Annex 2 should be referred to for information on the weather guidelines that should be considered when conducting such burns and for the management objectives that are to be accomplished by prescribed burning.

3.1 Forest Management Objectives

The individual forestry management recommendations were based upon a consideration of the following broad management objectives developed for the overall forest community occurring on VTS-S.

- Provide appropriate vegetation cover for training needs as determined by mission requirements.

- Maintain a healthy forest ecosystem appropriate to the region through even and uneven aged management techniques. Forest values to be protected or improved are:
  - Soil conservation and water quality protection
  - Wildlife habitat
  - Biodiversity
  - Timber and forest products

- Control invasive pest plants (IPP) for the health of the forest.

- The cedar-dominated stands should be subjected to extensive thinning to reduce stem density, enhance training opportunities, reduce wildfire risks, and promote restoration of native grasses and other herbaceous plants that prefer open areas.

- Create conditions that encourage the establishment of young trees that will be available to regenerate the forest when the existing trees are removed.

- Utilize prescribed fire appropriately for each community types:
  - Prescribed fire should be applied in cedar dominated forest stands only after thinning is accomplished. Thereafter, burns should be directed toward reducing excessive accumulations of fuels to reduce wildfire risks and should be conducted at intervals of 3 years.

- Prescribed fire in bottomland hardwood stands should only be used as necessary for fuel reduction or to meet military mission needs. Harwood stands should be burned no more frequently than every 6 years.
- Stands dominated by grasslands should be burned at 1 to 2 year intervals. Monitoring should be performed at the midpoint between intervals to determine if the interval between burn events should be reduced or increased.

3.2 Timber Harvest Operations

The periodic harvest of timber is the primary measure used to manage forestry resources. The principle purpose of the forest management program on the VTS-S is to support the military mission and ecosystem management goals, while optimizing the forest resource and its associated forest products and benefits. Timber harvest decisions are not to be directed solely to generate revenue.

Timber harvests must be consistent with the military mission and comply with federal laws and policies, including avoiding adverse impacts on sensitive species and cultural resources. Prerequisites for timber harvests include the following:

- A current and approved Forest Management Plan that is normally included in an INRMP.
- National Environmental Policy Act documentation
- Comply with applicable laws
- Be a fiscally sound investment
- Capable of ecosystem sustainability
- Comply with installation safety restrictions
- Consider potential effects on significant archeological resources and historic properties.

The process for conducting a timber sale on VTS-S will start several months prior to harvest time:

- A stand-specific harvest plan will be developed in accordance with this plan (January)
- A Record of Environmental Consideration will be prepared for the harvest plan to satisfy NEPA requirements
- The harvest plan and REC will be sent to the TN SHPO for consideration (before March 1)
- The harvest plan and REC must be submitted to NGB with a Timber Report of Availability (ROA) (by May 30 prior to the fiscal year in which the harvest is planned)

3.3 Pest Management

Trees are susceptible to periodic infestations of insects and fungi that have the potential to result in serious damage to an installation's forest resources and overall landscape. This can result in the diminishment in the quality of the training landscape; economic loss of potential merchantable timber; modification of habitat conditions within the forest ecosystem that could influence wildlife populations; and an increased risk of wildfire. While such infestations are a natural phenomenon, actions may be required on occasion to prevent the spread of the infecting vector and/or remove damaged and diseased trees.

The U.S. Forest Service (USFS) is responsible for protecting forests from insects and disease in cooperation with the owners of forest lands. The DoD and the U.S. Department of Agriculture entered into a Memorandum of Agreement (MOA) in 1990 to conduct forest insect and disease suppression on lands administered by the DoD. Under the MOA, the USFS provides technical assistance and funds to

provide foliage protection, reduce specific insect and disease populations, reduce risk of artificial spread to uninfested areas, and to prevent tree mortality.

Army installations may receive funds from the USFS for forest pest suppression projects under the terms of the MOA. Installations wanting to receive pest management funding should have a biological assessment of the forest resources in questions conducted by the local USFS staff. The biological assessment should recommend the type of technical assistance required and management actions that could be pursued to address the pest problem. This could include population monitoring, surveys, biological evaluations, determination of trends and projected damage, and consideration of environmental and economic impacts. Approximately one year is required before funds are received for approved requests. The USFS funds are provided to the installations through Army channels to the proponent organizations for distribution to the appropriate installations. In the case of the TNARNG, pest management funds are received from the NGB.

3.4 Salvage of Disaster Damaged Trees

Natural weather phenomena such as tornadoes and ice storms can have a severe impact on forests. For example, large swaths of trees can be uprooted and/or their trunks broken above the ground by tornadoes, while large ice storms can create extensive alterations in the forest canopy by damaging limbs and small branches. If the damage to trees is significant and widespread, individual trees can be weakened and become more susceptible to disease and parasites in the years following the weather event. That damage can reduce growth rates and possibly even result in the death of individual trees.

If the damaged trees represent a significant economic loss or if the physical aftermath creates a safety hazard, impediment to training, or threat of insect infestation, it may prove prudent to undertake salvage operations in an attempt to recover as much of the lost volume and value of the damaged timber as possible. Salvage actions must be pursued relatively quickly following the disaster to prevent the deterioration in the quality of the damaged wood so as to recover as much economic value as possible. Even though prompt action is needed, the environmental evaluation requirements are typically not waived. In the event a salvage harvest is deemed necessary, TNARNG will coordinate with USACE to conduct the necessary environmental review and emergency harvest procedures.

4.0 ENVIRONMENTAL CONSIDERATIONS IN FOREST MANAGEMENT

All timber sales must be consistent with all applicable environmental laws and regulations. Experience has shown that cultural resources (i.e., historic and/or archaeological) and endangered and threatened species issues have the greatest potential to affect forestry management operations, including timber sales.

4.1 Cultural Resources

Forest management activities must not negatively impact cultural resources on the VTS-S. Several aspects of timber management have the potential to affect cultural resources, including timber harvest operations, site preparation and planting, and prescribed fire. Cultural resources investigations (Phase I survey in 1999 and Phase II survey in 2005) have identified two archaeological sites that are eligible for listing in the National Register of Historic Places, as well as other sites considered ineligible. These sites are identified in the TNARNG GIS system and will be incorporated into forest management planning. All efforts will be made to minimize any impacts on known cultural resources.

The known archaeological sites, whether eligible or not, will be excluded from ground-disturbing activities unless full consultation with the Tennessee State Historic Preservation Officer (SHPO) has been

conducted for the project. Such activities include, but are not limited to, the construction of plowed fire breaks (see Annex 2, Figure A2.1 for "no plow zones"), the use of dozers or other heavy equipment to clear stumps and logging slash, and the use of mechanical planting equipment. Cannon cemetery will be protected from damage during forestry activities by maintaining a 50 foot no-harvest buffer zone surrounding it.

This plan will be submitted for review to the Tennessee SHPO prior to implementation. In addition, the SHPO will be contacted for comments on the annual report of timber availability submitted each year for timber sale planning. Other forestry projects which have the potential to impact known cultural resources on the VTS-S will be coordinated with the SHPO as appropriate.

4.2 Sensitive Species

Chapter 3 of the INRMP contains information on sensitive species occurring or having the potential to occur on the installation based on information obtained from the Tennessee Division of Natural Heritage and on-site surveys. The VTS-S has no known resident federally listed threatened or endangered species. Two species that have been documented on the training site – the meadow jumping mouse and the sharp-shinned hawk – have partial federal status, indicating that a subspecies of each taxa is designated as threatened or endangered in a portion of its national range. The populations found in Tennessee, however, do not include this subspecies and have been determined to be secure at this time. These two species are listed as deemed in need of management by the state of Tennessee. A number of other species of concern (see Table 3.5) have been documented within a 5-mile radius of VTS-S, but have not yet been observed on the facility.

Almost all of the plant species and some of the animals listed in Table 3.5 prefer cedar glade habitat. Although there is considerable cedar habitat present on VTS-S (particularly in Training Area 2), much of it is overgrown with high stem densities and considerable branching. These conditions make the habitat unsuitable for most of the sensitive species to thrive on the installation. The forest management measures described in Section 6 of this annex include actions that could be taken to improve habitat conditions for these species.

If any federally listed species are found to be regularly utilizing the VTS-S, consultation with the USFWS will be initiated to ensure that further forest management and other natural resources activities will not negatively impact the species. Efforts will also be made to protect any state-listed threatened or endangered species that may be found on the training site through coordination with the Tennessee Wildlife Resources Agency (TWRA) and the Tennessee Natural Heritage Program.

4.3 Forestry Best Management Practices

Protection of watersheds and water quality during forest management activities can be a significant concern. Forestry practices can generate nonpoint source (NPS) pollution including sediment, organic matter, pesticides, nutrients, and elevated water temperatures. Removal of or damage to vegetative cover can increase runoff and erosion. The Stewart Creek embayment of the J. Percy Priest Lake is a major landscape feature at VTS-S, with significant portions of all six training areas bordering the lake's shoreline at various locations on the installation. The entire installation drains into the embayment.

The headwaters of Stewart Creek originate upstream of VTS-S. The installation represents the most downstream portion of the drainage basin before the stream flows into J. Percy Priest Lake. The area contained in the installation represents only a small portion of the Stewart Creek Basin's total drainage area. Much of the basin upstream of VTS-S has been developed as part of the urban sprawl associated with Nashville. The installation's training areas represent the most significant remaining undeveloped

blocks of land in the Stewart Creek Basin and serve as a buffer between the lake's shoreline and surrounding land uses.

Forestry Best Management Practices (BMPs) have been developed to reduce the adverse effects of forest operations on ecosystems and to protect water quality. A BMP is a practice or combination of practices considered to be the most effective means of preventing or reducing the amount of pollution by nonpoint sources to a level compatible with water quality goals and protecting fish and wildlife populations and habitats. BMPs will be applied to all timber management activities on the VTS-S.

The Tennessee Division of Forestry has adopted BMPs for forestry operations to prevent the impairment of water quality in the State's streams. The Tennessee BMPs are offered as nonregulatory guidelines to be used during the construction of roads, log landings, and skid trails to minimize the environmental impact of forest management activities. The BMPs are summarized in Table A1.2 and are available in manual form at http://www.state.tn.us/agriculture/forestry/bmpmanual.html. Although the BMPs are offered as guidelines, the State of Tennessee has firm expectations that appropriate BMPs will be employed in all forestry operations. Under the Tennessee Water Quality Control Act as amended in 2000, the Tennessee Department of Environment and Conservation has the power to issue a stop work order if a timber harvesting operation is determined to pollute waters of the State because a logger failed or refused to implement BMPs.

Table A1.2: Forestry Best Management Practices for VTS-Smyrna. (From Guide to Forestry Best Management Practices in Tennessee. 2003. Tennessee Department of Agriculture, Division of Forestry.)

Forestry Practice	Activity/Resource	BMP
Forest Roads	Locating Roads	Use soil surveys and topographic maps to develop plan.
		Use existing roads to minimize length of road construction.
		Locate roads as far from water bodies as possible.
		Avoid locating roads at confluence of streams.
		Avoid building roads in streamside management zones and sensitive areas.
		Avoid or minimize stream crossings. When that is not possible, crossings should be constructed at right angles.
		Locate roads on upper slopes near ridge crests to promote drainage, but avoid top of ridges.
		Fit roads to topography by following natural contours and keep grade between 2 and 12 percent. Avoid road sections with 0 percent grade.
	Constructing Roads	Complete construction several weeks in advance of use by logging traffic to allow road bed time to settle.
		Avoid construction during wet weather.
		Construction grades on 2 to 12 percent slopes where possible. Steeper slopes should be used for only short distances where adequate drainage structures are provided.
		Runoff from roads should not directly discharge into streams.
		Minimize runoff at stream crossings.
		Control drainage from roads by using appropriate design techniques: varying grades, crowning, outsloping, wing ditches, sediment control structures, broad-based dips, water bars, water turnouts, and/or cross-drain culverts.
		Push cleared trees and brush to downhill side of road to assist in trapping sediment.
		Maximize sunlight exposure to road surface.
		Minimize road width, right-of-way, and stream crossings to minimize soil

Forestry Practice	Activity/Resource	BMP
		disturbance
		Revegetate exposed soils in potential problem areas that could generate sediment.
	Road Retirement	Construct water bars or other drainage structures immediately after active logging has ceased.
		If logging will be delayed, construct temporary drainage and erosion control structures.
		Remove temporary bridges, culverts, and pole fords.
		Remove sediment and debris from dips, ditches, and culverts.
		Use mulch and/or seed with lime and fertilizer to prevent soil erosion.
Streamside Management Zones (SMZs)	Perennial and Intermittent Streams	Streamside Management Zone (SMZ) planning should be done before beginning timber harvest.
		Mark SMZ boundary prior to harvest.
		SMZ width will be a minimum of 50 feet between disturbed area and top bank, with 20 additional feet for each additional 10% of slope. This applies to both sides of the waterway.
		If trees are harvested in SMZ, maintain 50 percent canopy cover or greater.
		Do not use stream channels as roadways for equipment.
		Harvest of timber on training site's islands will be done only during winter pool.
		Avoid equipment operation within SMZ; harvested trees should be cabled or winched out.
	Ephemeral Streams or Wet Weather Conveyances	Avoid skidding within drains during wet conditions.
		Avoid locating roads in drains except when necessary for crossings.
		Do not empty road runoff into drains.
		Minimize soil exposure and compaction to protect ground vegetation.
	Sensitive Areas	Avoid skidding in these areas.
		Avoid locating roads in these areas.
		Do not empty road runoff into drains.
		Minimize soil exposure and compaction to protect ground vegetation.
Stream crossings	Crossings	Avoid or minimize stream crossings. When that is not possible, crossings should be constructed at right angles.
		Locate crossings on straightest stream sections.
		Avoid locating crossings at confluence of streams.
		Design to minimize disruption of movement of aquatic life.
		Approaches should be graveled and should rise away from streams to minimize erosion,
		Install broad-based dips and wing ditch turnouts to turn water off roads before entering stream
	Fords	Use fords for haul roads only, not for skid trails.
		Locate fords where stream banks are low.
		Fords should have a solid bottom.
		Where necessary, use gravel to establish low water crossing.
	Culverts	Permanent culverts should be sized to accommodate the area to be drained.
		Temporary culverts may be smaller, but must be removed after completion of logging.
		Install culverts in a manner that minimizes disturbance of stream. Stabilize fill material with riprap and/or vegetation.
		Inspect culverts periodically to ensure they are free of blockages.
		Install culverts on grade with bottom of channel to allow movement of aquatic life.

Forestry Practice	Activity/Resource	BMP
	Bridges	Locate bridges across narrow points of stream and on firm soils.
		Protect banks from sloughing during construction.
		Remove temporary bridges.
		Do not cover bridges with soil.
		Use temporary bridges for skid trails to prevent equipment and logs from entering stream channels.
Log Landings	Log Landings	Locate landings outside of SMZs and away from streams and sensitive areas.
		Slope landings 2-5 percent to allow for drainage.
		Prevent debris and fuels/lubricants from being washed by runoff into streams.
		Re-vegetate landings after use if they pose a potential water quality problem.
		Install drainage and sediment control structures to divert runoff.
Skid Trails	Skid Trails	Minimize number of skid trails by using existing trails.
		Locate skid trails on slopes 2 to 30 percent. Steeper slopes can be used for short distances if water control/drainage structures are provided.
		Runoff from skid trails should not discharge into a stream.
		Control runoff by varying trail grade, water bars, wing ditches and/or sediment control structures.
		Prevent runoff associated with stream crossings.
		Avoid skidding across streams, drains, and sensitive areas.
		Use culverts or temporary crossing structures.
		Do not use fords to skid across streams.
		Do not operate equipment in streams.
		Avoid skidding directly up or down hill, but follow contours or “zigzag” if possible.
		Use low ground pressure tires on skidders when available and concentrate skidding as much as possible on a few primary skid trails to minimize site disturbance and soil compaction.
		After completing logging, remove temporary bridges and culverts, sediment and debris from dips, ditches, and culverts, and revegetate problem areas.
		Use mulch and/or seed with appropriate amounts of lime and fertilizer when needed to prevent soil erosion.
		Avoid ruts that risk channeling water into a stream.
Logging Debris	Disposition of Debris	Trees should not be felled in or across streams.
		Pull treetops far enough from waterways to prevent them from being washed in during high water.
		Do not drag trees and tops through a stream channel.
		Do not remove stumps and roots from stream banks.
Servicing and Maintaining Equipment	Oils and fuels	Prevent oil and fuel spills. If a spill occurs, clean up all spilled materials and contaminated soils and dispose of both properly. Notify Tennessee Department of Environment and Conservation of spill incident.
Site Preparation for Tree Panting	Mechanical	Choose site preparation method that will expose and disturb as little bare soil as possible.
		Establish SMZs to minimize sediment entering streams.
		Carry out all mechanical site preparation operations and tree planting along the contour of the land.
		Slopes over 30 percent should be hand planted and should not be subjected to mechanical site preparation.
	Chemical	Favor chemical methods over mechanical methods on steep slopes and erodible soils to control undesirable vegetation.
		Follow all EPA label instructions
		Never apply pesticides directly to water except when registered for

Forestry Practice	Activity/Resource	BMP
		application over water.
		Establish SMZ to minimize chemicals entering streams.
		Avoid use of chemicals in or near sensitive areas.
		Consider weather conditions and equipment capabilities to avoid herbicide drift.
		Calibrate spray equipment to apply chemicals uniformly and in correct quantities.
		Prevent chemical leaks from equipment and check equipment.
		Mix and load chemicals outside of SMZs and sensitive areas.
		Rinse spray equipment and discharge rinse water only in areas that are part of the application site. Never rinse tanks or sprayers in or near streams
		Dispose of chemical containers according to label instructions.
Prescribed Fire	Preparation	Locate windrows well away from drains to prevent materials from being washed into streams.
		Construct fire lines on the contour in advance of prescribed burning.
		Plow fire lines only as deep and wide as necessary to control the spread of the prescribed fire and to minimize soil disturbance.
		Construct water bars and wing ditches at appropriate intervals on firelines to turn water into adjacent undisturbed areas.
Fertilization	Application and Clean Up	Determine appropriate amounts and types of fertilizer needed before application.
		Consider weather conditions and equipment capabilities to avoid drift into SMZs.
		Conduct all on-site fertilizer handling away from waterbodies, wells, ditches, and sensitive areas.
		Clean up and/or contain all fertilizer spills immediately.
		Dispose of fertilizer containers and/or excess fertilizer according to applicable governmental regulations and label requirements.

4.4 Monitoring and Inspections

Monitoring is a key element in ecosystem management. Army forest managers are required to balance increasing demands for resource use, such as military training, forest product sales, biodiversity conservation, and, where applicable, recreation use of military lands. The VTS-S forestry program should be periodically monitored to: (1) assess whether or not forest management objectives are being met; and (2) detect trends in forest health and condition in response to the forest management actions proposed.

Forestry program monitoring on the VTS-S will include:

- The progress of each timber sale should be monitored to assure that the harvest is being conducted in accordance with the terms of the contract. Monitoring should be coordinated with the USACE's Mobile District if the timber sale is administered by the USACE. At the conclusion of the timber harvest, a final inspection of the site should be conducted jointly by the USACE and the TNARNG to assure the cut was conducted in accordance with the contract stipulations to allow release of the buyers' bond.

- Effective management requires feedback on the results of the management activities. The necessary assessment may be conducted specifically for the forestry program or as a part of another program area. The VTS-S forests will be monitored to assess:

- Whether the overall condition of the forest is meeting military mission requirements
- The effects of training activities on forest resources
- Response to forest management activities
- Wildlife habitat quality
- Influence of forest management on sensitive species
- Impacts on cultural resources
- Erosion problems related to timber management practices and the success of repair efforts
- Any areas affected by disease or insect infestations (particularly southern pine beetles during summer months)
- Storm or other natural damage
- Invasive pest plant problems
- Fuel loads on the forest floor and the risk for wildfires
- Areas for inclusion in future timber ROAs

- The baseline forest inventory was conducted for VTS-S in 2005. Forest resources should be re-inventoried in 2015. If that work is to be accomplished by contract, adequate advance time should be allowed to prepare the scope of work and to award the contract by that timeframe. The 2015 inventory should include a specific task requiring a comparison of the forest condition in 2015 with the results of the 2005 inventory to determine the direction the installation's forest is headed; how effective management measures have been in assuring a quality forest is provided; and identifying adjustments in the long-term management goals in the installation's forest management program.

5.0 MANAGEMENT PRESCRIPTIONS

The following stand descriptions and management prescriptions are based on the 2005 forest inventory. All planned harvests will thin smaller trees to open up the stands for training purposes, to release existing dominant and subdominant trees for further growth, and to encourage germination and seedling growth for advance regeneration.

Generally, no more than 60 acres will be harvested in a given year. In the event that the island portion of TA 2 is harvested, the entire 70 acres (minus buffer zones) will be harvested at one time to minimize impacts on the mudflat that will have to be crossed to access the island. Stands less than 60 acres may be subdivided and harvested in multiple years if training needs dictate on-going access to a portion of the stand.

As the Cantonment area is heavily developed and Training Area 1 is maintained as a regularly mown grassy field, these areas are not considered further in the VTS-S forest management plan.

In all harvest activities, pre-commercial or commercial, there will be no timber removal within 100 feet of creeks or J. Percy Priest Lake. A 100' buffer will also be maintained along property boundaries except for the 25' line of site clearing required along the fence-line itself.

5.1 Training Area 2

With 217 acres on the mainland, Training Area 2 is the largest of the VTS-S's six training areas. Training Area 2 lies along much of the installation's eastern boundary and about half of the northern boundary. The western boundary of the mainland portion of the training area is formed by the shoreline of the J. Percy Priest Lake. A large island in the lake is also considered a part of Training Area 2, although it is rarely utilized for training. The island is approximately 71.3 acres in size.

Training Area 2 supports two forest stands: a bottomland hardwood dominated forest at the lower elevations bordering the lake shoreline and a cedar dominated forest in the upland areas. The cedar dominated stand has a high stem density with low branching that makes it almost impenetrable, which severely limits training activities.

A network of sinkholes has been identified in the northeastern corner of TA2; this 23 acre portion of the training area will be excluded from all timber harvests. An approximately 10-acre tract along the training area's southern boundary is maintained in an open condition for equipment training and storage.

Stand Descriptions

Stand s0201 is a 126.3-acre immature upland cedar and hardwood forest occurring on the higher upland areas on the mainland portion of the training area and covering the island as well. The stand is dominated by cedar and oak and contains a few pines. The trees range in age from 10 to 30 years. Stem density is high among the cedars, with numerous low branches. The overall health of the stand is excellent but will only decline over the next ten years without management.

Stand s0201(d) is the 71 acre continuation of the immature upland cedar and hardwood forest located on the island.

Stand s0202 is a 78.2-acre mature hardwood forest occurring at the lower elevations of the training area along the lake. The stand is dominated by red oak and miscellaneous hardwood species, with a mix of hickory, poplar, walnut, and pine. The trees range in age from 30 to 50 years. The overall health of the stand is good.

Forest Management Prescription

Stand s0201. This stand will be thinned by removing all cedar trees that are less than 16 inches in diameter at breast height (DBH). This will allow room for the remaining trees to grow and assist in training them. During the thinning operation, all hardwoods will be left regardless of size. Large portions of the stand are covered in almost pure growths of redcedar. Such areas need to be opened up to allow other species to seed in. Where a preferred hardwood seed source exists, openings may be up to 2 acres in size.

Field training should improve considerably once small cedars are thinned out, allowing for greater maneuverability and providing better sight lines. The stand will be divided into two sections to be thinned in different years in order to meet the 60 acres per year guideline.

The island portion of stand s0201 can be accessed only by watercraft during summer months. During winter drawdown of the lake, the island may be reached by crossing a mudflat that is approximately 400 to 500 feet wide. Thinning operations on this island are not a priority as it is rarely used for training exercises; however, any future timber harvests to occur on the island will be conducted during winter

months when lake water level is at winter pool. Skid bridges will be used to cross the mudflats. Upon completion of harvest, all materials used in construction of skid bridges must be completely removed from the crossing and carried offsite or disposed of in an appropriate manner. See Best Management Practices listed in Table A1.2 for further guidelines regarding timber harvesting in sensitive areas.

Following thinning of this stand, prescribed burning can be done once every 3 years to prevent the accumulation of highly combustible forest fuels. No burning should be attempted prior to thinning because of the extreme fire hazard associated with the dense cedar stands.

Stand s0202. This stand will be thinned from below by removing all trees that are not in the dominant or co-dominant crown class. The goal would be for tree crowns to not touch each other on at least three sides. Some of the co-dominants may be removed to allow more room for the remaining trees to grow. The stand will be divided into two sections to be thinned in different years in order to meet the 60 acres per year guideline.

Several small wetland areas occur along the shores of J. Percy Priest Lake. Trees may be harvested from these areas in accordance with the prescription; however, equipment use within the wetland will be minimized to avoid soil disturbance. Harvesting operations will occur in this stand only during winter drawdown of the lake in order to minimize impacts to soils. As with all other harvests, a 100 foot non-harvested buffer will be maintained along the shore of the lake and the property boundary.

Prescribed burning may be done every 6 years for fuel reduction if necessary. Burning should be conducted in strict accordance with the weather guidelines listed in Annex 2. No burning should be performed before the thinning is done.

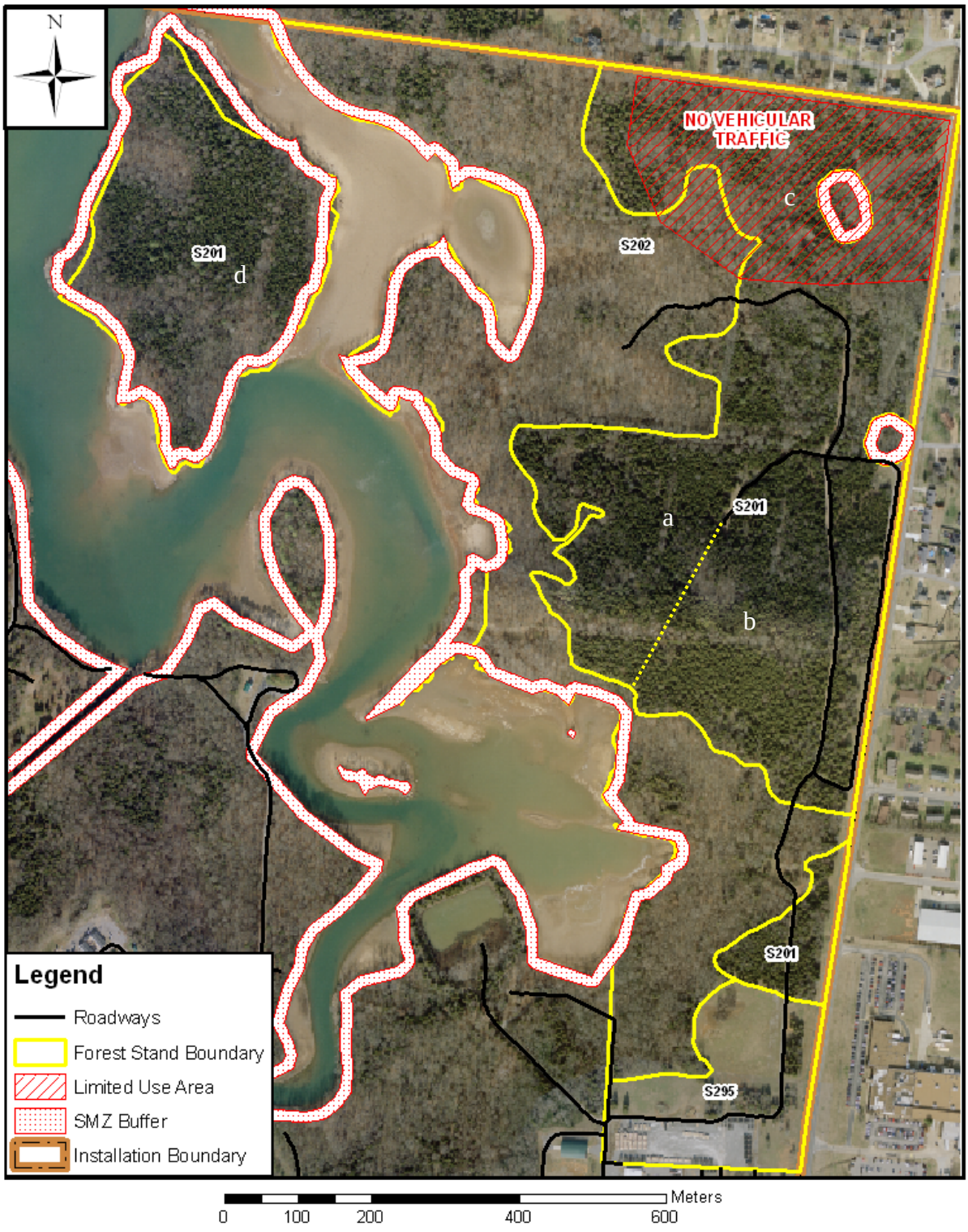

Figure A1-2: Forest stands in Training Area 2 on VTS-Smyrna.

5.2 Training Area 3

Training Area 3 is 74-acre site that is bounded on the north, west, and south by the impounded portion of Stewart Creek and on the east by Training Area 2 and an element of the cantonment area. Part of this area was used as a landfill for various types of refuse when the installation was operated as Sewart Air Force Base (AFB) by the U.S. Air Force. For the purposes of this Forest Management Plan, TA3 also contains the remains of the former AFB sewage treatment lagoon (actually in TA2). Because of these contamination issues, the TNARNG does not use this area for active training. An area totaling less than 10 acres along the training area's eastern boundary contains structures associated with the installation's cantonment area and is permanently maintained in an open condition. A single forest stand covers 68.4 acres (92 percent) of the training area.

Stand Description

Stand 01 is a 68.4-acre stand of immature bottomland hardwood forest occurring on the relatively low elevations that characterize most of the site. The stand is dominated by red oak and white oak, with a mix of hickory, poplar, walnut, and a few pines. The trees range from 10 to 25 years in age and are the result of ecological succession over the years since the site was maintained in a cleared condition by the U.S. Air Force. The overall health of the stand is excellent.

Forest Management Prescription

Stand s0301 will be thinned by removing all trees that are less than 14 inches DBH. This will allow room for the remaining trees to grow, plus aid in training. If, by following this DBH guideline, thinning would create an opening of 1 acre or greater in size, some of the trees smaller than 14 inches should be retained to maintain forest coverage of the area unless areas of this size are desired for specific training purposes.

Training Area 3 contains both bottomland hardwoods and upland redcedar woodlands. The bottomland hardwoods cover the lower elevation areas that border the J. Percy Priest Lake shoreline. The cedar woodlands occupy the higher elevation areas and are relatively dense, with numerous other woody shrubs and other hardwood species being intermingled among the cedars. The area does contain some small openings that are covered in grasses and other herbaceous plants. Although the training potential of Training Area 3 would definitely benefit from selective thinning of the cedars and other woody species and the subsequent application of prescribed fire, use of this area for training has been impeded by historic waste disposal issues that date back to the prior occupation and use of the installation by the U.S. Air Force. Until the waste-related issues are resolved, Training Area 3 will be designated as a No Burn Area. In addition, prior to conducting any prescribed burns in adjoining portions of Training Area 2 firebreaks will be constructed around known landfill sites in Training Area 3.

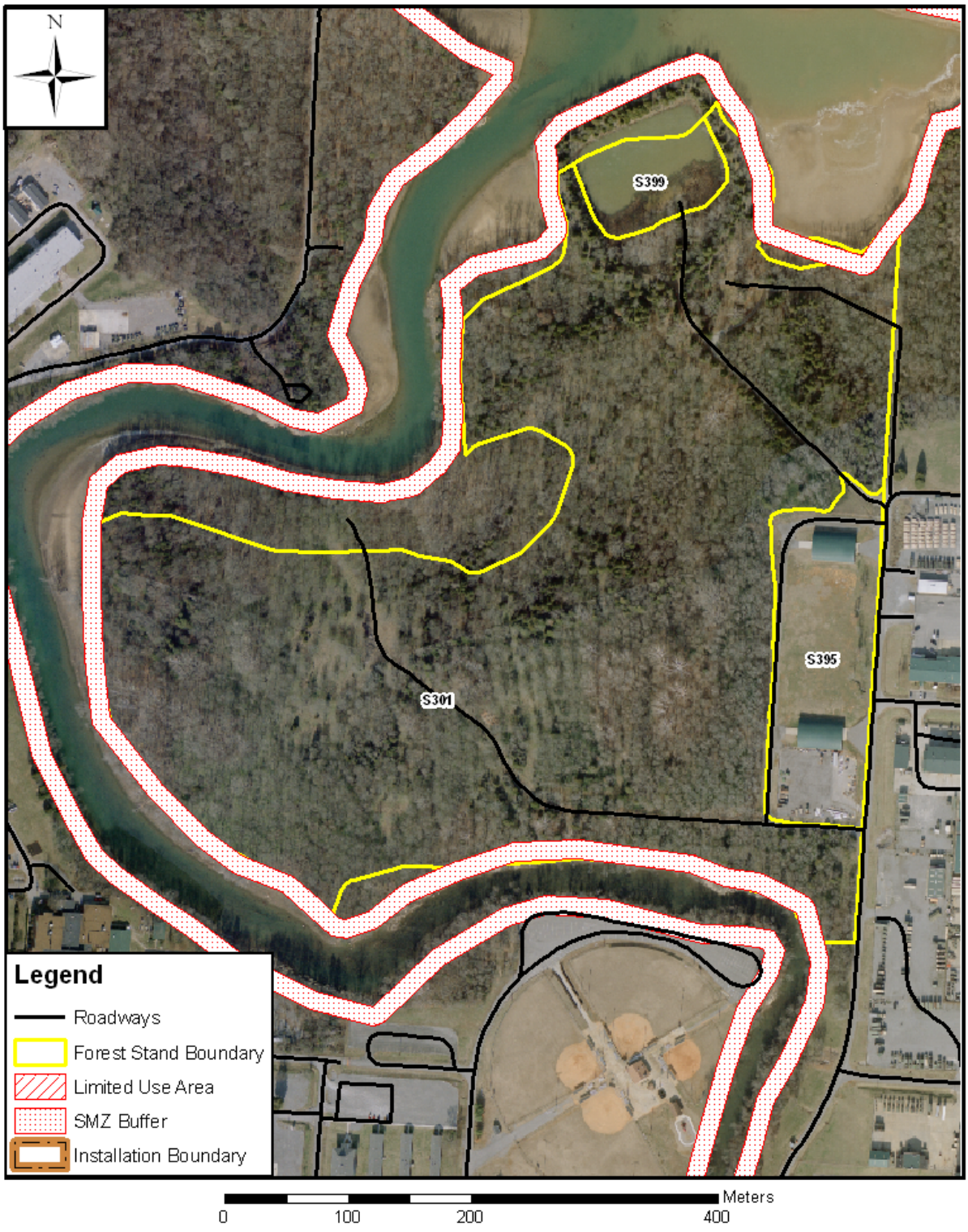

Figure A1-3: Forest stands in Training Area 3 on VTS-Smyrna.

5.3 Training Area 4

The 55 acres comprising Training Area 4 occur as broad peninsula protruding north into the waters of J. Percy Priest Lake. Smyrna Airport is located to the south, and Training Areas 5 and 6 to the east and west, respectively. The 2005 Forest Inventory determined that only one forest stand with a diverse assemblage of individual tree species occurs on the site. The interior of the training area supports a savannah-like grassland with numerous cedar trees being scattered throughout the open area. A small portion of the training area nearest to the airport is maintained in a permanent grassed condition

Stand Description

Stand s0401 consists of 42.2-acre immature upland pine and hardwood forest. The stand is dominated by red oak and white oak, with a mix of hickory, cedar, and a few pines. The site appears to have been a former open field that naturally regenerated over several decades. The trees range in age from 10 to 30 years. The hardwood species are more dominant at the lower elevations along the lake shoreline, while cedars are more abundant on the interior upland areas. Although the overall health of the stand is excellent, its condition will decline without management

Forest Management Prescription

Stand s0401 will be thinned by removing all trees that are less than 10 inches DBH. This will allow room for the remaining trees to grow, plus aid in training of the trees that are left. If following this DBH guideline would create an opening of 1 acre or greater in size, some of the trees smaller than 10 inches should be retained to maintain forest coverage of the area.

Following thinning, the frequency of prescribed burning would depend upon the primary vegetation assemblage occurring within specific portions of the training area. For example, hardwood dominated sites should be burned no frequently than every six years, cedar and cedar grassland associations every 3 years, and permanently maintained open grassed areas once a year or every other year. Prescribed burns should be conducted with the objective of preventing excessive accumulations of organic fuel loads. No burning should be attempted prior to thinning because of the extreme fire hazard associated with the dense cedar stands.

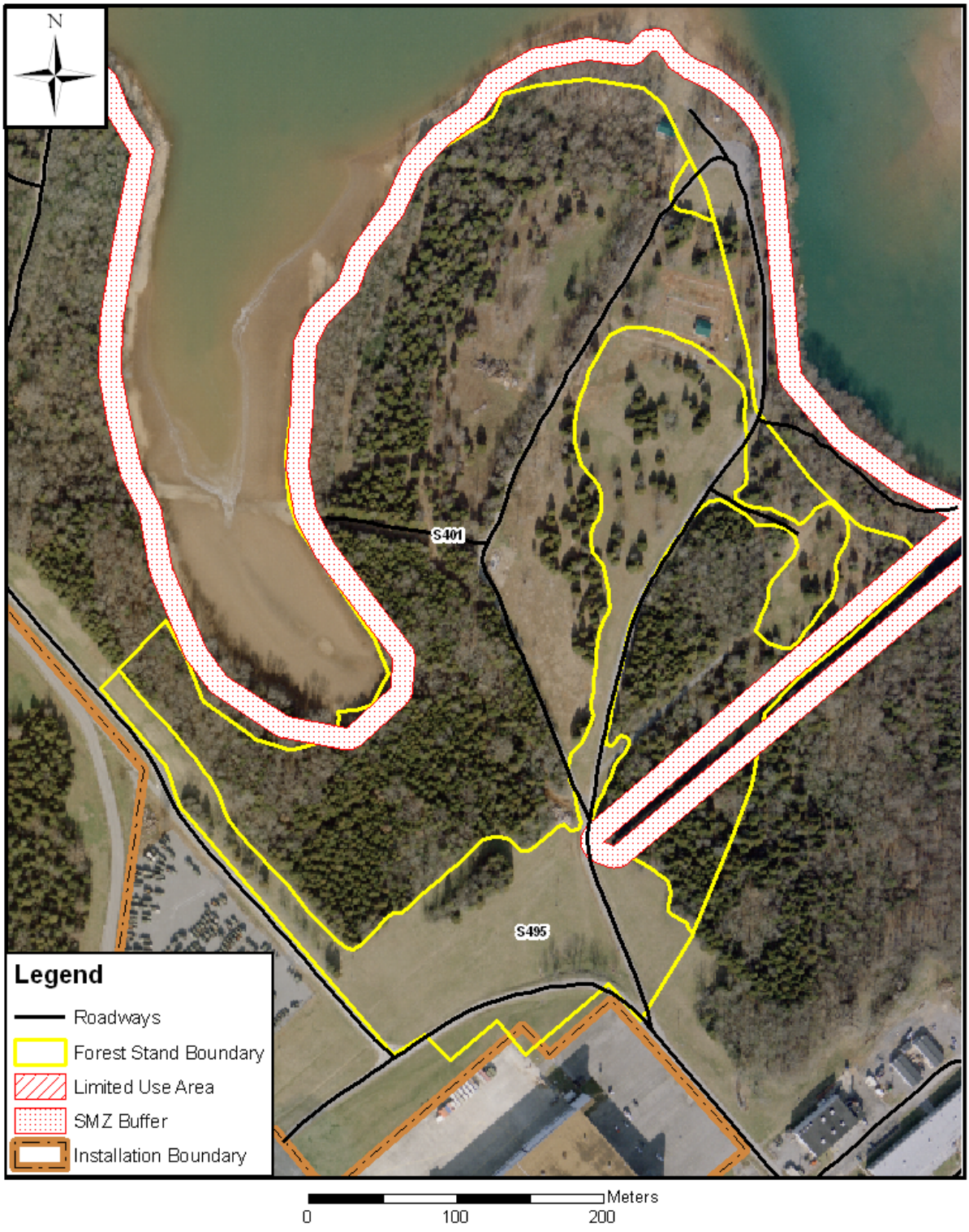

Figure A1-4: Forest stands in Training Area 4 on VTS-Smyrna.

5.4 Training Area 5

Training Area 5 is 54 acres in size. It is a peninsula that extends to the north and east into the upstream reaches of the Stewart Creek Embayment of J. Percy Priest Lake. The overall training area includes a small island that is approximately 4.4 acres in size. Almost 94% of the training area is forested and is designated as a single stand for forest management purposes. The training area is bounded to the west by Training Area 4 and to the south by a portion of the installation's cantonment area.

Stand Descriptions

Stand s0501 is a 50.6 acre mature pine and hardwood forest. The stand is dominated by pines and miscellaneous hardwoods. The hardwoods are more common at the lower elevations, while the pines are more abundant at the higher elevations on the site. The trees range in age from 10 to 35 years. The overall health of the stand is judged to be good.

Forest Management Prescription

Stand s0501 will be thinned by removing all trees that are less than 10 inches DBH. This will allow room for the remaining trees to grow, plus aid in training of the trees that are left. If following this DBH guideline would create openings of 1 acre or greater in size, some of the trees smaller than 10 inches should be retained to maintain forest coverage of the area.

This training area contains a small island just north of the boat ramp. During summer months, this island can be accessed only by watercraft. During winter drawdown of the lake, the island may be reached by crossing a mudflat that is approximately 50 feet wide. Thinning operations on this island are not a priority as it is rarely used for training exercises; however, any timber harvests to occur on the island will only occur during winter months when lake water level is at winter pool. Skid bridges will be used to cross the mudflat. Upon completion of harvest, all materials used in construction of the skid bridge must be completely removed from the crossing and carried offsite or disposed of in an appropriate manner. See Best Management Practices listed in Table A1.2 for further guidelines regarding timber harvesting in sensitive areas.

Following thinning, prescribed burning can be done once every 6 years for fuel reduction. Burning should be accomplished in strict accordance with the weather guidelines listed in the Prescribed Fire Plan (see Annex 2). This will minimize the potential for damage to the hardwoods.

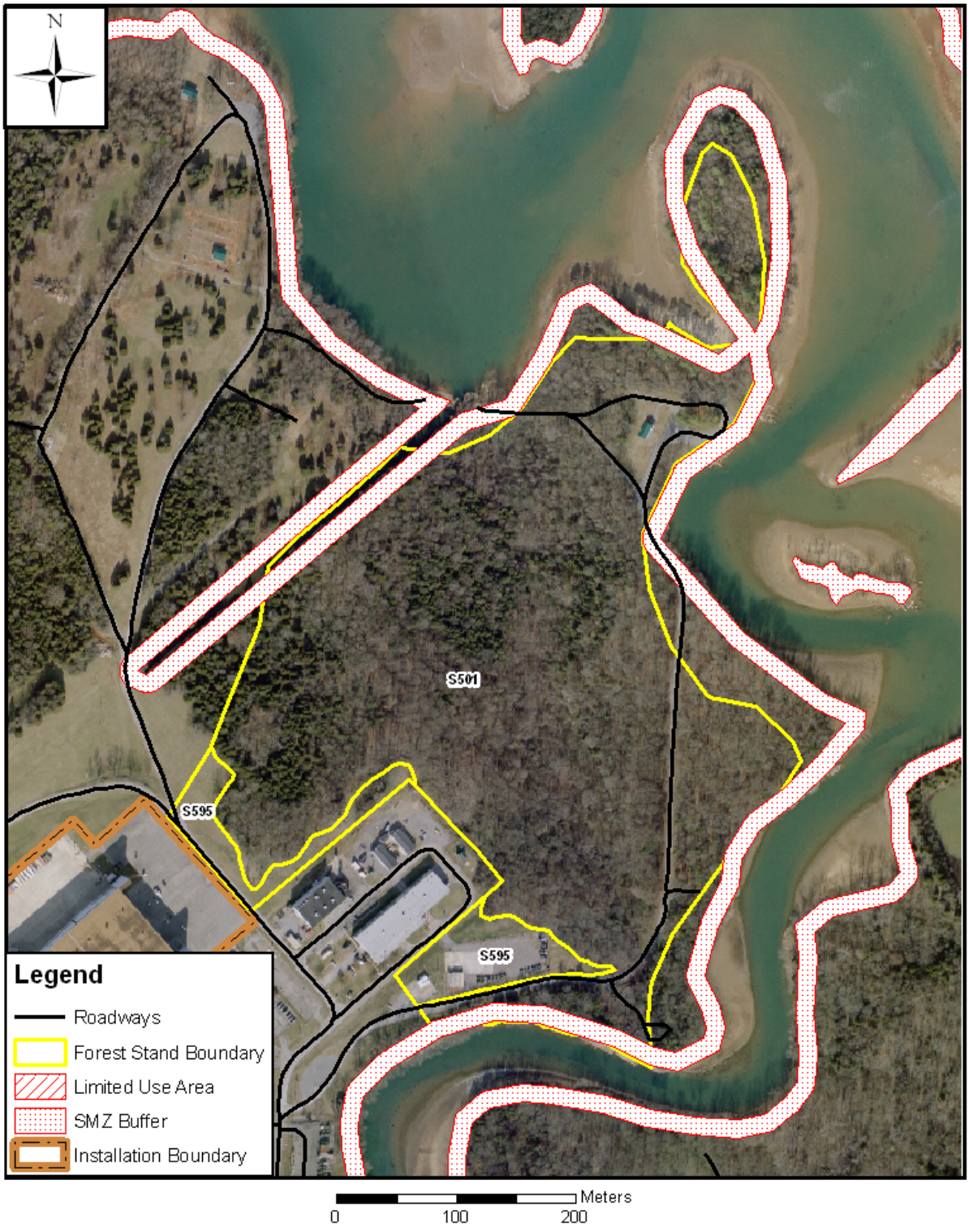

Figure A1-5: Forest stands in Training Area 5 on VTS-Smyrna.

5.5 Training Area 6

At 110 acres, Training Area 6 is the second largest of VTS-S's six training areas. Over half of the training area is bordered by J. Percy Priest Lake to the east and north. Undeveloped lands and agricultural property lie adjacent to the western boundary, while Smyrna Airport property forms the southern boundary. Two large open areas are maintained in permanently grassed conditions for training purposes. The southernmost of these open areas contain the small arms firing range and associated buildings. Although the 2005 Forest Inventory designated the forested area on TA6 to be a single stand for forestry management purposes, two principal vegetation associations actually occur within the area. The lower elevations are dominated by hardwoods, while the higher elevations are covered in open savannah-like prairie habitat within which cedar trees are abundant. The Cannon Cemetery is located on the most northern point of land extending into the lake.

Stand Description

Much of the 90.8 acres found in Stand s0601 is characterized as an immature upland pine and hardwood forest. The lower elevations within the stand are dominated by miscellaneous hardwoods, with a mix of hickory, white oak, poplar, walnut, and a few pines. The higher elevation areas support a considerable amount of cedar. The trees range in age from 10 to 50 years, with the oldest trees typically being hardwood specimens occurring along the lake shoreline. The present overall health of the stand is considered to be excellent for the hardwood component, but poor for the cedars due to over-stocking in some areas.

Forest Management Prescription

Stand s0601: The hardwood component of this stand will be left as is for the next 10 years. After the next Forest Inventory update is prepared, the management prescriptions for this stand will be reconsidered. The eastern redcedar component on approximately 25 acres will be lightly thinned to enhance the utility of the area for military training purposes and to promote the expansion of native prairie grasses.

Prescribed burning in hardwood component may be accomplished every 6 years to reduce forest fuels. Burning within the cedar component should be attempted every 3 years to inhibit the spread of cedars and other undesirable scrubby vegetation. To the extent possible, the open areas in TA6 could be burned every year. All burning should be undertaken in strict accordance with the weather guidelines listed in the Prescribed Fire Plan (see Annex 2) to minimize both damage to the hardwoods and the potential for fire to escape to off-installation lands.

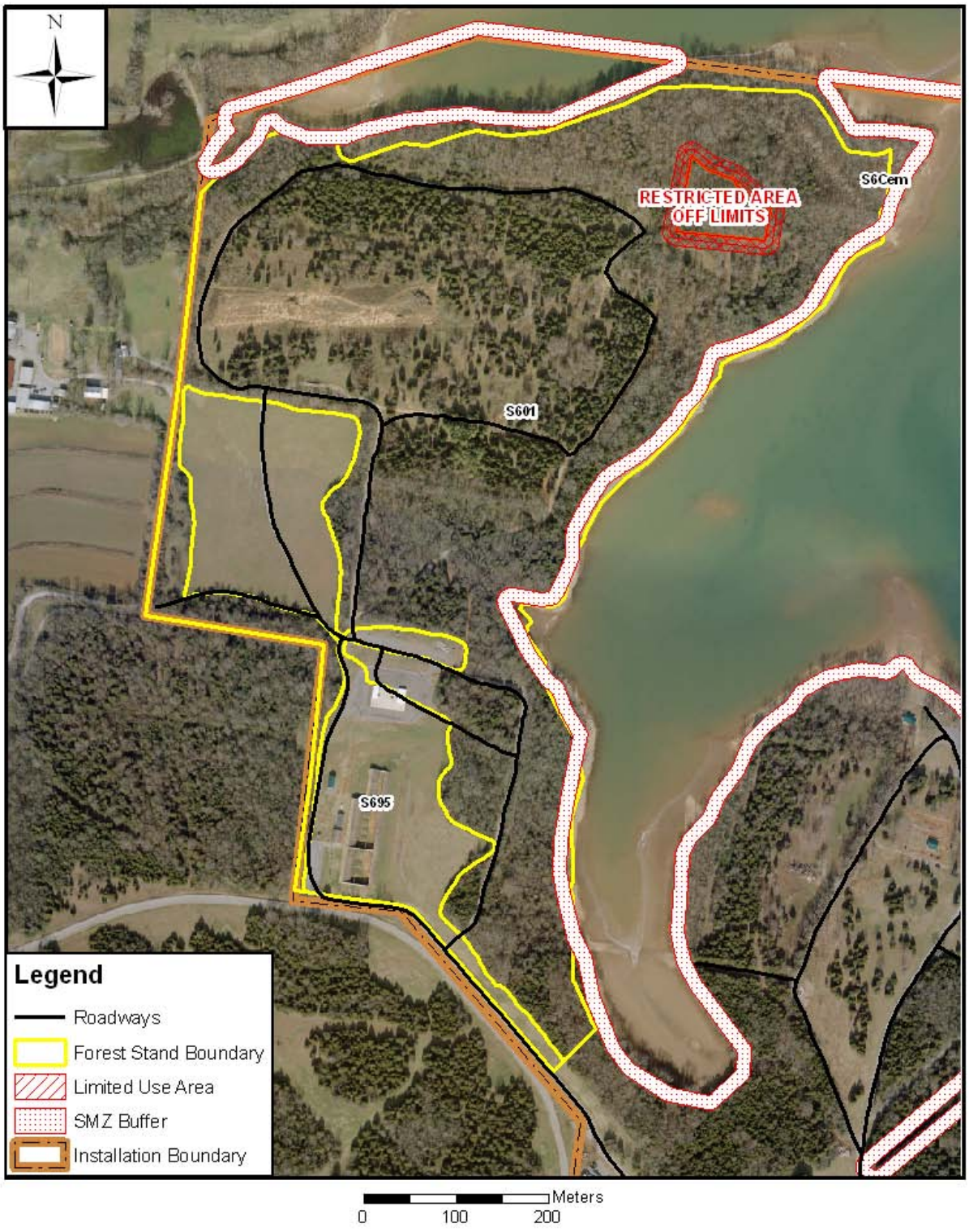

Figure A1-6: Forest stands in Training Area 6 on VTS-Smyrna.

6.0 RECOMMENDED IMPLEMENTATION SCHEDULE

A total of six individual forest stands have been designated on VTS-S, with one stand subdivided into 3 management sections. In general, the overall health of the installation's forest resources is considered to be relatively good. Despite the good health of the forest stands observed at the time the Forest Inventory was conducted in April 2005, the conditions are anticipated to decline over the next five to ten years if the stands are not thinned.

Due to the relatively young age composition of the forest associations occurring over most of the training areas, it appears that much of the installation was once maintained in cleared condition. This may have occurred prior to 1970 when the installation was managed as the Sewart AFB by the U.S. Air Force. Since the TNARNG assumed control of the installation property in 1970, the process of ecological succession has allowed forest communities to become established, and in some cases the present stem density is so thick that effective military training has become extremely difficult on portions of some of the training areas (e.g., Training Areas 2, 4, and 6). As a result, many of the forest stands are in need of thinning to improve conditions for training.

Generally, no more than 60 acres will be harvested in a given year. In the event that the island portion of TA 2 is harvested, the entire 70 acres (minus buffer zones) will be harvested at one time to minimize impacts on the mudflat that will have to be crossed to access the island. Stands less than 60 acres may be subdivided and harvested in multiple years if training needs dictate on-going access to a portion of the stand.

Table A1.3 lists stands in order of the priority of treatment for the first ten years of management. Harvests may skip a year, depending on site access, and so this list may not be completed within ten years. This schedule is subject to change based on military mission needs and updated forest inventory data. A resurvey of the VTS-S forest stands is scheduled for 2015. This plan and the harvest priority will be revised as dictated by the results of the new inventory.

Application of prescribed fire should be an important management tool in the management of VTS-S's forest resources, particularly for those areas that are dominated by thick growths of cedar. See Annex 2 for information on the individual burn units into which the forest stands are recommended to be divided, and the intervals that should be considered between burn operations for the respective units.

Table A1.3: Timber stand harvest priority for VTS-Smyrna.

Training Area	Stand & Section	Acres	Primary Management Action
2	s0201(b)	32	Thin redcedar <16"
4	s0401	42	Thin <10"
5	s0501	51	Thin <10"
2	s0201(a)	35	Thin redcedar <16"
6	s0601	25	Thinning
2	s0202	78	Thin below dominant/subdominant
3	s0301	55	Thin <14"
2	s0201(d)	71	Thin redcedar <16"

Annex 2

Wildland Fire Management Plan

VTS-Smyrna

Tennessee Army National Guard

Prepared By

Anchor Point Group

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March 2018

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Table of Contents

1.0 INTRODUCTION

This Wildland Fire Management Plan (WFMP) has been developed in accordance with the 2002 Department of Army (DA) Wildland Fire Policy Guidance. It presents the standards by which the VTS-Smyrna (VTS-S) wildland fire control and prescribed burning programs will be conducted. This plan is a component of the Integrated Natural Resources Management Plan (INRMP) for the training site (Annex 2) and is especially linked to the Forest Management Plan annex to the INRMP.

This plan shall be in compliance with:

- Army Regulation (AR) 420-1, 02 Dec 08, Fire and Emergency Services
- AR 200-1, 13 Dec 2007, Environmental Protection and Enhancement
- DOD Instruction 6055.6, 21 Dec 06, DoD Fire and Emergency Services Program
- Army Memorandum, 04 Sep 2002, Army Wildland Fire Policy Guidance

1.1 Goals and Objectives

Fire management policy for VTS-S was developed to support the following goals:

- Provide for the safety of fighters, assigned personnel and the public on every wildland fire activity.

- Reduce wildfire potential on the training site and suppress undesired wildfires to protect lives, property, and natural and cultural resources in a cost-effective manner.

- Utilize prescribed fire to maintain and improve the usability of the training site to support all aspects of the military mission.

- Utilize prescribed fire to effectively protect and enhance valuable natural resources and to implement ecosystem management goals and objectives.

1.2 Key Definitions

Backfiring. A tactic associated with indirect attack, intentionally setting fire to fuels inside the control line to slow, knock down, or contain a rapidly spreading fire. Backfiring provides a wide defense perimeter and may be further employed to change the force of the convection column. Backfiring makes possible a strategy of locating control lines at places where the fire can be fought on the firefighter's terms. Except for rare circumstance meeting specified criteria, backfiring is executed on a command decision made through line channels of authority**.**

Contingency Plan. The portion of a prescribed fire plan, incident action plan, or implementation plan that identifies possible but unlikely events and the contingency resources needed to mitigate those events.

Contingency Resources. Planned and identified fire suppression personnel and equipment that mitigate possible but unlikely events that exceed or are expected to exceed holding resource capabilities.

Fuelbreak. A natural or manmade change in fuel characteristics which affects fire behavior so that fires burning into them can be more readily controlled.

Incident Command System (ICS). A standardized on-scene emergency management concept specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.

Operational Period. The period of time scheduled for execution of a given set of tactical actions as specified in the Incident Action Plan. Operational Periods can be of various lengths, although usually not over 24 hours.

Prescribed Fire. Controlled, purposeful application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions which allow the fire to be confined to a predetermined area and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives. Any fire intentionally ignited by management actions in accordance with applicable laws, policies and regulations to meet specific objectives.

Unified Command. In ICS, unified command is a unified team effort which allows all agencies with jurisdictional responsibility for the incident, either geographical or functional, to manage an incident by establishing a common set of incident objectives and strategies. This is accomplished without losing or abdicating authority, responsibility, or accountability.

Wildland. An area in which development is essentially nonexistent, except for roads, railroads, power lines and similar transportation facilities. Structures, if any, are widely scattered.

Wildland Fire. Any non-structure fire occurring in the wildland that is not meeting management objectives and thus requires a suppression response.

Wildfire. An unplanned, unwanted wildland fire, including unauthorized human caused fires, naturally occurring wildland fires, and escaped prescribed fires, where the objective is to put out the fire.

1.3 Location and Physical Features

The VTS-S is an 857-acre training facility managed by the Tennessee Army National Guard (TNARNG). The installation is located in Rutherford County in middle Tennessee, approximately 22 miles southeast of Nashville and partially within the city limits of the Town of Smyrna. The training site contains an intensively developed cantonment area of 169 acres; six designated training areas totaling 520 acres; and approximately 180 acres of aquatic habitat associated with Stewart Creek and J. Percy Priest Lake. The exact acreage of the installation covered by water varies depending on the prevailing surface elevation of the lake.

The region surrounding VTS-S has been greatly influenced by urban sprawl as a result of the growth and development of Nashville, the second largest city and the capital of Tennessee. The areas surrounding and immediately adjacent to the installation reflect the expanding residential and light industrial/commercial activities that are typical of the overall region creating a complex and varied pattern of land uses.

The installation's southwestern and western boundaries are formed by the Smyrna/Rutherford County Regional Airport. On the east VTS-S is bounded by densely populated residential areas and light industrial/commercial development. Additional residential developments are located along the installation's northeastern boundary. The only undeveloped lands bordering the installation are located to the northwest.

Stewart Creek and J. Percy Priest Lake are the primary water features at VTS-S. Stewart Creek enters the training site along the southeastern border and flows into J. Percy Priest Lake, an impoundment of the Stones River covering approximately 14,200 acres (22.2 square miles). The lake is surrounded by 18,854 acres of associated project lands, 10,000 acres of which are devoted to wildlife management. The lake is maintained by the Nashville District of the USACE and is operated to generate hydroelectric power, provide both drinking water and flood protection, promote fish and wildlife resources, and to create recreational opportunities. Over 97% (847 acres) of VTS-S property is licensed to TNARNG by either the Nashville or Mobile District of the USACE. Under the terms of the license, military training activities on the licensed lands cannot conflict with the operation of J. Percy Priest Lake. Much of the land is subject to flooding by the lake as a part of regional flood control practices. As a result, the actual amount of lands available for training within the licensed area vary during the course of the year, depending upon the current level of the lake.

Approximately 53% (456 ac) of the training site is forested. Low-lying areas near the lake and creek are occupied by bottomland hardwoods, while the higher, inland areas are dominated by eastern red cedar woodlands which are often densely overstocked. The remainder of the training site includes a heavily developed cantonment area (169 acres) and a number of small grassland areas maintained for military training purposes. There is no unexploded ordnance on the VTS-S.

2.0 PROGRAM OVERVIEW

2.1 Organizational Structure and Responsibilities

The wildland fire program on VTS-S will operate in accordance with DA Memo (4 Sep 2002), "Army Wildland Fire Policy Guidance," and the DA "Sustainable Range/Installation Environmental Activities Matrix" (2 Sep 2005) for funding. The Adjutant General (TAG) as commander of the TNARNG is directly responsible for the operation and maintenance of the Volunteer Training Sites, including implementation of this WFMP. TAG delegates fire-related duties among environmental and training site staffs.

The Wildland Fire Program Manager for the TNARNG is the Natural Resources Manager (NRM) in the Environmental Office at 3041 Sidco Dr., Nashville, TN 37204. The NRM is responsible for preparing and maintaining this WFMP. The NRM also ensures that state employed firefighters are trained to at least National Wildfire Coordinating Group (NWCG) Firefighter type 2 (FF2) standards, and federal employees to at least NWCG FF2 or DoD FF1 standards. The NRM maintains training and certification records, and schedules training for all TNARNG personnel as needed. DoD certified wildland fire fighters should also register their training and certifications in the DoD Fire and Emergency Services Certification Program website found at **http://www.dodffcert.com/CertResponse.aspx**, which is maintained by HQ Civil Engineering Support in compliance with Assistant Chief of Staff for Installation Management (ACISM) guidance.

VTS-S Range Control is responsible for coordinating the immediate wildland fire control response on the training site. Initial wildfire response will be conducted only by authorized and qualified TNARNG and partner agency personnel. Qualifications are defined by NWCG as described in PMS-310-1 (https://www.nwcg.gov/sites/default/files/publications/pms310-1.pdf) and by NFPA (https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1051). The Smyrna Fire Department is the primary responder for all non-aviation related fires at VTS-S onsite and would respond to any fires within the VTS-S. If needed, the Smyrna Airport Fire Department and the Tennessee Division of Forestry would respond. A unified

command will be set up with any of the above departments and any authorized and qualified VTS-S personnel in the event that the outside agencies are called in to help control a wildland fire that is beyond the capabilities of the authorized and qualified training site staff. The Smyrna Fire Department or the Smyrna Airport Fire Department would respond to any structural fires on the training site.

Prescribed fire activities on the VTS-S are cooperative actions conducted by authorized and qualified training site personnel, cooperating/partner agencies, contractors, and the Environmental Office. Assistance and backup support are provided by the Smyrna Fire Department and Tennessee Division of Forestry in accordance with a yet to be developed formal Memorandum of Agreement. Environmental personnel that have authorization and current NWCG qualifications for their position will participate in prescribed burns conducted for ecosystem management goals.

2.2 Interagency Cooperation and Mutual Aid Agreements

The Town of Smyrna Fire Department will be the first agency alerted in the case of fire emergencies that occur, including during a prescribed burn. While the Smyrna Airport Fire Department is located immediately adjacent to the VTS-S cantonment, they are primary responders only for aviation- related fire affecting either the airport or the AASF. Smyrna Fire Department will, however, request additional support from the Airport Fire Department, if needed. The Tennessee Division of Forestry (TDF) will also be contacted if additional assistance is needed to conduct or manage prescribed and/or wildland fires. A formal Memorandum of Agreement or other appropriate document will be developed between the TNARNG, Town of Smyrna Fire Department and the Tennessee Department of Forestry to facilitate cooperation between the agencies for future activities including wildland fire training, fire management, and prescribed fire. The agreement will also include processes for sharing of resources and procedures for wildfire suppression and prescribed fire implementation.

2.3 Personnel

VTS-S Range Control is responsible for coordinating the immediate wildland fire control response on the training site. Initial wildfire response will be conducted only by authorized and qualified TNARNG and partner agency personnel. Qualifications are defined by NWCG as described in PMS-310-1 (https://www.nwcg.gov/sites/default/files/publications/pms310-1.pdf) and by NFPA (https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1051). The Smyrna Fire Department is the primary responder for all non-aviation related fires at VTS-S onsite and would respond to any fires within the VTS-S. Prescribed burning will be conducted by contract or with assistance from partner agencies when available. Additional firefighters may be requested from their cooperators by partner agencies. Signed MOAs will be completed to support fire management needs.

2.4 Available Equipment

The VTS-S maintains a cache of fire equipment for wildland fire suppression and prescribed burning (Table A2.1). In addition, personal protective equipment (PPE) conforming to National Fire Protection Act (NFPA) 1977 (Standard on Protective Clothing and Equipment for Wildland Fire Fighting) is maintained for all authorized and qualified personnel on site. Each firefighter is outfitted with:

- Nomex pants
- Nomex shirt
- Firefighting helmet

- Leather gloves
- Goggles
- Fire shelter
- Pack for gear
- Leather boots are required, but are provided by the individuals.

Table A2. 1 Available Fire Equipment at VTS-S

Fire rake	7
Pulaski axe	4
Shovels (long handled)	6
Shovels (D handled)	3
Axe	4
16” Stihl chainsaw	3
Portable pressure washer (no holding capacity)	1
200 gal trailer mounted pressure washer	1
300 gal Bambi bucket (used by air support)	2
D-7 bulldozer	1
D-3 John Deere bulldozer (state-owned)	2
120-G grader	2
Gyro-track with brush grinder	1
6415 JD tractor	1
Bobcat frontend loader	1
24-C skid loader	2
MD24C 2.5 yd^3 bucket loader	1
Chevy 2500 4WD pickup truck	2
6’ scraper	1
6’ box blade	1
10’ bush hog	1
16’ batwing bush hog	1
Disc harrow	1
100 gal spray tank	1
John Deere 6x4 Gator	1

2.5 Funding Requirements

The funding responsibilities for wildland fire are defined in the DA Sustainable Range/ Installation Environmental Activities Matrix (2 Sep 2005). Wildland fire expenses are primarily the responsibility of the Facilities/Real Property Division. Funding for WFMP implementation, wildland fire prevention, fuels management for hazard reduction, wildland fire suppression, prescribed burning, firebreak construction and maintenance, and other wildland fire management is an installation operations and maintenance responsibility.

Integrated Training Area Management (ITAM) is permitted to conduct vegetation control for the improvement of training land. Prescribed fire is sometimes one of the methods implemented to

accomplish that vegetation control. However, ITAM funds are not available specifically for any fire management purposes.

Environmental funds may be utilized for prescribed burning that has a specific ecosystem management or rare, threatened, and endangered species management objective as presented in the INRMP and for wildland fire management activities conducted for the purpose of compliance with environmental laws and regulations. Forestry reserve account funds may be requested for fire-related projects that will improve forest health or timber management concerns on the facility.
The funds available will be used to continue the training of the on-site resources and maintain a cache of personal protective equipment and wildfire tools. The VTS-S personnel should use appropriate management response in all incidents which will maintain a cost-efficient program.

2.6 Public Relations

A public relations plan will be developed to address wildfires and prescribed fires. The Objective of the plan is to coordinate roles, responsibilities, procedures and messages with cooperating agencies. Plans should be developed to promote and explain the use of prescribed fire. In the instance, a wildfire or prescribed fire could negatively impact neighbors, advanced planning of messages will help managers deal with potential issues. Plans should consider who will be the Public Information Officer, what media outlets to reach, potential liability, what information is appropriate to share with the public what will occur in the event of a serious accident or fatality. As a minimum, the plan should be developed by VTS-S, TDF and Smyrna Fire Department. Other local fire agencies should be consulted as appropriate.

For prescribed fires, appropriate county agencies will be informed to ensure that the burn operation complies with all local government fire regulations. When involved with any fire application, VTS-S personnel should always consult with the Smyrna Airport and should contact the Smyrna Airport Fire Department and the Smyrna Fire Department. Burn permits are required from both the Tennessee Department of Agriculture (TDA) Division of Forestry and from the Town of Smyrna (see Section 6.7 for additional contact information). The surrounding public should be made aware of any smoke issues that may arise and could cause any health issues.
The following list (Table A2.2) identifies the agencies and organizations that should be notified of a prescribed burn operation:

Table A2. 2 Prescribed Fire Contact list

TN Division of Forestry	931-685-5030
Smyrna Airport	615-459-2651
Smyrna Airport Fire Department	615-943-8398
Smyrna Fire and Police Department	615-459-6644
Rutherford County Sheriff's Department	615-898-7771
Tennessee Highway Patrol District 3	615-741-3181
USACE JPP Office	615-889-1975
Smyrna Municipal Golf Course	615-459-2666

A news release will be used to inform the public of the planned burn so that the adjacent property owners will understand what is happening when they see smoke on the day of the burn.

2.7 Environmental Review

This Integrated Wildland Fire Management Plan is incorporated as an annex to the Revised Integrated Natural Resources Management Plan for the VTS-S. Therefore, it is included in the Environmental Assessment of the effects of implementation of the Revised INRMP which has been prepared in accordance with the National Environmental Policy Act of 1969.

3.0 SAFETY AND EMERGENCY OPERATIONS

All wildfire emergency operations go through Range Control and will be coordinated through 911 dispatch. The Range Control Officer will function as the Incident Commander for initial attack by authorized and qualified firefighters for small scale fire suppression. The Town of Smyrna Fire Department will be notified via 911 and will respond and assume command. If a wildfire is beyond the capabilities of the on-site staff, Incident Command will be turned over to the Tennessee Division of Forestry.

The on-site Incident Commander will ensure all firefighter and public safety precautions are taken and are the highest priority in all operations. Except in the event of a threat to human life, no wildland fire situation will require placing firefighter or equipment in extreme danger.

Before fire suppression engagement the Incident Commander will go over the plan of operation with all personnel directly participating and ensure all personnel have at least the minimum PPE, authorization and training required.

VTS-S Range Control is responsible for coordinating the immediate wildland fire control response on the training site. Initial wildfire response will be conducted only by authorized and qualified TNARNG and partner agency personnel. Qualifications are defined by NWCG as described in PMS-310-1 (https://www.nwcg.gov/sites/default/files/publications/pms310-1.pdf) and by NFPA (https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1051). The Smyrna Fire Department is the primary responder for all non-aviation related fires at VTS-S and would respond to any fires within the VTS-S. Firefighters will be issued and carry an Incident Response Pocket Guide (PMS-461) when on fires. In addition, they will be provided Wildland Fire Incident Management Field Guide (PMS-210). Each firefighter will be knowledgeable and review the 10 Standard Fire Orders and the 18 Watchout situations. No emergency situation will be approached without the proper safety mitigations in place with the use of Lookouts, Communications, Escape Routes and Safety Zones (LCES). All firefighters will participate in an Annual Fire Refresher (RT-130), any additional NWCG refreshers required based on position, and locally required training. RT-130 curricula are available at https://www.nifc.gov/wfstar/index.html

All safety gear will comply with NFPA 1977 Standard on Protective Clothing and Equipment for Wildland Fire Fighting. This standard specifies the minimum design, performance, testing, and certification requirements for items of wildland fire fighting protective clothing and equipment, including protective garments, helmets, gloves, footwear, goggles, chain saw protectors, and load carrying equipment.

3.1 Risk Assessment Process

Safety of TNARNG personnel, firefighters, civilians, and neighbors is of paramount importance in all wildland fire actions. Risk assessment for all emergency response situations will follow the five step process outlined below. Situational awareness must be maintained throughout the changeable conditions of a wildland fire activity and re-assessment conducted whenever there is a significant alteration of circumstances.

3.1.1 The Risk Management Process

Safety of TNARNG personnel, firefighters, civilians, and neighbors is of paramount importance in all wildland fire actions. Risk assessment for all emergency response situations will follow the five step process outlined in the NWCG Incident Response Pocket Guide[1]. Situational awareness must be maintained throughout the changeable conditions of a wildland fire activity and re-assessment conducted whenever there is a significant alteration of circumstances.

Step 1. Situational Awareness
- Gather information
  - Objective(s)
  - Previous fire behavior
  - Communication
  - Weather forecast
  - Who's in charge?
- Any local factors
  - Scout the fire/incident

Step 2. Hazard Assessment
- Estimate potential fire behavior hazards
  - Look Up / Down / Around indicators
- Identify tactical hazards
  - Watch Outs
- What other safety hazards exist?
- Consider severity vs. probability

Step 3. Hazard Control
- Firefighting Orders and LCES Checklist – MANDATORY
  - Anchor point
  - Downhill checklist (if applicable)
- What other controls are necessary?

Step 4. Decision Point
- Are controls in place for identified hazards?
  - NO: Reassess situation YES: Next question
- Are selected tactics based on expected fire behavior?
  - NO: Reassess situation YES: Next question
- Have instructions been given and understood?
  - NO: Reassess situation YES: Initiate action

[1] PMS-461/NFES 1077

Step 5: Evaluate

- Personnel: Low experience level with local factors?
  - Distracted from primary tasks?
  - Fatigue or stress reaction?
  - Hazardous attitude?
- The Situation: What is changing?
  - Are strategy and tactics working?

3.1.2 Prescribed Burning Risk Assessment

The Risk Management Process will also be applied during prescribed fire activities. Suggested prescribed burning parameters should not be exceeded without careful evaluation based on review of previous fire behavior, burn objectives, available resources and review of current science that indicates a valid justification. Rationale for deviation from these parameters will be documented in an approved and signed Prescribed Fire Burn plan.
Prescribed burning will **NOT** be conducted under any of the following conditions:

- A predicted temperature greater than 85º F
- A predicted wind speed greater than 18 mph at the 20' level
- A predicted relative humidity less than 25%
- An atmosphere with Red Flag conditions issued by TDF or USDA-FS
- Go/No Go check list not mitigated
- Lack of qualified personnel or equipment available to manage the prescribed burn
- Any burn objective is not being met
- Any Prescribed Fire plan requirement that is not being met.

3.1.3 Fire Danger Rating and Burning Index

Fire danger rating is a classification based on the Burning Index and is available from the National Weather Service fire weather system http://www.weather.gov/meg/?n=fireweather . Fire danger rating will be checked daily prior to training operations during fire season. It provides guidance of importance for prescribed burn activities and for military training. Prescribed burns will generally be conducted at low or moderate fire danger rating. Pyrotechnic devices and live fire training will be limited in accordance with the recommendations in (Table A2.3).

Table A2. 3 Fire Danger Rating Guide

Fire Danger Rating and Color Code	Burning Index (BI)	Description	Recommended Military Considerations
(1) Low (Green)	0-20	Fuels do not ignite readily from small firebrands. Most prescribed burns are conducted in this range.	None.
(2) Moderate (Blue)	21-40	Fires are not likely to become serious and control is relatively easy. Fires burning in these conditions generally represent the limit of control for direct attack methods.	None.
(3) High (Yellow)	41-60	Fires may become serious and their control difficult unless they are attacked successfully while small. Machine	Recommend firing pyrotechnics into open drums; altering firing times

		methods are usually necessary or indirect attack should be used.	to hours with lower fire danger.
(4) Very High (Orange)	61-79	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. The prospects for direct control by any means are poor at this intensity.	No pyrotechnics or tracer rounds allowed, except with written authorization from Range Control.
(5) Extreme (Red)	80+	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. The heat load on people within 30 feet of the fire is dangerous.	No pyrotechnics or tracer rounds allowed.

3.2 Personnel Training and Certification

Training will adhere to the standards set by NWCG as described in PMS-310-1 (https://www.nwcg.gov/sites/default/files/publications/pms310-1.pdf). All firefighters need to obtain the basic Firefighter Type 2 (FFT2) qualifications (S130/190 classes) and will need to attend an annual fireline safety refresher provided on-site or off. (Annual Fire Refresher (RT-130) curricula is available at https://www.nifc.gov/wfstar/index.html.)

The Natural Resource Manager (NRM) for TNARNG, is responsible for maintaining and tracking the training records for VTS-S personnel in accordance with DOD direction to follow NWCG procedures. DoD wildland fire fighters should register their certifications in the DoD Fire and Emergency Services Certification Program website found **http://www.dodffcert.com/CertResponse.aspx**. The NRM will keep track of the training being offered close to the installation and inform training site personnel of its availability.

3.3 Physical Fitness Standards

NWCG standards require all wildland firefighters at FFT2 position to meet the arduous fitness level. All personnel engaged in wildland fire activities will meet the requirements established for their positions in NWCG PMS 310-1. The field test will be administered annually by the Natural Resources Manager and/or the Environmental Program Manager according to the standards in NWCG Work Capacity Test Administrator's Guide[2]. Newly assigned personnel with fire suppression or prescribed fire duties will be NWCG qualified for their position, including a current fitness test.

4.0 FIRE FACTORS

4.1 Fire History

No significant wildfires have occurred on the training site. Most wildfires have been associated with military activities such as firing blanks or tracer rounds, or pyrotechnics. Each fire has been less than one acre in size and has been extinguished by on-site staff.

[2] https://www.nwcg.gov/publications/307

4.2 Mission Considerations

The mission of the VTS-S is to support unit requirements for maneuver, range operations, equipment use, and other combat readiness training. Much of the military training that takes place at the VTS-S involves air assets, due to the proximity of the military facilities to the Smyrna Airport, or equipment maintenance as reflected in the considerable infrastructure located within the installation's cantonment area. Field exercises are conducted on portions of the six training areas (Figure A2.1), with most of the training activities occurring in Training Areas 4, 5, and 6. The extreme density of the cedar woodlands in Training Area 2 make this site difficult to use for training purposes. Training Area 3 is not used because of environmental contamination issues. Lastly, Training Area 1 is so small as to have limited use in training. A timber thinning program followed by the routine application of prescribed fire would enhance the utility of Training Area 2 for both wheeled vehicle maneuvering and dismounted infantry and land navigation tactics. Timber thinning of Eastern Red Cedar before using prescribed fire will allow for safer and more effective implementation of the initial use of prescribed fire in this vegetation type. Following the initial prescribed burn, periodic prescribed burns will remove young cedar trees in the future. Periodic burns will help reduce fuel loading of down woody material, grasses, shrubs, tree seedlings. This will help maintain a more open area that is more suitable for training.

This WFMP supports the military mission of the VTS-S by providing for timely wildfire response, thus minimizing training downtime and facility loss to wildfires. The prescribed burn program provides a cost-effective method of maintaining and expanding open training areas such as ranges and controls fuel buildup to minimize wildfire intensity. Prescribed fire can also be a useful management tool to maintain the forested areas in an open condition that is conducive to the movement of vehicles. Periodic burns will help reduce fuel loading of down woody material, grasses, shrubs, and tree seedlings. This will help maintain a more open area that is more suitable for training.

Potential negative impacts of the wildland fire program include smoke impacts and interruption of training activities. Care in scheduling burns to accommodate the training calendar will minimize all effects on training activities. Wildfire control downrange will require a range shutdown, which could lead to loss of training time. Smoke management will be addressed through the guidelines provided in this plan.

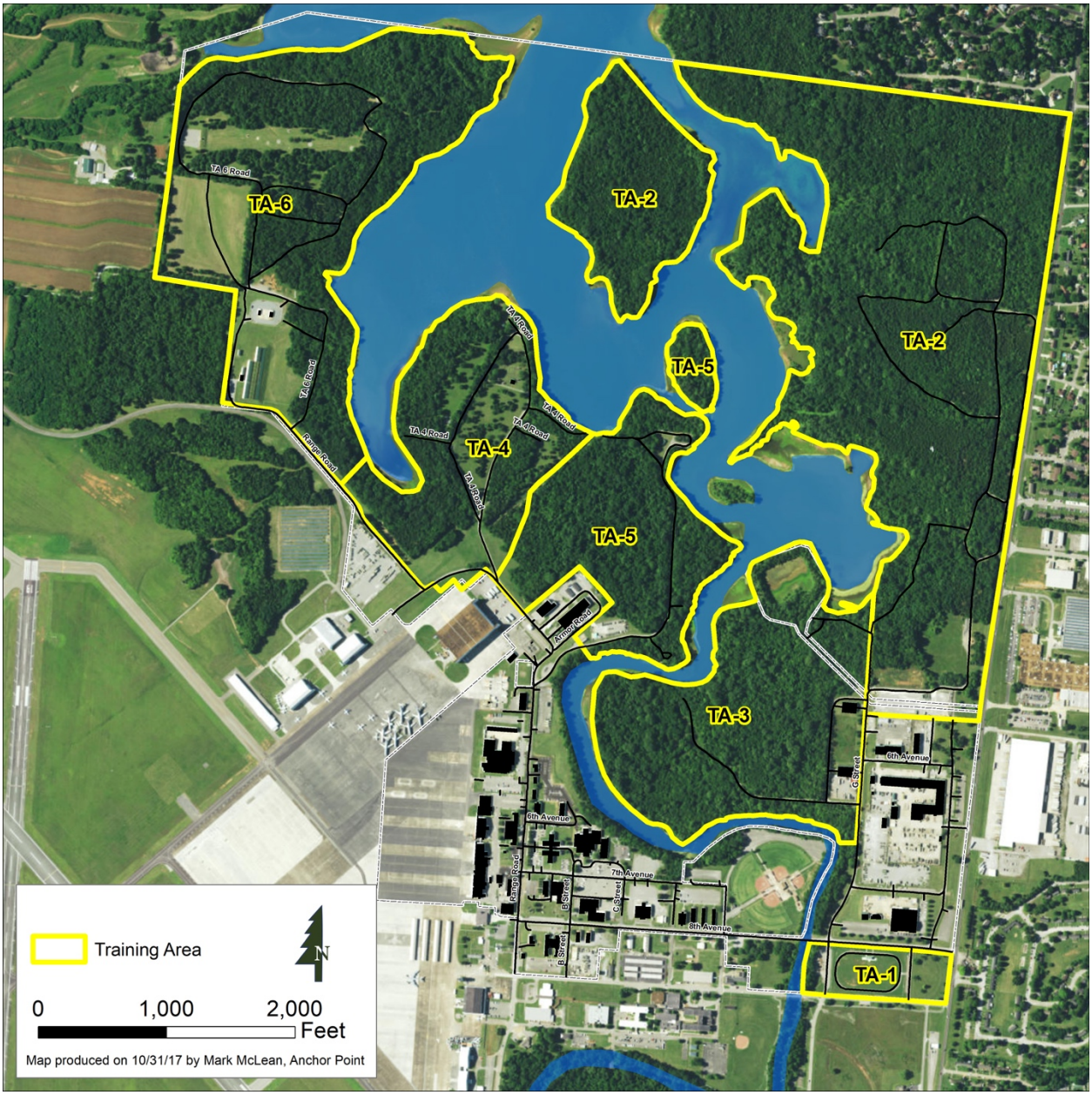


Figure A2. 1 Training Areas

4.3 Natural and Cultural Resources Considerations

Fire management may have beneficial or negative impacts on both the natural and cultural resources of a site, and both can represent constraints on the fire program, especially prescribed burning.

4.3.1 Cultural Resources

Development of firebreaks is the greatest fire-related threat to Cultural Resources on VTS-S. No new permanent firebreaks (off existing roads and trails) will be developed without consultation with the Tennessee State Historic Preservation Officer (SHPO). Temporary plow line firebreaks may be

constructed in those portions of the training site which have been surveyed and identified as free of significant archaeological or historical resources. Routinely mowed fuel breaks may be effective in areas where soil disturbance is not allowed.

A Phase I archaeological survey of VTS-S conducted in 1998 identified 14 archaeological sites and four historic sites on the installation. One of the archaeological sites and all four historical sites were recommended as eligible for the National Register for Historic Places. These sites are considered “no plow” zones, and are included in (Figure A2.2) with the natural resource sites that are also protected from the fire plow. Fire control in “no plow” zones will depend on existing firebreaks or methods that do not disturb the soil. The Cannon Cemetery is located in Training Area 6 and will be protected from wildfire and prescribed burns (Figure A2.1and A2.2)

4.3.2 Natural Resources

Water resources are the most significant natural feature on the VTS-S. Riparian forests represent over 25 percent of the total forest cover occurring in the installation and are found on either side of Stewart Creek and J. Percy Priest Lake, as well as on the two islands in TA 2 and TA5. Riparian hardwood vegetation is highly sensitive to burning. Frequent burning and/or hot fires can stress and damage the trees making up this forest community.

If wildland fire were allowed to burn completely to the shoreline, potential erosion and water quality issues would be created by the removal of the ground vegetation and leaf litter that were burned. Portions of Stewart Creek upstream from the training site have been designated impaired by the Tennessee Division of Water Pollution Control and are listed as 303(d) impaired as a result of nitrate runoff and loss of biological integrity due to siltation. It is extremely important that waters adjacent to the VTS-S are protected from further contamination to avoid additional listing and to promote stream recovery. In addition, shoreline burning could create a short term aesthetic problem for the recreating public on the lake.

To minimize these concerns and potential erosion issues, all efforts will be made to protect a 50 foot buffer (also known as a Streamside Management Zone [SMZ]) from the banks of Stewart Creek and J. Percy Priest Lake. This vegetated buffer will protect water quality and provide a screen between burned areas and the lake. In a number of locations, bottomland hardwood forests border the lake. In those situations, if possible, the entire extent of the bottomland hardwood forest bordering the lake will be used as the buffer zone and will remain unburned.

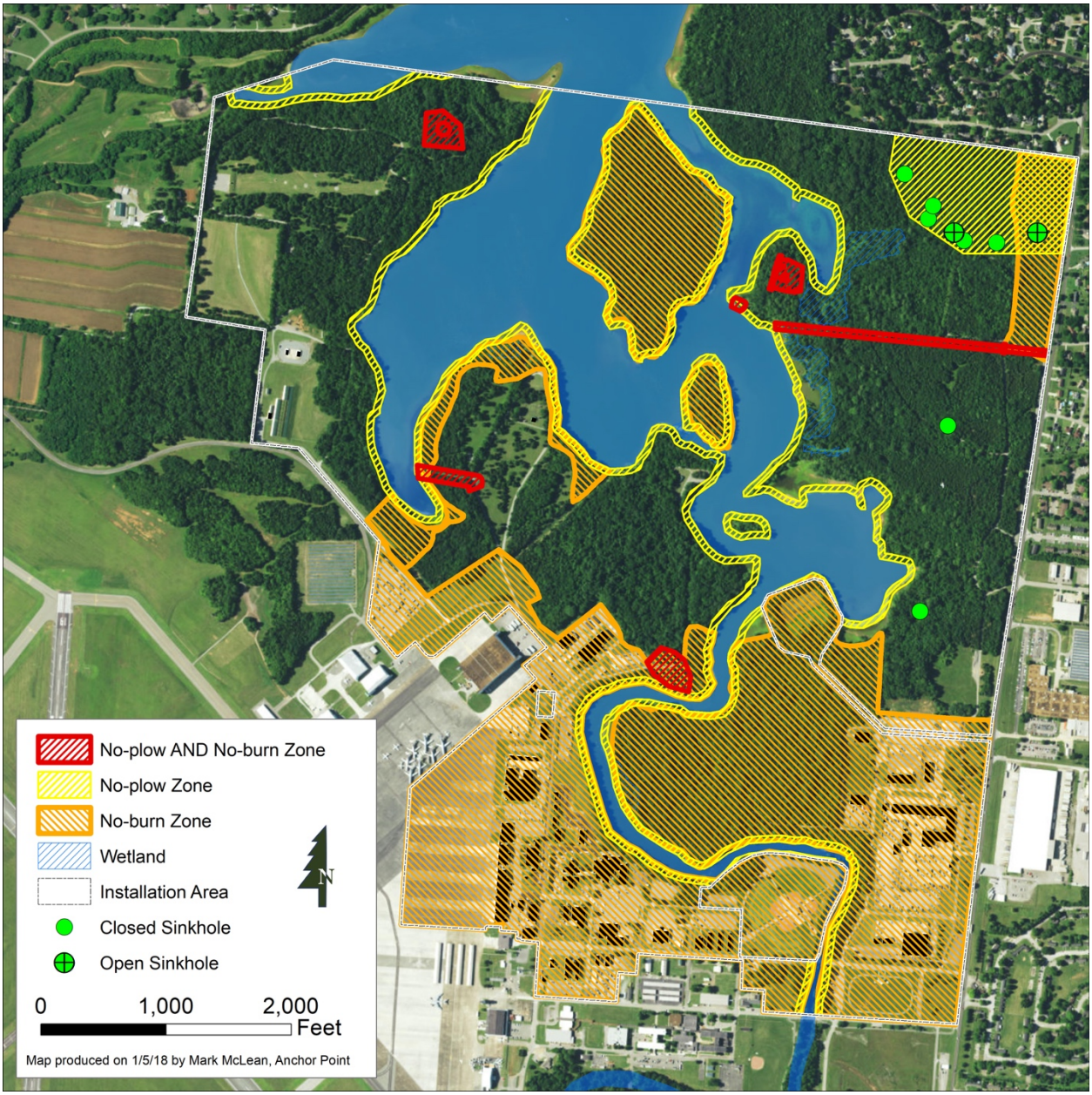


Figure A2. 2 No-Plow Zones on VTS-S due to significant natural and/or cultural resources

The SMZ is also a "no-plow zone" (Figure A2.2); if possible, firebreaks should be established further than 100 feet from the stream bank as needed.

- Erosion control on firebreaks is also a concern in order to minimize the potential for sedimentation into these water bodies. Water control structures to manage surface water movement will be installed during firebreak construction. Permanent fire lines will have water control structures maintained. Temporary firelines will be rehabilitated as soon as practicable after any fire. Existing barriers such as roads and trails will be used whenever possible to reduce the need for fire line construction and to minimize resource impacts.

- No federally listed plant species have been discovered on the VTS-S; however, populations of four federally listed endangered plants have been documented within five miles of the training site. Twenty-one additional plant species (see Section 3.9.1 of the INRMP) of concern to the Tennessee Natural Heritage Program have also been found within five miles of the VTS-S, although not on the training site property.

The life histories of these plant species suggest that occasional burning in the dormant season would be beneficial, especially in expanding open areas and controlling competitors. Most of these sensitive species prefer limestone cedar glade and/or barrens habitat, the former of which is widely prevalent in surrounding undeveloped and protected lands and which may have existed on the site of VTS-S prior to human development. If any of these species are identified in future rare species surveys on the training site, this wildland fire management plan will be reconsidered with regards to the management of the new species.

One member of a federally listed endangered mammal species, the gray bat (Myotis grisescens) was captured on VTS-S during a 2013 bat survey. No caves or sinkholes suitable for use as gray bat roost, maternity roost, or hibernacula were found on post by a 2005 karst survey, or during a 2013 bat habitat survey. The 2013 bat habitat survey found generally poor roosting, and poor to moderate commuting and foraging habitat on VTS-S. It was concluded that the bat was simply foraging and commuting through the area. Gray bats are known to prefer feeding on aquatic insects over open water, along waterways, and along forest openings. Prescribed fires will normally be conducted during the winter months when gray bats will be absent and dormant, and should not have the potential to impact the species directly. Following the restrictions on burning and fireline plowing within SMZs or within bottomland hardwood forest will prevent erosion and sedimentation of the waterbodies present, thus protecting the aquatic insects that gray bats primarily feed upon.

- Two animals with partial federal status have been sighted at VTS-S: the meadow jumping mouse (Zapus hudsonius) and the sharp-shinned hawk (Accipiter striatus). These species are protected in a portion of their range, but the populations in Tennessee are stable and are not included under the protected designation. Both species are considered in need of management by the State of Tennessee, as are three other species documented at the site: great egret (Ardea alba), cerulean warbler (Dendroica cerula), and yellow-bellied sapsucker (Sphyrapicus varius); however, populations of all five species appear to be stable in Tennessee at this time (NatureServe 2007). Prescribed fire should have little impact on avian populations on and around the training site. Burning can influence small mammals through habitat change, and less frequently, direct injury. The scheduling of prescribed burns across the training site is designed to ensure unimpacted habitat is maintained within close proximity of burn sites each year (See Table A2.5,6 & 7).

In addition, four state species of concern have been found within five miles of the training site (see Section 3.9.2 of the INRMP for the complete list). As noted for local sensitive plant species, if any of these animals are found on VTS-S property, reevaluation of this plan may be necessary.

4.4 Fire Regime

The fire regime classification system is used to characterize frequency and intensity of a fire within landscapes based on interactions between vegetation dynamics, fire spread, fire effects, and spatial context. Fire Regimes consider the frequency that the fire visits the landscape, the type of pattern created, and ecological effects. Fire Regimes are based on historical fire data. The following natural fire regimes are arranged along a temporal gradient, from the most frequent to the least frequent fire

return interval. The definitions below (Table A2.4) are from the General Technical Report, Rocky Mountain Research Station #87 (GTR-RMRS-87).

Table A2. 4 Fire Regime Categories

Fire Regime I	0-35 years	Low Severity
Fire Regime II	0-35 years	Stand Replacement
Fire Regime III	35-100+ years	Mixed Severity
Fire Regime IV	35-100+ years	Stand Replacement
Fire Regime V	200+ years	Stand Replacement

Plant communities of VTS-S fall into two Fire regimes;

Fire Regime I: Fires in the under-story fire regime generally do not kill the dominant vegetation or substantially change its structure. Approximately 80 percent or more of the above ground dominant vegetation survives fire. The under-story fire regime occurs primarily in southern pine and oak-hickory forests, including the oak-hickory forest types found at VTS-S. Fire is a natural maintenance disturbance for these types of stands, and is used to maintain and regenerate oak-hickory for timber stand improvement and wildlife stand improvement concerns.

Fire Regime II: This regime is known as the frequent replacement group. It is primarily for grasslands and shrub lands where fires typically replace greater than 75 percent of the stand. This regime covers short and tall grass ecosystems and eastern red cedar stands like those found on the VTS-S. It should be noted that due to lack of fire eastern red cedar has become much more prevalent than what is considered historic. In order to return areas with dense cedar stands to Fire Regime II, hand or mechanical tree thinning will be needed. Trees removed will need to be pile burned, or removed from the site. Routine prescribed burns can then help manage cedar regeneration.

4.5 Fuel Types

VTS-S consists of 857 aces, approximately 20% of which is developed cantonment area. Slightly more than half of the training site land is covered in either managed grasslands or with red cedar woodlands that range from dense stands with little understory vegetation to sparse savanna-like communities with significant grass cover. Bottomland hardwoods and mixed evergreen/hardwood stands generally occur on the lower elevation lands bordering the lake.

Fuel models are used to predict fire behavior outcomes. Previous version of the WFMP utilized 13 Fuel Models. The fuel model system has been updated and now includes 40 models. Some objectives for updating the fuel models included a need to improve the accuracy of fire behavior predictions outside of the severe period of the fire season, such as during a prescribed fire and to increase the number of fuel models applicable in high-humidity areas. Both of these factors will be beneficial for managing wildland fires at VTS-S. (Additional details are in Scott, J. and Burgan, R. (2005)[3].

[3] Scott, J.H. and R. Burgan. 2005. Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model, United States Department of Agriculture Forest Service, RMRS-GTR-153.

In the context of fire behavior modeling, “fuel models” are a set of numbers that describe fuels in terms that the fire behavior modeling equations can use directly. There are seven characteristics used to categorize fuel models:

- Fuel Loading
- Size and Shape
- Compactness
- Horizontal Continuity
- Vertical Arrangement
- Moisture Content
- Chemical Content

Approximately 279 acres of VTS-S is in the timber litter group. The fuel under most forest stands consists of light to moderate loading of fuel, most of which is compacted on the ground (see Figure A2.9). Fuels of this type are found throughout the Piedmont and Upper Coastal Plain regions of the Southeast. In dense pine stands, the predominant fuel is the matted pine needles. In upland hardwoods, it is compacted hardwood leaves. The amount of brush will vary from almost non-existent to almost solid brush, especially if there is little over-story. This fuel type will generally consist of grasses, pine needles, deciduous shrubs, small saplings, pinecones, twigs and branches. Fires in this fuel type will generally be of low intensity and slow spreading. The surface fuel is compacted and dries out very slowly. Consequently, much of it will not be available. Shrubs and small saplings tend to be more readily available and will add to the intensity where they are present. Most fires will be of rather low intensity and easy to control except during droughts when a larger percent of the fuel will be available. Firefighters can be surprised when this happens if they are not alert because of the increased intensity and rapid spread of the fire.

Each of the major fuel types present in the study area are described below, in terms of the characteristics that coincide with that fuel model.

Grass Fuel Type Models (GR)

The primary carrier of fire in the GR fuel models is grass. Grass fuels can vary from heavily grazed grass stubble or sparse natural grass to dense grass more than 6 feet tall. Fire behavior varies from moderate spread rate and low flame length in the sparse grass to extreme spread rate and flame length in the tall grass models (Table A2.3 and 4).

All GR fuel models are dynamic, meaning that their live herbaceous fuel load shifts from live to dead as a function of live herbaceous moisture content. The effect of live herbaceous moisture content on spread rate and intensity is strong.

GR1 (Mowed areas)

The primary carrier of fire in GR1 is sparse grass, though small amounts of fine dead fuel may be present. The grass in GR1 is generally short, either naturally or by grazing, and may be sparse or discontinuous. The moisture of extinction of GR1 is indicative of a dry climate fuelbed, but GR1 may also be applied in high-extinction moisture fuelbeds because in both cases predicted spread rate and flame length are low compared to other GR models. This would include mowed and maintained grass areas.

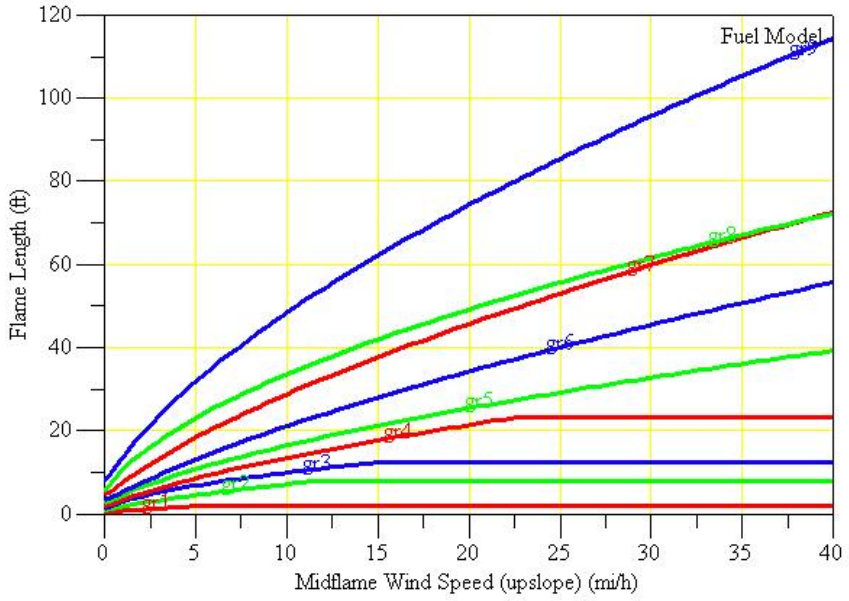


Figure A2. 3 Modeled flame lengths for GR fuel models

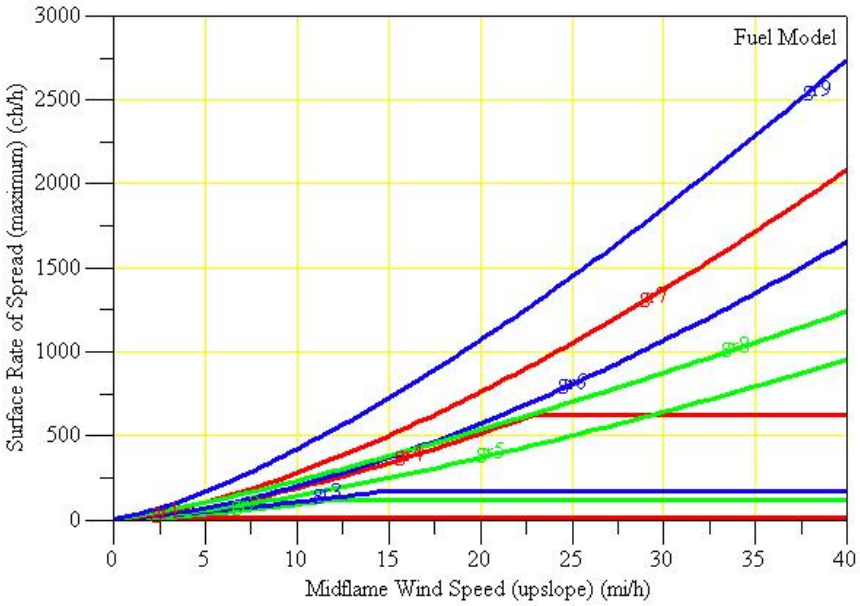


Figure A2. 4 Modeled rates of spread for GR fuel models

Timber Litter Fuel Type Models (TL)

The primary carrier of fire in the TL fuel models is dead and down woody fuel. Live fuel, if present, has little effect on fire behavior (Table A2.5 and 6).

TL2 (Upland Forests)
The primary carrier of fire in TL2 is broadleaf (hardwood) litter. Low load, compact broadleaf litter. Spread rate is very low; flame length very low. This is the most common fuel on VTS-S.

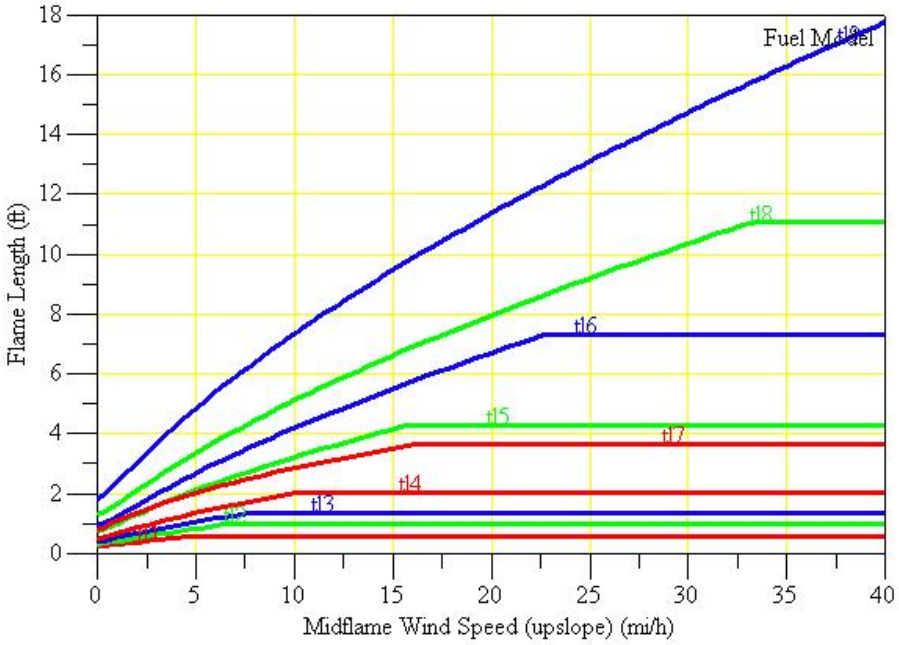


Figure A2. 5 Modeled flame lengths for TL fuel models

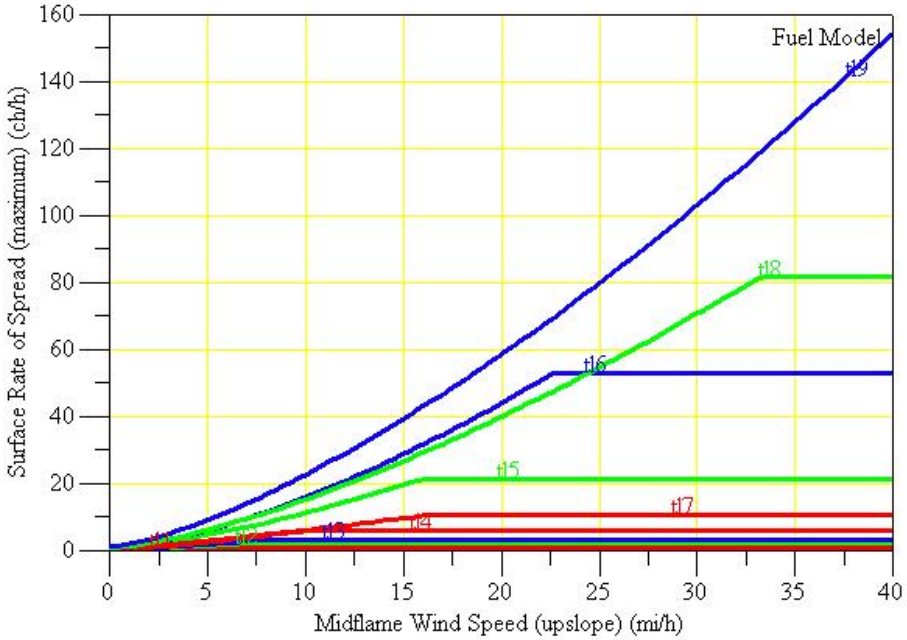


Figure A2. 6 Modeled rate of spread for TL fuel models

Timber-Understory Fuel Type Models (TU)
The primary carrier of fire in the TU fuel models is forest litter in combination with herbaceous or shrub fuels. TU1 and TU3 contain live herbaceous load and are dynamic, meaning that their live herbaceous fuel load is allocated between live and dead as a function of live herbaceous moisture content. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model (Table A2.7 and 8).

TU2 (Hardwood with Eastern Red Cedar mixed)
The primary carrier of fire in TU2 is moderate litter load with shrub component. High extinction moisture. Spread rate it moderate; flame length low. This model represents areas with a dominant hardwood canopy and cedar in the understory.

TU4 (Eastern Red Cedar)
The primary carrier of fire in TU4 is short conifer trees with grass or moss understory. Spread rate is moderate; flame length moderate. This model is used for estimating Eastern Red Cedar fire behavior. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model.

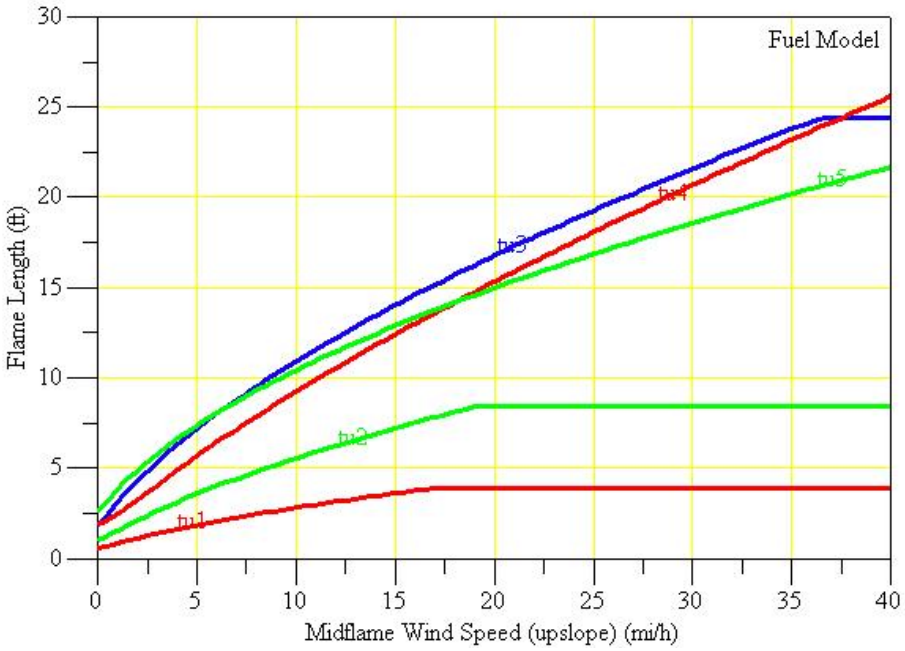


Figure A2. 7 Modeled flame lengths for TU fuel models

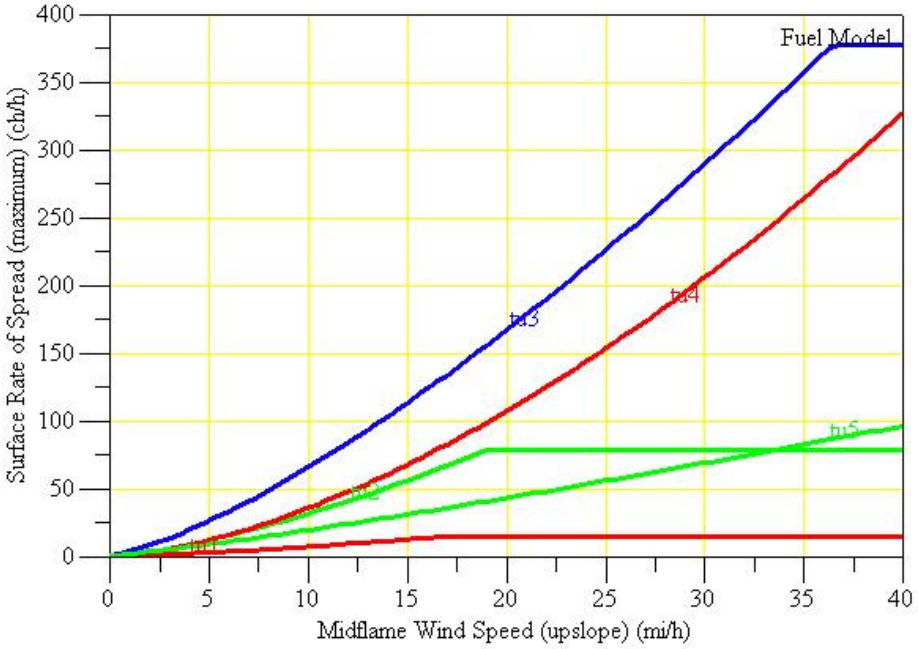


Figure A2. 8 Modeled rates of spread for TU fuel models.

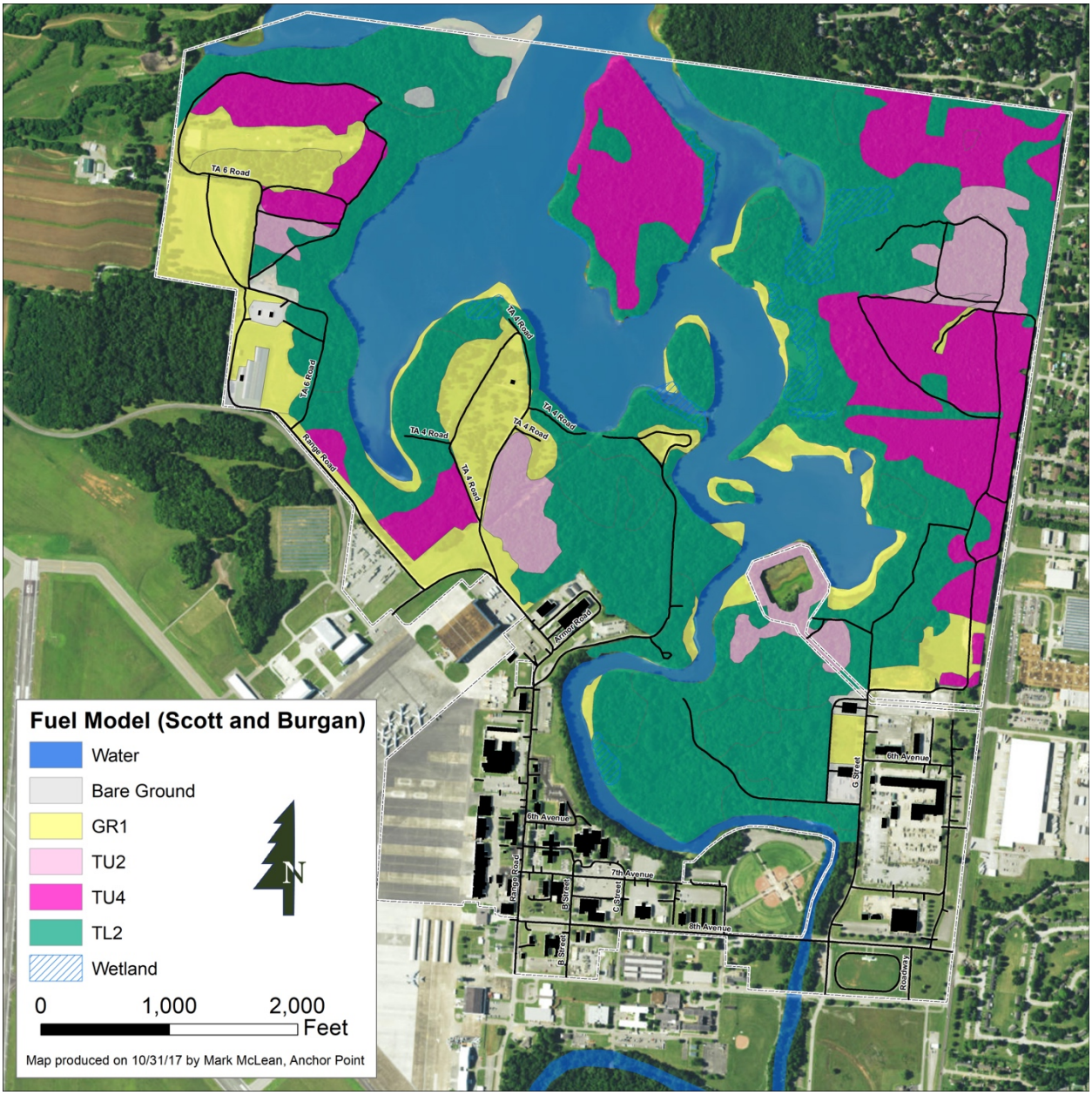


Figure A2. 9 Fuel Types on VTS-S

5.0 WILDLAND FIRE CONTROL

Due to its small size, the VTS-S is not subdivided into fire management zones. Wildfire in all areas outside the Cantonment (where structural firefighters would almost always be needed) will be addressed similarly with the objectives of:

- Preserving firefighter and other human safety
- Protecting real property
- Containing all fires within the training site boundaries
- Protecting significant natural and cultural resources
- Suppressing or using wildland fire in accordance with military and environmental needs

5.1 Suppression and Prevention

Wildfire prevention encompasses all of the following activities. Permanent staff will be briefed on the fire danger rating each day. Each visiting unit will be briefed prior to the start of any exercises on the fire potential for that day and any restrictions on use of pyrotechnics and/or tracers. (See Table A2.2 Fire Danger Rating for limitations).

Fuel breaks will be maintained on all boundaries, and along existing roads. These breaks in vegetation will reduce fire intensity as a fire approaches existing roads or boundaries. This will increase the likely hood of success for suppressing a wildland fire. Boundary maintenance will reduce possibility of wild land fire entering or leaving the facility. Mowed fuel breaks will be used in areas where soil disturbance is not allowed. Fire personnel should be aware that fires can cross fuel breaks and spotting may occur across fuel breaks.

- Structures and other properties of value will be surveyed for risk of exposure to wildland fire.
- Firewise practices will be implemented around structures in wildland areas.
- Burn Safe Tennessee website has useful information on this and other wildfire prevention information.
- Flammable materials stored adjacent to structures will be removed.
- Facility construction will be evaluated for risk of embers entering the structure. Grasses will be mowed around structures.
- New construction design should consider wildland fire risk.

5.2 Detection

All personnel using or working on VTS-S are responsible for detecting and reporting wildfires. All wildfires must be reported to Range Control.
In the event of a wildfire these steps will be followed;

1. All assigned personnel and visiting units will report wildfire to Range Control.
2. Range Control notifies 911 who notifies Town of Smyrna Fire Department.
3. Only authorized and qualified VTS-S firefighters will respond to wildland fires on the training site.
4. Range Control assigns authorized and qualified VTS-S and/or unit personnel to start initial attack.
5. Town of Smyrna Fire Department responds.
6. Unified Command is established with Town of Smyrna Fire Department and Range Control Officer.
7. Training Site Command and Natural Resources Manager and/or Environmental Department is notified.
8. If fire exceeds or it is anticipated that fire suppression needs exceed onsite capabilities, Smyrna Airport Fire Department is requested. Fire department will request additional resources through their normal channels and agreements.
9. Unified Command Structure is modified in accordance with MOA's, and personnel capabilities based on incident complexity. (As formal agreements are completed this procedure may change)
10. At no time will the wildland firefighting assets be used for fighting vehicle, fuel, or structure fires

without approval from the Installation Commander or the Range Officer.
Under normal circumstances, immediate suppression will be the goal of wildland fire response on VTS-S. Occasionally, an accidental fire may be managed to burn the entirety of a range or said burn unit which is scheduled for prescribed burning in that FY. The unit burn plan should be reviewed to ensure objectives of the prescribed burn will be met before committing to this strategy. Backfiring using existing control lines will be considered in these situations. In some situations, current and predicted fire behavior, environmental conditions and available resources may dictate that allowing a fire to burn to a preexisting control line or similar barrier is the safest and best suppression strategy.

5.3 Dispatch Procedures

VTS-S Range Control is responsible for coordinating the immediate wildland fire control response on the training site. Initial wildfire response will be conducted only by authorized and qualified TNARNG and partner agency personnel. Qualifications are defined by NWCG as described in PMS-310-1 (https://www.nwcg.gov/sites/default/files/publications/pms310-1.pdf) and by NFPA (https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1051). The Smyrna Fire Department is the primary responder for all non-aviation related fires at VTS-S onsite and would respond to any fires within the VTS-S. Range Control will notify 911 of wildland fires. If additional support is needed, resources will be requested through 911. The Smyrna Fire Department may request support from the Smyrna Airport Fire Department, and if necessary from the Tennessee Division of Forestry. A unified command will be established between VTS-S, Smyrna Fire Department and Tennessee Division of Forestry if necessary following guidance in the MOA.

5.4 Communications Plan

Range Control and municipal authorities are not able to communicate on Range Control's radios, therefore cell phones are the best means of communication. It is critical to provide an updated cell phone list to local agencies. There is cellular phone signal throughout most of VTS-S.

- VTS-S Range Control Cellular number (615) 686-9789

5.5 Extended Attack Procedures

If a fire cannot be contained in the first operational period, the Tennessee Division of Forestry will be requested to manage the incident. The Memorandum of Agreement will be reviewed to clarify procedures, cost management, responsibilities and authorities of signatories.

5.6 Rehabilitation Needs and Procedures

The Natural Resource Manager (NRM) for TNARNG should evaluate all burned locations and suggest any site rehabilitation measures that may be needed. Rehabilitation cost responsibility for wildfires would depend on what started the fire, the objectives of the rehabilitation, and what is being rehabilitated. For example, If the fire was naturally caused and the damage was to an environmental resource, environmental funds would need to be used, however, if the fire was started by ranges/training and the damage was to training lands Installation Operations and Maintenance would be responsible.

5.7 Records, Reports, and Monitoring

Firefighters will complete a fire report and turn it into Range Control after every fire. A standard form

will be developed for the report. These fire reports should be filed in a permanent record and include:

- Incident name
- Date and Time
- Incident Commander
- Location
- Size in Acres
- Fuel Type
- Fire Cause (if known)
- Names of responders and position
- Equipment assigned to incident by ID number and type
- Brief description of the events
- Any other items identified by cooperating agencies
    - Include all field logs, communication records, images, records of property damages,

- Document the After-Action-Review in the fire record:
    - What did we set out to do (what was planned)?
    - What actually happened?
    - Why did it happen that way?
    - What strategies, tactics and procedures should be sustained? What can be improved?

The Range Control Officer will forward copies of these wildfire reports to the Natural Resource Manager for TNARNG who is responsible for maintaining fire records for all wildfires.

6.0 PRESCRIBED FIRE MANAGEMENT

Prescribed fire can be used as a land management tool at VTS-S. Based on the fuel types on the installation, prescribed fire should be used selectively and under a limited set of circumstances. The sensitivity of hardwoods and eastern red cedar to fire necessitates that the burner be experienced in conducting prescribed burns in these forest communities. The following overall burning guidelines were considered in developing the prescribed fire objectives and the recommended prescribed burn program for VTS-S.

- A buffer of at least 50 feet should be maintained between areas burned and the shoreline of J. Percy Priest Lake and Stewart Creek to protect water quality and to screen burn operations from the lake. Plowed fire breaks must be further than 50 feet from the shoreline.
- If burning is done in hardwood stands, the fire should be done 2-6 days after good rainfall and when relative humidity is 40 to 50%.
- Eastern red cedar stands should be burned after a thinning and harvested tress removed or piles burned to reduce available fuel for a broadcast burn.
- Prescribed burns should be directed at reducing excessive fuel loads and maintaining a desired stocking level within forest stands.
- If privet is burned, follow up treatments (burning, chemical, mechanical) must be programmed.
- Open fields should be burned but not so hot as to burn the grass roots. To prevent erosion and to reduce program costs, 100 % consumption of all grassland fuels is not necessary.

- Any pile burn is for burning vegetation grown on the site. Nothing other than vegetation is allowed to be burned. Tennessee Department of Environment and Conservation, and Division of Forestry have information on what can be burned in piles.

6.1 Objectives

The following are the primary objectives for the prescribed burning program at VTS-S which are described in more detail below:

- Reduce fuel load and wildfire threat.
- Utilize prescribed fire, as appropriate, to create and maintain conditions as required by the military mission.
- Utilize prescribed fire, as appropriate, to aid in control of invasive plant species.
- Utilize prescribed fire, as appropriate, to aid in the regeneration of native glade and barrens communities, grasslands and to improve health of forest resources on VTS-S.

6.1.1 Reduce fuel load and wildfire threat.

Fire management activities should concentrate on preventing, managing, and controlling wildfires that originate on the installation, as well as fires that may encroach onto the installation from neighboring properties.

- Eastern red cedars have thin bark and fine, flammable foliage that ignites easily and are highly susceptible to fire. Prior to conducting prescribed burns in densely forested stands, selective thinning using mechanical methods must be accomplished to reduce the available fuel and created conditions that safely and effectively allow controlled burns. The thinning operations will be focused on creating openings and access lanes that will suit military training needs and provide appropriate spacing among the remaining trees. Lower limbs will be removed to a minimum height of 4 feet above the ground to reduce the risk of uncontrolled fire that could engulf the cedar trees. Control of invading cedar trees is most effective if trees are less than 10 years of age and 6.6 feet (2 m) tall.

- The bottomland hardwood forests should be burned on a 6-year interval to reduce fuel loads while minimizing damage to the timber. Traditionally burns are conducted in mid-winter (December-February) under conditions that will produce the coolest fires possible. More frequent and intense burning could damage or stress the trees, resulting in a sparse tree canopy, reduction in growth rates, diminishment of the quality of harvested timber, the death of trees, and encouragement of dense undergrowth and invasion by other woody plants that will take advantage of the increased sunlight penetration to the forest floor. Burn plans should be developed to meet desired objectives for each site. Planners should review the latest fire science during specific burn plan developed. Fire effects on forests on the VTS-S will be monitored and future burn prescriptions adjusted as necessary to meet future objectives that maintain training needs and a healthy forest ecosystem.

In order to achieve prescribed fire objectives of regenerating plant communities' individual unit burn plans must consider plant community compositions and the desired fire effects for both training and the plant communities. INRMP Section 3.7.1 Vegetation Cover describes the vegetative communities that occur. Ecologists familiar with these plant communities should be consulted while developing burn plans for these areas.

6.1.2 Create and maintain conditions required by the military mission.

The military mission at the VTS-S requires a variety of landscape conditions. The dense red cedar forests found in TA2 and portions on TA6 are currently not favorable for many aspects of the military mission and could be effectively managed by prescribed fire after thinning operations are conducted. Open areas and grasslands may be effectively managed by prescribed burning to control woody species encroachment and to rejuvenate herbaceous and graminoid species.

- TA2 will be thinned and prescribed fire will be used to further open up the area to make it more suitable for wheeled and dismounted combat trails, land navigation training, and a Forward Operating Base (FOB) location.

- In TA6, prescribed burning will improve maneuverability and would allow for the construction of additional combat trails.

- Approximately 13% of the training site is composed of managed open areas and grasslands, with the largest portions found in TA6 and TA4. Although these open areas have historically been maintained by mowing or brush hogging, use of prescribed fire could minimize the required frequency of such mechanical control. In addition, fire will improve the health of the herbaceous and graminoid components of the grassland, better control woody species encroachment, and assist in controlling exotic invasive pest plant species, including common privet, sericea lespedeza, and Japanese honeysuckle.

6.1.3 Aid in the control of invasive species.

Prescribed fire may be used in combination with mechanical and herbicidal methods to control invasive species that are problematic on VTS-S, including common privet, Japanese honeysuckle, and Chinese lespedeza. Care will be taken to avoid the use of prescribed fire in those locations where fire could stimulate the spread of other invasive plant species such as Johnson grass. Prescribed fire alone is unlikely to control these species.

6.1.4 Regenerate native glade and barrens communities

Ecosystems at VTS-S have been heavily manipulated over the last 200 years, primarily due to agricultural practices and military use. Fire suppression, over the same time period, has caused further changes in the structure and composition of the installation's plant communities. Introducing prescribed fire could help to restore naturally-occurring communities such as cedar glades and barrens by controlling red cedar stand density, reducing accumulation of forest floor litter, and allowing the establishment of a more diverse mix of grasses and forbs.

Most plants endemic to prairie and cedar glade habitats flower and bear seeds from late summer into early fall. Therefore, prescribed fire should be applied in late spring prior to green-up in the existing savannah-like areas in Training Areas 4 and 6 and to newly thinned areas in TA2. Such a burning schedule will maintain the open conditions required for military training while encouraging a native species assemblage. Brush hogging should be avoided in these areas, if feasible, between July and September to allow flowering and maturation of seeds of the native grassland plants and to deter exotic invasive species from colonizing the opening.

In order to achieve prescribed fire objectives of regenerating plant communities' individual unit burn plans must consider plant community compositions and the desired fire effects for both training and the

plant communities. INRMP Section 3.7.1 Vegetation Cover describes the vegetative communities that occur. Ecologists familiar with these plant communities should be consulted while developing burn plans for these areas. Burn Planners should review the latest literature during development of site specific plans.

6.2 Constraints

In addition to minimizing damage to the hardwood timber, prescribed fire on VTS-S must be conducted cautiously with concern for other major limitations on burning on the training site:

6.2.1 Protection of the waterways.

Water resources are the most significant natural feature on the VTS-S, due to the immediate proximity of Stewart Creek and J. Percy Priest Lake. A 50 foot buffer (a.k.a. SMZ) will be maintained along all banks of Stewart Creek and J. Percy Priest Lake, within which neither vegetation nor soils should be disturbed.

Erosion control on firebreaks is also a concern in order to minimize the potential for sedimentation into these water bodies. Water control structures to manage surface water movement will be installed during firebreak construction. Permanent fire lines will have water control structures maintained. Temporary firelines will be rehabilitated as soon as practicable after any fire. Existing barriers such as roads and trails will be used whenever possible to reduce the need for fire line construction and to minimize resource impacts.

6.2.2 Protection of sensitive species.

All prescribed fire prescriptions applications will be developed and implemented with sensitivity to the biological requirements and behavioral patterns of species of special concern that have the potential to occur on VTS-S.

The federally endangered gray bat has been found on VTS-S. Implementing prescribed fires during its inactive or dormant season, following restrictions to prevent erosion, and preventing siltation of water ways and water bodies will prevent any impacts to the species. No federal or state-listed threatened, endangered, or sensitive plant species have been identified on the VTS-S; however, federal and state listed plants and animals have been found within five miles of the training site. These species are discussed in more detail in Section 3.9 of the INRMP. Maintenance of appropriate habitat for these species is a conservation concern and will be considered in prescribed fire planning. If any additional federally listed species are identified on the VTS-S, this plan will be revised to ensure sufficient protection.

6.2.3 Safety Hazards.

There are safety factors that need to be considered and/or mitigated prior to and during prescribed burns.

- There will be no burning in Training Area 2 until after mechanical thinning has been conducted and much of the biomass has been removed. Other areas that contain very dense stands will also be harvested prior to the initiation of a new fire regime (see the Forest Management Plan Annex for more information).

- Controlled burns will not be used in Training Area 1, due to its location, small size, and need

for a manicured, mowed appearance. Other grassed locations at VTS-S that will be excluded from prescribed burning include all lawns immediately adjacent to buildings, parking areas, and other developed areas and those sites that are routinely used to store equipment for training purposes. Controlled burns will also be restricted from Training Area 3, which is currently designated as off limits for all training activities due to its previous use as a DoD landfill prior to TNARNG management. Until restoration of these sites is complete, TA3 will be a No Burn Area.

- The northeast corner of Training Area 2 contains several sinkholes which have been mapped and posted. Any prescribed burns in this area will be initiated after ignition techniques and tools have been evaluated. Prior to ignition a safety briefing identifying the locations of these sinkholes and appropriate actions to avoid entrapment or physical injury around them.

- **Troops down range –** if troops are down range, we recommend that they be completely out of the burn unit, and that any access to or near the burn unit be restricted until the burn is completed.

- **Heavy fuels –** if areas of heavy fuel are identified before the burn is initiated, you can mitigate by scattering the fuel in the surrounding area, remove the fuel, pretreat the fuels with water or foam, or by putting a firebreak around the fuels. If areas of heavy fuels are identified after the burn is initiated, you can mitigate by holding up burn operations until the heavy fuels burn down, and have someone patrol the "green" side of the firebreak for any spot fires. If access is available, you can also wet down the heavy fuels with an engine or some type of suitable water source.

- **Areas w/o functional firebreaks –** we highly recommend firebreaks being installed before initiating any prescribed burn. In some areas access with a dozer is not feasible or even possible to install firebreaks, other options would be to install a wet line with an engine, or to install a firebreak by hand (Hand line).

- **Proximity of Residential Structures-** There are numerous structures adjacent to the eastern boundary along Weakley lane that would need to be contacted prior to burning. Fuel breaks should be completed along east side to help mitigate escape potential.

6.3 Smoke Management and Air Quality

The U.S. Environmental Protection Agency (EPA) monitors specific air quality parameters to determine if a particular area is in attainment with the National Ambient Air Quality Standards (NAAQS). The parameters of interest are ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen oxides, and lead. Smoke produced by wildfires contains a number of these pollutants.

The Tennessee Department of Environment and Conservation's (TDEC) Division of Air Pollution Control is responsible for protecting the State's air quality. TDEC has developed regulations governing open burning, which is defined as any burning event that generates combustion products that are emitted directly into the open atmosphere without passing through an open stack. Prescribed burns are a type of open burning; however, TDEC regulations specifically exempt prescribed open burns of forests and grasslands performed in connection with land management activities from having to receive permits issued by TDEC. As a result, TDEC places no special requirements on the conduct of prescribed burns, other than directing burners to obtain Burn Permits from the TDA Division of Forestry and complying with local burn regulations and ordinances.

As a precaution to ensure full compliance with TDEC open burn regulations, the area to be burned should be visually inspected prior to the burn to assure that no items that are prohibited from open

burning have been abandoned within the site (e.g., tires, oils, paints, vinyl siding, treated wood, etc.). If these materials are present, they will be removed before burning. Each burn plan will identify strategies to assist in reducing the amount of smoke generated during the burn. Of equal importance, burns will be conducted when conditions minimize the amount of smoke produced.

Although it is not required in order to obtain a TDF burn permit, the TDEC Division of Air Pollution Control should be contacted prior to conducting a prescribed burn to ensure that the burn site is not located within a declared Air Pollution Episode (e.g., air pollution alert, warning, or emergency). If some form of Air Pollution Episode has been declared, the prescribed burn will be postponed until conditions improve. All questions on air quality issues should be directed to the Division of Air Pollution Control (1-888-891-8332).
Atmospheric conditions should be favorable for smoke to rise into the upper air and away from smoke-sensitive areas such as highways, airports, and urban areas. There are several smoke-sensitive areas at VTS-S that will warrant consideration during the conduct of every prescribed burn.

Although smoke generated from controlled burns has the potential to create short term problems in managing air traffic, the Smyrna Airport has indicated that it is willing to work with the TNARNG in the conduct of prescribed burns. The Smyrna Airport Manager shall be notified at least 24 hours before a prescribed burn is to be performed so that the control tower personnel can be informed of the impending burn and issue a notice to the Federal Aviation Administration Nashville Center so that all pilots planning to use the airport will be aware of the potential for smoke to influence visibility in the immediate vicinity of the airport. Due to the proximity of Smyrna Airport to VTS-S, the Smyrna Airport Manager will be consulted during the advance planning for each prescribed burn to assess potential air traffic issues during preparation and decision-making process.

- Smyrna Airport borders VTS-S to the west and southwest. It is operational 24 hours a day. Landings for all aircraft are primarily made from the south on Runway 32, with take-offs occurring to the northeast on Runway 14. However, if wind conditions are not suitable, the secondary landing approach is Runway 19 from the north, with departures using Runway 1 toward the south. The orientation of the runways means that planes using Runways 1 and 19 have the potential of either taking off or landing, over portions of VTS-S. Planes using these two runways may have a greater potential to be exposed to smoke during prescribed burn events.

- Roads – A number of roads and highways are located in the areas surrounding VTS-S. Traffic volumes on these roadways vary, ranging from very heavily used major highways to limited use access roads into residential subdivisions. The combined US Highway 41/State Highway 70 is the most heavily used roadway near the installation and is located approximately a quarter of a mile to the south.

- Businesses and Residences – A diverse array of light industrial operations and businesses are located to the south and southeast of VTS-S, with residential developments concentrated to the north and northeast. These developments begin immediately adjacent to the installation boundary, typically being separated by only a road or a thin strip of vegetation.

- To mitigate areas from being smoked in, the burn would need to be conducted on a day with good smoke dispersion, mixing height, and transport winds that will carry the smoke in a favorable direction.

All burn activities should consider the potential effects of smoke dispersion on the residents and employees located within these areas. Prior to all prescribed fire operations, a news release will be

provided to local media outlets serving the immediate area to assist in notifying the public of the programmed burn events. Any complaints or concerns expressed by the public will be recorded on the post-burn evaluations, included in after action review files, and will be considered in the planning for subsequent burns.

- J. Percy Priest Lake is a 14,200 acre reservoir operated by the USACE. The lake forms much of the northern border of the installation, with the Stewart Creek embayment winding its way through the VTS-S to the point at which its namesake stream flows into the lake. All six of the installation's training areas border the lake or stream to some extent. The lake is operated for multiple purposes, including hydroelectric power generation, flood protection, fish and wildlife resources, and recreation.

Smoke has a tendency to move down slope toward bodies of water. This is particularly true at night when air temperatures decrease and humidity is typically higher, causing the heavier air to sink to lower elevations. The problems can be intensified by the smoke mixing with fog if conditions are favorable for producing fog. These conditions can create visibility problems on the lake that adversely affect navigation and recreational activities.

Because of the intimate nature in which the lake's Stewart Creek embayment is associated with the installation lands, special emphasis shall be placed on conducting all prescribed burns so that they will be completed and all smoke production ended well before the onset of night. To the extent possible, all burns will be timed to be completed in the early afternoon. The USACE Resource Manager for the lake should be consulted during the planning of all prescribed burns and informed at least 24 hours before the conduct of each burn so the Corps will be prepared to respond to any lake management or safety issues associated with the smoke that will be generated. The Resource Manager for J. Percy Priest Lake may be contacted at (615)889-1975.

- Smyrna Municipal Golf Course – The golf course, owned and operated by the City of Smyrna, is located less than a quarter of a mile southwest of the VTS-S, on the far side of the Smyrna Airport. It consists of 27 holes and a variety of associated facilities. The golf course should be informed in advance of all prescribed burns so that appropriate arrangements can be made to provide information to golf course users on the days the burns are conducted. This can be accomplished by contacting the course Golf Pro at (615)459-2666.

Local law enforcement personnel will be informed in advance of a prescribed burn and a determination will be made about possible need for an officer to be assigned manage traffic movement in case smoke impedes visibility on the roads. Temporary signs will be posted during prescribed burns to inform motorists of potential smoke hazard issues.

Although prescribed burns are not regulated by the EPD, to avoid potential air quality compliance problems, the area to be burned should be visually inspected prior to the burn to assure that no items that are prohibited from open burning have been abandoned within the site (i.e., tires, oils, paints, vinyl siding, treated woods, etc.). Should such materials be present, they should be removed prior to burning.

6.4 Use of Fire Breaks

Fire breaks can consist of established roads, logging trails, cleared lanes used for the sole purpose of controlled burns, utility rights-of-way, and watercourses. Ideally, fire breaks should be capable of supporting groundcover to guard against erosion when not being used to contain fires. Prior to the conduct of a prescribed burn, the fire breaks should be inspected to ensure that they are in the proper

condition to contain the fire. Following the burn, the fire breaks should be inspected again to determine if any remedial measures are needed to prevent erosion and other problems from developing.

To ensure that fire breaks are available when needed, a regular maintenance program must be pursued to maintain the fire breaks in a cleared and open condition, with a minimum of undergrowth and low hanging limbs. The best maintenance scenario exists when the fire breaks serve dual or multiple purposes (i.e., roads, utility rights-of-way, etc.). In such situations, it is possible to distribute maintenance costs to other installation activities instead of having to assign the total costs to the prescribed fire program.

The existing road system provides the basis of the fire break network on the VTS-S. A perimeter fire break should be maintained in conjunction with the security line-of-sight clearing along the boundary fence, as funds are available. Additional fire breaks will be developed to subdivide large areas, especially in training areas 2, 4, and 6 because of the high stem density of red cedar in these areas. The new breaks will be developed in conjunction with the planned timber thinning in these training areas – prior to any prescribed burning. Where possible, the fire breaks will eventually function as and be maintained as tank trails. Firebreak construction will be limited in the northeast portion of TA2 due to the presence of several sinkholes and related karst features.

Permanent firebreaks will be constructed with appropriate erosion control features to manage surface water runoff. Those not utilized as maneuver and tank trails will be maintained in a grassed condition to the extent allowed by the available sunlight penetrating the forest canopy. With the exception of periodic brush hogging, the vegetative cover on these firebreaks will only be disturbed when necessary during the conduct of prescribed burns or in preventing the spread of wildfire. Temporary fire breaks will be cut, as needed, prior to prescribed burns or during wildfire control, in accordance with the no-plow zones (Figure A2.2). These fire breaks will be reclaimed and revegetated as soon as possible following the fire.

The City of Smyrna Gas Department (615/459-2553) has a large meter on their gas line that crosses a portion of TA4. A firebreak should be constructed around this utility feature and care should be exercised in conducting any prescribed burn in its vicinity. Cannon Cemetery is located in the northwestern portion of VTS-S in TA6. A firebreak should be constructed around the periphery of the cemetery, beyond the 50 ft. buffer zone, to protect it during prescribed fire events. There are culturally significant earthen features in TA5 that are designated No Plow zones and in which, no firebreaks may be constructed (See Figure A2.2). These features are not sensitive to fire.

6.5 Training and Crew Requirements

Prescribed fire personnel will follow the training set forth in the PMS-310-1 (http://www.nwcg.gov/pms/docs/docs.htm). At a minimum, the following positions should be filled during operations:

- Prescribed Fire Crew Members (VTS-S personnel with FFT2 training)
- Prescribed Fire Burn Boss (1, 2, or 3) depending on complexity

6.6 Burn Plans

A site-specific burn plan is developed for each prescribed burn on the VTS-S, containing the elements listed in the Interagency Prescribed Fire Plan (NWCG PMS 484-1) and the Interagency Prescribed Fire Planning and Implementation Guide (NWCG PMS 484[4]). Pile burns also require approved burn plans.

[4] https://www.nwcg.gov/sites/default/files/publications/pms484.pdf

The 2017 Elements are;

- Element 1: Signature Page
- Element 2: Agency Administrator Ignition Authorization and Prescribed Fire Go/No Go Checklist
- Element 2A. Agency Administrator Ignition Authorization
- Element 2B. Prescribed Fire Go/No-Go Checklist
- Element 3: Complexity Analysis Summary and Final Complexity
- Element 4: Description of Prescribed Fire Area
    - Physical Description.
    - Vegetation and Fuels Description
    - Description of Values
    - Maps
- Element 5: Objectives
- Element6: Funding
- Element7: Prescription
- Element 8: Scheduling
- Element 9: Pre-burn Considerations and Weather
    - A. Considerations.
    - B. Method and Frequency for Obtaining Weather and Smoke Management Forecast(s):
    - C. Notifications
- Element10: Briefing
- Element 11: Organization and Equipment
- Element12: Communication
- Element 13: Public & Personnel Safety, Medical
    - Safety Hazards and Mitigation
    - Emergency Medical Procedures, Emergency Evacuation Methods, and Emergency Facilities
- Element 14: Test Fire
- Element15: Ignition Plan
- Element 16: Holding Plan
- Element17: Contingency Plan
- Element 18: Wildfire Declaration
- Element 19: Smoke Management and Air Quality
- Element 20: Monitoring
- Element 21: Post-burn Activities.
- Prescribed Fire Plan Appendices

6.7 Notification

Agencies and individuals who may play a role in the prescribed burn or may be affected by the burn will be notified prior to the ignition of a prescribed fire. The MOA will address specific requirements of those partners.

- The Rutherford County office of the Tennessee Division of Forestry will be notified via the request for a Burn Permit. If additional aid is to be requested from TDA, they will be notified well in advance of the planned burn.
    - TDF Rutherford County 931-685-5030

- The Town of Smyrna Fire Department issues burn permits for all open burning, including prescribed fire, conducted within the city limits and should be contacted at least 24 hours prior to all burns. The Smyrna Airport Fire Department is the primary responder only for aviation-related fire emergencies; however, they should also be alerted prior to any prescribed fires so that they will be prepared to act if they are called upon for assistance and so they may make preparations for potential reduced visibility on and around the airfield.

    - Smyrna Fire Department 615-459-6644
    - Smyrna Airport Fire Department 615-943-8398

- Local law enforcement agencies will be notified so that they can plan for smoke-induced traffic duties, as needed.
    - Smyrna Police Department 615-459-6644
    - Rutherford County Sheriff Department 615-898-7771
    - Tennessee Highway Patrol District 3 615-741-3181

- The USACE Project Office for J. Percy Priest Lake, the Smyrna Airport, and Smyrna Municipal Golf Course will be contacted at least 24 hours prior to the burn so that they may make necessary notifications and preparations.

    - USACE JPP Office 615-889-1975
    - Smyrna Airport 615-459-2651
    - Smyrna Municipal Golf Course 615-459-2666

- Temporary signs may be placed along Weakly Lane to inform motorists of potential visibility hazards from smoke resulting from the burn.

- A news release may be utilized to inform the public if the planned burn is extensive or located close to the property line.

- The surrounding public should be made aware of any possible smoke issues that may arise and could cause any health issues.

Public Affairs Office should be notified at least a month prior to burning so that they can generate News releases and other public messages to be sent to local media outlets.

- Newspaper
- Radio
- Local Internet Sites

6.8 Contingencies for an Escaped Burn

Prior to any prescribed burn, a small test fire will be ignited to confirm that the fire will behave in the desired manner.

However, if after conducting a successful test fire and igniting the main burn any of the following conditions develop, burning will be stopped and the fire will be plowed under:

- Fire behavior is erratic

- Fire is difficult to control
- Wind shifts or other unforeseen weather conditions develop
- Weather conditions move outside the prescription range
- Smoke is not dispersing as predicted
- Public road or other sensitive area becomes smoked-in
- Burn does not comply with all laws, regulations, and standards
- Large fuels are igniting and burning
- There are not enough personnel to mop-up before dark and the likelihood exists that smoke will settle in a smoke-sensitive area overnight
- Any criteria identified in the specific unit prescribed burn plan require an escape declaration.

Under any of these conditions, Range Control will be notified that contingency actions are being taken. If the contingency actions are successful at bringing the project back within the scope of the Prescribed Fire Plan, the project may continue. If contingency actions are not successful by the end of the next burning period, the prescribed fire will be converted to a wildfire, an Incident Commander will be designated and assistance will be requested from cooperators in accordance with the MOA. The burn can be declared a wildfire by the Burn Boss at any time if their assessment is the declaration is necessary.

6.9 Monitoring

Three types of post fire monitoring should be conducted to determine if fire management activities are reaching the stated objectives: post operational report, post fire effects monitoring, and burn program objective monitoring.

6.9.1 Post operational reports

Are an important written record of the burn, enabling future staff to learn from previous activities. They will be completed during and immediately following a prescribed fire activity to address the effectiveness of the overall burn process – the plan, implementation, personnel, and effectiveness at meeting objectives. The post-operational report will include:

- Burn unit information
- Burn dates
- Forecasted weather conditions
- On-site burn day weather conditions
- Crew assignments
- Burn schedule
- Fire narrative
- Immediate post burn effects
- Comparison of post burn effects with unit fire management objective
- Notes and recommendations.

Within this report, several questions should be answered:

- Were the fuel conditions within plan guidelines and were guidelines appropriate?
- Did the burn stay within planned parameters?
- Were the fire lines installed as planned and were they adequate?

- Was the equipment in the plan available and appropriate, effective?
- Were the crew number, training, and assignments appropriate?
- Did the crew understand what they were doing, desired fire behavior and effects?
- Was the rate of spread and flame length as predicted in the plan?
- Were public interactions satisfactory?
- What ignition techniques were used?
- What was the weather during the burn, were pre burn and post burn forecasts accurate
- What were Smoke impacts on VTS-S and neighbors
- What was the duration of mop up?
- Did post fire checks find unanticipated hot spots or problems?

To answer some of these questions, during the burn, a designated crewmember will be assigned to record fire behavior. This may include flame length, flame height, rates of spread, ongoing fire weather readings. It is highly recommended that a NWCG qualified Fire Effects Monitor (FEMO) be assigned to the fire for data collection. Post fire estimates of fire intensity (scorch height and class, char, understory burn severity, and litter consumption), should be recorded after each burn to determine if burn specific fire management objectives were met. Permanent transects with photo points may be established to monitor and measure tree densities and plant composition. Observations of rare species reaction to fire management will be noted.

6.9.2 Fire effects monitoring

Conducted via a post-burn evaluation of the physical effects of the fire. This monitoring should include data collected during and immediately following the fire, as well as during the first growing season following the fire. Parameters to be evaluated will include tree mortality, mid-story kill, pine bark beetle or other pest infestation, erosion problems, and whether overall burn objectives were met. These evaluations are completed and filed with the burn plan.

6.9.3 Burn program objective monitoring

Will be conducted over a longer time scale in conjunction with the review of INRMP objectives and achievements.

6.10 Prescriptions

The prescriptions below describe the preferred environmental conditions for a burn. Some deviation from these prescriptions in response to specific objectives will be possible on the recommendation of an experienced burn boss, such as the GFC District Forester. The general prescription for prescribed burning in the grassland areas of VTS-S is presented in Table A2.5, the prescription for burning the Eastern Red Cedar is presented in Table A2.6, and the prescription for burning the hardwood forest habitat is presented in Table A2.7.

Table A2. 5 Prescription for controlled burns in grasslands, fields, and forest openings

Stand Description:	Overstory	None to scattered trees
	Understory	Grasses and small brush, young cedar trees
	Fuels	GR1, TU2
	Topography	Gentle rolling hills to flat
Weather Range	Surface wind (dir./speed)	North, West, South at 5 – 8 mph
	Transport wind (dir./speed)	Greater than 5 mph
	Mixing height	Greater than 500 m
	Stagnation index	0 – 3 daytime
	Relative humidity	35 – 55 %
	Temperature	High 70°F Low 30°F
	Start time	9:30 am (or as soon as permit allows)

Table A2. 6 Prescription for controlled burns in upland hardwoods.

Stand Description:	Overstory	Mainly Eastern Red Cedar trees
	Understory	Grasses, young cedar trees, needles
	Fuels	TU4
	Topography	Gentle rolling hills
Weather Range	Surface wind (dir./speed)	North, West, South at 5 – 10 mph
	Transport wind (dir./speed)	Greater than 5 mph
	Mixing height	Greater than 500 m
	Stagnation index	0 – 3 daytime
	Relative humidity	30 – 45 %
	Temperature	High 80°F Low 30°F
	Start time	9:30 am (or as soon as permit allows)

Table A2. 7 Prescription for controlled burns in TA A-2 pine stands.

Stand Description:	Overstory	Closed canopy mature stands
	Understory	Open, small areas of brush
	Fuels	TL2
	Topography	Gentle rolling hills
Weather Range	Surface wind (dir./speed)	North, West, South at 5 – 10 mph
	Transport wind (dir./speed)	Greater than 5 mph
	Mixing height	Greater than 500 m
	Stagnation index	0 – 3 daytime
	Relative humidity	40 – 55 %
	Temperature	High 70°F Low 30°F
	Start time	9:30 am (or as soon as permit allows)

6.11 Schedule

The planned prescribed fire management actions for VTS-S are presented in Tables A2.8. Recommended fire frequency is depicted for all burn units in Figure A2.10. The prescribed fire management measures and their recommended frequency of occurrence are based on the objectives identified in Section 6.1 and correlate to the forest management prescriptions described in the forest management plan (Annex 1 of the INRMP).

Table A2. 8 Burn schedules

	2YR	Acres	3YR	Acres	6YR	Acres	Total Acres
2018	TA4-2 TA6-1	5 15	TA4-5 TA6-6	9 15	TA2-5	71	115
2019	5-6 6-2	1 14	2-2 4-6	42 10	6-3	22	89
2020	4-2 6-1	5 15	2-3 4-3 4-7 6-7	26 8 8 19	5-3	11	92
2021	5-6 6-2	1 14	4-5 6-6	9 15	6-5	21	60
2022	4-2 6-1	5 15	2-2 4-6	42 10	5-2	34	106
2023	5-6 6-2	1 14	2-3 4-3 4-7 6-7	26 8 8 19			66

The open grasslands of the training site will be subject to a 2 year fire rotation. Forest stands that are dominated by eastern red cedar will also be burned on a 2 year rotation, but not until after these stands have been thinned through timber harvest. Stands in the 3-yr rotation group will not be subject to prescribed burning until after stand thinning or timber harvest. The hardwood stands (generally along the shoreline) will be burned every 6 years, and the 50 foot buffer zone along the lake or creek will not be burned at all. Dates are subject to minor changes if timber harvests are not completed on schedule.

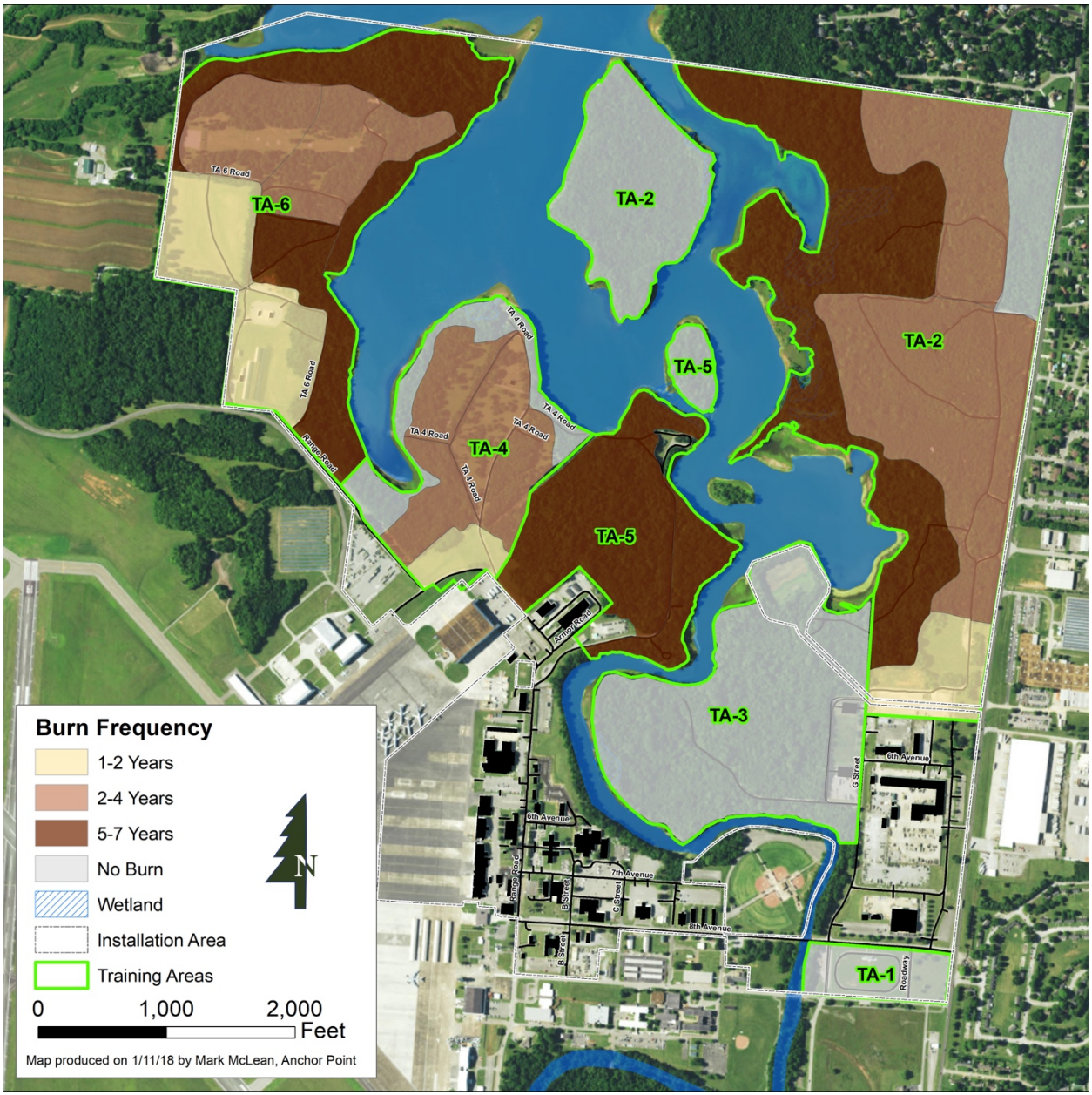


Figure A2. 10 Prescribed burn frequency for burn units

7.0 Attachments

7.1 Reference Materials

Department of Army Memorandum. 4 Sep 2002, Army Wildland Fire Policy Guidance.

Department of Army Memorandum. 2 Sep 2005, Sustainable Range/Installation Environmental Activities Matrix.

Interagency Prescribed Fire Planning and Implementation Procedures Guide, PMS 484, (2017) https://www.nwcg.gov/publications/484.

Kabric et.al. (2017) Proceedings 20th Central Hardwood Forest Conference, Columbia, MO March 28 – April 1, 2016, General Technical Report NRS-P-167

NWCG Prescribed Fire Pan, PMS 484-1, https://www.nwcg.gov/publications/476

NFPA. 1977. Standard on Protective Clothing and Equipment for Wildland Fire Fighting (2005 edition)

NWCG Publications – available at http://www.nwcg.gov/pms/pms.htm

PMS 307, Work Capacity Test Administrator's Guide (March 2003)

PMS 310-1, Wildland Fire Qualification System Guide (January 2006) PMS https://www.nwcg.gov/sites/default/files/publications/pms461.pdf

PMS 410-1, Appendix B, Fire Behavior (April 2006)

PMS 424, Prescribed Fire Complexity Rating System Guide (January 2004)

Incident Response Pocket Guide, PMS 461, https://www.nwcg.gov/sites/default/files/publications/pms461.pdf

Schmidt, K.M., J.P. Menakis, C.C. Hardy, W.J. Hann, and D.L. Bunnell. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. USDA Forest Service, Rocky Mountain Research Station.

Scott, J. and Burgan, R. (2005). Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. USDA Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-153, 72 pp.

Thompson Engineering, Forest Management Group, and Aerostar Environmental Services. 2006. Volunteer Training Site – Smyrna Forest Management Plan. Prepared for the TNARNG.

Weather Information:
Spot Weather Forecast, http://spot.nws.noaa.gov/cgi-bin/spot/spotmon?site=ffc
General Forecast, http://www.srh.noaa.gov/ffc/html/firewx.shtml
West Tennessee Fire Weather, http://www.weather.gov/meg/fireweather

7.2 Prescribed Burn Plan Template

TNARNG PRESCRIBED FIRE PLAN

Facility:_____

Training Area:_____ Burn Unit Number/Name:_____

Fuel Type:_____ Acres:_____

Burn Permit #: _____

Fire Planner(s):

Name:_____

Title:_____

Signature: _____ Date:_____

Name:_____

Title:_____

Signature: _____ Date:_____

Burn Boss:

Name:_____

Title:_____

Signature: _____ Date:_____

Complexity Rating:_____(Low, Moderate, High)

Approved By:

Signature: _____ Date:_____

A. Pre-Burn Go/No Go Checklist

	YES	NO
Has the area (inside and outside the unit) experience unusual drought conditions or does it contain above-normal fuel loadings which were not considered in the prescription development? If YES, go to question below. If NO, continue with Section B.		
If YES, have appropriate changes been made to plans for ignition, holding, mop-up, and patrol? If YES, continue with Section B. If NO, **stop** and consult Fire Manager.		

B. Prior to Crew Briefing:

- ☐ Fire Unit is as described in plan
- ☐ Copy of burn plan is on site
- ☐ Certified Burn Boss present; Permit obtained (#_____)
- ☐ Required number personnel present, with required PPE
- ☐ Weather forecast obtained & within prescription; Long-range forecast checked for chance of severe weather
- ☐ Official & neighbor notifications complete
- ☐ Required equipment for holding, weather monitoring, ignition, & suppression is on-site & functioning
- ☐ Crew has reviewed equipment
- ☐ Planned ignition & containment methods are appropriate for current & predicted conditions
- ☐ Planned contingencies & mop-ups are appropriate for current & predicted conditions
- ☐ List of emergency phone numbers are in each vehicle
- ☐ Off-site contingency resources are operational and available

C. Crew Briefing:

- ☐ Prescribed Fire Objectives
- ☐ Burn Unit size & boundaries
- ☐ Burn unit hazards & safety issues
- ☐ Expected weather & fire behavior
- ☐ Organization of crew & assignments
- ☐ Methods of ignition, holding, mop-up, communications
- ☐ Contact with the public; Traffic concerns
- ☐ Safety & medical plan
- ☐ Location of back-up equipment, supplies, & water
- ☐ Contingencies for escaped prescribed fire
- ☐ Contingencies for medical emergency

D. Prior to Ignition:

- ☐ On-site weather and fuel conditions are within prescription & consistent with forecast
- ☐ Test burn conducted; fire & smoke behavior within prescribed parameters.

Burn Boss:_____ **Date:**_____

1. Burn Objectives

_____

_____

2. Location and Physical Description (Attach map)

A. Site_____ **Training Area**_____

B. Size_____

C. Topography / Slope_____

D. Project Boundary_____

E. Complexity_____

3. Vegetation / Fuels Description

A. On-site Fuels

Vegetation Types	Fuel Models	% of Unit Area	% Slope	Aspect

B. Adjacent Fuels

Vegetation Types	Fuel Models	% of Unit Area	% Slope	Aspect

4. Description of Unique Features

A. Natural:_____

B. Cultural:_____

5. Special considerations (fences, power poles, …)**:**

_____

_____

_____

_____

6. Prescription

A. Environmental Prescription:_____

_____

B. Fire Behavior Prescription:_____

_____

7. Fuel and Weather Prescription (acceptable ranges)

Fuel Parameters	**Prescription MIN/MAX**	**Forecast* MIN/MAX**	**Test Fire**	**Rx Burn**
1-Hour Fuel Moisture (%)				
10-Hour Fuel Moisture (%)				
100-Hour Fuel Moisture (%)				
Live Fuel Moisture (%)				
Other (e.g., KBDI, live/dead ratio…)				
Weather Parameters				
Air Temperature (ºF)				
Relative Humidity (%)				
Days Since Rain				
20 ft. Wind Speed (mph)				
Wind Direction(s)				
Midflame Windspeed (mph)				
Atmospheric Mixing Height (ft.)				
Atmospheric Stability				
Rate of Spread				
Flame Length (ft.)				
Scorch Height (ft.)				
Probability of Ignition				

*Attach weather forecast.

8. Scheduling

A. Ignition Timeframe / Season(s):_____

B. Projected Duration:_____

C. Constraints:_____

9. Pre-burn Considerations and Weather

A. On-site Considerations:_____

B. Off-site Considerations:

C. Method & Frequency for Obtaining Weather and Smoke Management Information:

D. Notifications (List all agencies and neighbors):

Name	Date	Method	Contact Information
Public		Press Release	
Public		Road Signs	
TN Division of Forestry		Phone	931-685-5030
Smyrna Airport		Phone	615-459-2651
Smyrna Airport Fire Department		Phone	615-943-8398
Smyrna Fire and Police Department		Phone	615-459-6644
Rutherford County Sheriff's Department		Phone	615-898-7771
Tennessee Highway Patrol District 3		Phone	615-741-3181
USACE JPP Office		Phone	615-889-1975
Smyrna Municipal Golf Course		Phone	615-459-2666
J. Percy Priest Lake Resource Manager		Phone	615-889-1975

10. Ignition Plan

A. Firing Methods (including Techniques, Sequences, and Patterns)**:**

B. Devices:

C. Ignition Staffing:

11. Holding Plan

A. General Procedures:

B. Critical Holding Points:

C. Minimum Organization or Capabilities Needed:

12. Contingency Plan

A. Trigger Points:_____

_____

B. Actions Needed:_____

_____

C. Additional Resources and Maximum Response Time:_____

_____

D. Secondary Control Lines:_____

_____

E. Backup Water Supply:_____

13. Crew Organization

- **Burn Boss:**
- **Ignition Boss:**
  - **Ignition:**
  - **Ignition:**
- **Holding Boss:**
  - **Holding:**
  - **Holding:**
  - **Holding:**
- **Monitor:**

14. Equipment

Equipment Item	Quantity	Source

15. Fire Details

Ignition Time_____ **Fire Declared Out**_____

Narrative_____

_____

_____

7.3 Post Burn Evaluation

1. **Site**_____ **Training Area**_____
   Burn Date_____
   Evaluation Date_____(immediately following burn)
   Re-evaluation Date_____(follow-up as needed)

2. **Amount litter left** (immediately after burn)_____**(inches)**

3. **Understory vegetation consumed**_____**(%)**

4. **Scorch: % of Area with Crown Scorch**
   <1/3_____ **1/3 – 2/3**_____ **2/3+**_____

5. **Any spotting / slopovers?** (immediately after burn)

_____

_____

_____

6. **Tree Damage (insects, disease, mortality)?**_____

_____

7. **Understory kill of undesired vegetation (% top-killed)**_____

8. **Any smoke management violations?** (immediately after burn)

_____

_____

_____

9. **Any escapes?** (immediately after burn)

_____

_____

_____

10. Any complaints? (immediately after burn)

_____

_____

_____

11. Adverse effects?

_____

_____

_____

12. Any restoration needed?

_____

_____

_____

13. Were objectives met (results)?

_____

_____

_____

_____

Immediate Evaluation By:_____ **Date:**_____

Recommendations for future evaluation:

_____

_____

_____

_____

Follow-up Evaluation By:_____ **Date:**_____

7.4 After-Action Review

What did we set out to do?

What actually happened?

Why did it happen?

What are we going to do next time?

Which activities should be sustained?

What can be improved?

ANNEX 3

INVASIVE PEST PLANT CONTROL
VTS-SMYRNA

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

As in most other regions of the world today, VTS-Smyrna suffers from infestations of invasive exotic pest plants. These pest species are causing significant changes to the natural vegetation communities and wildlife found on the site which, in turn, impacts the suitability and sustainability of the facility for military mission training. They are pervasively found in open areas along roadsides, streambanks, and other clearings as well as in the densely shaded understories of forested training areas.

Invasive exotic pest plants are species that evolved in other regions of the world but have become established in a new area where the lack of natural predators, diseases, and other controls allows them to thrive The primary problem species at VTS-S include privet (*Ligustrum vulgare* and *L. sinense*), Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus umbellata*), silver thorn olive (*E.* pungens), sericea lespedeza (*Lespedeza cuneata*), mimosa (*Albizia julibrissin*), Japanese Grass (*Microstegium vimineum*), Johnson grass (*Sorghum halepense*), and tree of heaven (*Ailanthus altissima*). Sparse infestations of Fuller's teasel (*Dipsacus fullonum*), wooly mullein (*Verbascum thapsus*), winter creeper (*Euonymus fortunei*), and white poplar (*Populus alba*) exist on VTS-S but can be eradicated with prompt application of mechanical and/or chemical controls.

This annex provides more detailed information on each of these problem species, including recommended methods of control. It also outlines the plan of attack for controlling these species on the training site, to be

implemented as funding allows. It is important to note that complete eradication of widespread invasive plant species is nearly impossible and is cost-prohibitive. Small, confined occurrences may be completely eliminated by prompt, decisive action; however, with well-established populations (e.g., the privet and Japanese grass on VTS-S) the only feasible goal is to contain and thin the infestation and hopefully prevent it from spreading further. Both eradication and control will take multiple years of repeated treatment to achieve.

The control plan on VTS-S will be a two-tiered approach: first, small occurrences (white poplar, tree-of-heaven, mimosa, winter creeper, wooly mullein, Canada thistle, Fuller's teasel) will be identified and treated on a training area-by-training area basis, and second, the larger infestations (privet, honeysuckle, Nepal grass, etc.) will be treated on a species basis in manageable sections. The spatial occurrence of the invasive species is described in more detail below. Control methods will typically use a combination of mechanical (cutting, pulling, mowing) and chemical (herbicide) means.

1.2 Objectives

The objective of this plan is to provide effective control of invasive exotic pest plants on the VTS-S, limiting the areas infected by exotics and allowing the native vegetation communities to reestablish themselves.

Factors guiding the eradication program:

- Eradication and suppression efforts will be coordinated and scheduled to avoid interference with training events
- There should be no detrimental environmental impact resulting from this control effort
- Limited vegetation removal may occur but will not be done in a manner destructive to the stability of the lake, stream bank, or the ecosystem present. Only herbicides labeled for application to water will be applied within 100 feet of any recognized waterway.
- Small or new infestations should be treated with the intent of complete eradication.

1.3 Species Targeted for Suppression

Invasive plant species are successful invaders because they generally grow rapidly, create large amounts of seed, and are thus positioned ecologically to exploit the greater amount of light found on the edges of man-made and natural openings as well as all disturbed areas. In this case the invasive species are adept at exploiting available light and space in the edges of roads and other breaks and openings in the forest canopy. The roads and openings of the forested and woodland portion of the VTS-S have provided many places for invasive plant species to seed into and dominate.

The Tennessee Exotic Pest Plant Council (TN-EPPC) has also developed a list of invasive plants and ranked them according to the threat that they pose. TN-EPPC recommends that Rank 1 and Rank 2 species be controlled and managed in the early stages of detection when possible. The classification of each invasive plant species observed at VTS-S is noted in the list below. Abundance of the invasive species in the aggregation was coded Dominant, greater than 50%, Present, 10 to 50 %, and Sparse, less than 10%.

Table A3.1 is a summary of the invasive species observed at the VTS-S site during the 2005 invasive species survey. It is organized alphabetically by species observed.

Table A3.1: Invasive exotic plant species observed on VTS-Smyrna (from Dynamic Solutions 2005).

Scientific Name	Common Name	TEPPC Ranking	Abundance at VTS-S
Ailanthus altissima	tree-of-heaven	Rank 1: Severe Threat	Present in TA-6, TA-2, TA-5, and TA-4 along roads, perimeter boundaries, and increasingly in the understory.
Albizia julibrissin	mimosa	Rank 1: Severe Threat	Present in TA-1, TA-2, TA-4, and TA-6 generally in edges of roads and openings.
Cirsium arvense	Canada thistle	Rank 2: Significant Threat	Sparsely throughout VTS-S.
Dipsacus fullonum	Fuller's teasel	Rank 2: Significant Threat	Sparsely in isolated location in TA-4.
Elaeagnus pungens	silver thorn olive	Rank 1: Severe Threat	Present in edges of TA-2 and pervasively present in TA-4, TA-5, & TA-6.
Elaeagnus umbellata	autumn olive	Rank 1: Severe Threat	Present in edges of TA-2 and pervasively present in TA-4, TA-5, & TA-6.
Euonymus fortunei	winter creeper	Rank 1: Severe Threat	Present in ornamental plantings and along Stewart Creek in the cantonment and sparsely in the under story of TA-5.
Lespedeza cuneata	sericea lespedeza	Rank 1: Severe Threat	Dominant in open grassy and open wooded areas and along roads.
Ligustrum sinense &/or Ligustrum vulgare	privet	Rank 1: Severe Threat	Pervasively present in edges and understory of TA-2, TA-4, TA-5, and TA-6.
Lonicera japonica	Japanese honeysuckle	Rank 1: Severe Threat	Present in edges and understory of TA-2, TA-4, TA-5, and TA-6.
Microstegium vimineum	Japanese grass; microstegium	Rank 1: Severe Threat	Dominant as shaded understory of all training areas.
Populus alba	white poplar	Rank 2: Significant Threat	Sparsely in one isolated population in TA-2.
Rosa multiflora	multiflora rose	Rank 1: Severe Threat	Present in all training areas.
Sorghum halepense	Johnson Grass	Rank 1: Severe Threat	Pervasively present in open sunny areas of all training areas and lawns of cantonment.
Verbascum thapsus	wooly mullein	Rank 2: Significant Threat	Sparsely in isolated population in TA-6.

2.0 CONTROL PLAN

2.1 Small Infestations

The several small infestations of white poplar, winter creeper, Fuller's teasel, wooly mullein, tree-of- heaven, and mimosa will be treated first, with the goal of complete eradication of these species on VTS-S.

White poplar occurs at VTS-S in a population at the south end of Training Area 2 (TA2). Large trees will be treated with Garlon 3A via either the cut stump method or by basal bark application. Both methods are effective throughout the year, as long as the ground is not frozen. Small trees and sprouts will be treated in the summer with a foliar application of glyphosate. Individual, isolated saplings may be effectively removed by hand pulling, as long as the entire root is extracted.

Winter creeper occurs in a few locations in the cantonment, around ornamental landscape trees and within the vegetative buffer along Stewart Creek and J. Percy Priest Lake. Effective control of this species should be achieved by initial hand cutting in August followed by foliar application of Garlon 4 in the winter. This will be repeated annually for several years. Cutting the vine to the ground prior to spraying will minimize fruit and seed development.

Fuller's teasel has been found in one isolated location just west of the entrance gate to Training Area 4. Hand or spade pulling is the most practical removal method for such a small population as this. Mowing the plants to the ground in early summer prior to flowering may also be an effective means of control.

Wooly mullein is found along road edges and Cannon Cemetery in Training Area 6. It will be treated by hand pulling in early spring (March – May). Plants will be bagged for disposal and, as mullein seed germination requires bare ground, the areas in which it is occurring will be sown with an appropriate native grass and forb seed mixture. These areas will be scouted and treated annually for several years until the seed bank is exhausted.

Tree-of-heaven and mimosa will be treated at the same time. A crew will travel the road system of the training site during the late summer or mid-winter and treat all individuals of these species that they encounter, and as documented in the 2005 survey. Tree-of-heaven has previously been found in TAs 2, 4, 5, and 6, while mimosa has been documented in TAs 1, 2, 4, and 6. Both species are generally found along roads and streambanks, in open areas, and along cleared property boundary lines. Large trees will be stem-injected or felled and the stump treated with Garlon 3A. Saplings will be basal-bark treated with Garlon 4. The following summer, a crew will return to treat all sprouts and seedling with a foliar spray of Garlon 4.

2.2 Extensive Infestations

A number of invasive species have become thoroughly established on the VTS-S and are unlikely to ever be completely removed. The goal of this program is to bring those infestations under control, reducing the numbers of exotic plants, rehabilitating native communities that have been affected, and limiting further spread of the invasives. The principle species falling under this category are privet, silver thorn and autumn olive, Japanese grass, Japanese honeysuckle, multiflora rose, and an open-areas combination of sericea lespedeza and Johnson grass.

For each of these species, the control effort will be intensive and require several years of effort. It would be most efficient to have a firm commitment of manpower and funding for at least 3 years' work prior to initiating any control efforts. A single year of effort without follow-up will have little long-term impact on the invasive species and will represent wasted effort and money.

In addition to the control efforts, it will be necessary to be prepared with a plan for reestablishing native vegetation once the invasives have been cleared. Native species restoration plans will be developed individually for areas requiring such. Restoration efforts will utilize all native species and will involve a minimum of soil disturbance.

2.2.1 Silver thorn and autumn olive

Both silver thorn and autumn olive are found pervasively throughout the training site, absent only from the cantonment and TA1. The two species are commonly found together at the facility, at times dominating open woodlands. Populations are found with greater size and density as one moves east to west across the site; that is, olives are much more prevalent in TA6 than in TA4, and in TA4 than in TAs 5 or 2. Control, therefore, will begin in TA2 and proceed westward with efforts directed at roadsides, open areas, and forest boundaries. For infestations with large quantities of low-growing leaves, a foliar spray of Arsenal AC will be applied. If stems

are too tall for this method to be effective either basal bark application of Garlon 4 or cut stump treatments of Arsenal AC would be more appropriate. This effort should be conducted in mid winter. The following summer, a return visit will be made to treated areas to foliar spray sprouts with Arsenal AC. See Table A3.2 for the herbicide concentrations to be used for each method.

2.2.2 Privet

Privet occurs pervasively in every training area on VTS-S and in the cantonment. It is found within a wide range of environmental conditions: from sunny, shallow-soiled streambanks to densely shaded cedar woodlands to open fields and roadsides. While open areas tend to yield larger, fuller privet plants, extremely dense populations of smaller plants are also present in the forest understory of all training areas. As roadsides and streambanks are generally easier to access, efforts to control privet will begin in these areas. Control will begin along the banks of Stewart Creek and J. Percy Priest Lake and then along all major roads within the training sites. Additional control efforts will focus on forest openings in the training areas. Individual plants less than 5" dbh will be treated with a basal bark spray of Garlon 4. Larger stems will be cut and immediately stump treated with Arsenal AC. This process will be repeated in manageable chunks starting with the Stewart Creek shoreline in the cantonment, working around the edges of the lake, and then moving inland to treat roadways and clearings within the training areas. This effort should be conducted in mid winter. The following late summer, a return visit will be made to treated areas to foliar spray sprouts with Arsenal AC. See Table A3.2 for the herbicide concentrations to be used for each method.

The same program will need to be repeated each winter for several years.

If there are areas of infestation in which little to no desirable vegetation remains, and that are at least 50 feet from any shoreline, the gyrotrack or similar equipment may be used to mow down the privet while leaving any other trees and shrubs standing, as possible. This should be conducted in summer when the ground is dry but before seed set. This will be followed up in the fall with broadcast foliar application of Arsenal AC to the sprouts.

2.2.3 Japanese grass

Japanese grass occurs in low-lying, shaded areas throughout VTS-S. It dominates the understory in all bottomland forests and along partly to densely shaded roadsides. It does not appear to be as pervasive in areas regularly inundated by the lake. Management will be concentrated along roadsides and shorelines where sunlight is greater and competition from other plants suppresses population densities.

Treatment will consist of foliar application of herbicide; the type used will depend on the surrounding vegetation. Glyphosate will be used where there is little desirable vegetation mixed with the Japanese grass. Sethoxydim, a grass selective herbicide, will be applied in locations where native herbaceous vegetation is still present. Treatment will be made in early June, with a second application in late July of the same year to ensure complete kill. Care will be taken to avoid drift onto the waterways (e.g., using a coarse spray, not conducting control activities near water on windy days). Sites will be inspected the following June for new germination. Complete removal will require several years to exhaust the seedbank.

Areas that are accessible and also sufficiently dry may be treated without chemicals by mowing in August. This method requires careful timing to remove the flowers before seed set but late enough to negate the possibility of new flower development. This method will also require several years of repeat treatments to exhaust the seedbank.

Areas that were heavily infested with Japanese grass will need to be reseeded or planted with native species to minimize the available space for re-invasion.

2.2.4 Japanese honeysuckle

Japanese honeysuckle is also present throughout the training site. It is found in all light regimes; however, populations are typically denser along forest edges, where more light is available. The first stage of control will be to treat infestations along roads and streambanks. Foliar spray with Garlon 3A will be conducted in the late fall. Care will be taken to avoid drift onto the waterways (e.g., using a coarse spray, not conducting control activities near water on windy days). Areas will be checked the following summer to determine the need for retreatment with the same prescription.

2.2.5 Open areas complex

Most open fields and roadsides around the training site are infested with some combination of sericea lespedeza, Johnson grass, and Canada thistle. Control of these species will be undertaken in combination with an effort to restore native grasses where feasible on the training site. Small arms ranges and lawns are typically not appropriate locations for native warm season grasses, due to their tall growth form. Such areas will be maintained with the existing mixtures of fescue, bermudagrass, crabgrass, and similar species. Canada thistle will be spot treated with glyphosate or Garlon when found in these areas.

Less manicured open areas (e.g., the open fields surrounding the small arms range and the M203 range, both in TA6) may be treated for invasive pest plants in preparation for reseeding native warm season grasses. A mixture of glyphosate and imazapic applied in the spring, followed by prescribed burning should control the fescue sufficiently so that native warm season grasses may be seeded and successfully established in these fields.

2.3 Environmental Precautions

VTS-S is bisected by the connected waters of Stewart Creek and J. Percy Priest Lake, the latter of which serves as a municipal drinking water source for numerous communities in the area. Protecting stream habitat from both chemical pollutants and sedimentation is of utmost importance.

- There will be no herbicide applications to water unless the chemical is labeled for aquatic use
- Within 25 feet of water, only stem treatments will be used to minimize risk of drift
- Foliar treatments will be avoided in any situation where the spray would be carried toward water
- At all times, care will be taken to minimize pesticide drift to desirable vegetation
- Where possible, dead vegetation will be left standing on the creek banks
- There will be no stump removal on creek banks
- Where creek bank vegetation is composed of more than 50% invasive species, revegetation and bank stabilization will be conducted immediately following IPP control

All label requirements will be followed, as will state and DoD pesticide regulations. Only state or DoD certified applicators will apply herbicides for IPP control. Non-certified personnel may help with non-chemical aspects of control, but will be briefed on pesticide safety prior to initiating work.

Due to the presence of Air Force Base-era landfills on Training Area 3, this parcel is designated as a restricted use area and is off limits to training and all other TNARNG activities. For this reason, Training Area 3 was omitted from the Invasive Plant Species Survey conducted in 2005, from which much of the baseline data for this plan was derived, as well as from the most recent Vegetation Community Survey (AMEC 2007). Therefore, little data is available regarding the extent of invasive pest plants in this training area. While pest plant issues on TA3 are most likely the same or very similar to those in all other regions of the VTS-S, control efforts will not be initiated until the status of this area has been revised by the U.S. Army Corps of Engineers.

2.4 Personal Protective Equipment (PPE)

Personnel who handle and/or apply pesticides are required to wear personal protective equipment and clothing designated on the herbicide label IAW the Federal Insecticide, Fungicide, and Rodenticide Act (40 CFR 162), Occupational Safety and Health Standards (29 CFR 1910), and DOD Directive 4150.7. Such protective devices include masks, respirators, gloves, goggles, and protective clothing necessary for the pest management operations being conducted and the pesticides used.

2.5 Treatment Methods

Cut stump

The cut stump method is a method used for trees and woody shrubs greater than 5" dbh. The tree is cut down, leaving a stump 2 to 6 inches high (excessive stump height can limit the effectiveness of this method). The appropriate herbicide solution is applied to the outer 20% of the freshly cut stump within a few minutes, if possible. (After 2 hours, a basal bark treatment with penetrant will have to be applied.) Apply the appropriate herbicide solution to the outer 20% of the stump's cut surface. All stems coming from the base or roots of the plant should be cut and treated at the same time.

The cut stump method is most effective when the plant is actively growing but not during the first flush of spring growth. Therefore, cut stump treatments may be initiated in late April to early May and continue through the summer. Cut stump can also be applied during the dormant season.

Stem injection

Stem injection is another method for use on large trees and shrubs. Incision cuts are made downward into the stem, and herbicide is applied into the cut. With hard to control species, the cuts should completely frill the stem. There is less physical effort required for this method as opposed to completely cutting down the tree, but it leaves a dead snag standing, which may be beneficial or not depending on the situation.

Like cut stump, stem injection is most effective in late winter or throughout the summer. It should not be utilized during the heavy spring sap flow.

Basal bark spray

The basal bark method is a recommended method for controlling young trees with smooth bark (generally individuals under 5" dbh). A 6 to 12 inch band of herbicide is applied around the circumference of the tree trunk approximately one foot above ground level. The width of the sprayed band depends on the size of the tree and the species' susceptibility to the herbicide. Ester formulations are most effective due to their ability to readily pass through tree bark. Esters are volatile and care must be taken to follow the label – avoid ester formulations on hot days because vapor drift can injure nontarget plants. A chemical penetrant should be included in the herbicide mixture.

Basal bark applications are usually made in late winter and early spring, when leaves do not interfere with trunk access. This method is effective during the summer, but much more difficult.

Foliar spray

The foliar spray method can be used for all target species not in close proximity to environmentally sensitive areas. This method is most effective in areas where there is a low density of desirable vegetation. Care must be taken to use appropriate spray equipment with sufficient droplet size to minimize drift to nontarget plants. Handheld sprayers can only treat plants up to about 6' in height. Leaves should be wet thoroughly but not to the

point that herbicide runs off and impacts non-target species. Air temperature should be above 65 F to ensure absorption of herbicides.

Foliar sprays should not be used on windy days. Care must be taken to minimize threat to surrounding nontarget vegetation and other sensitive sites (riparian areas).

The foliar spray method only works when the plant has full or near full leaf cover and is most effective from mid-summer to late fall, depending on the target species' life cycle. Evergreen or semi-evergreen species like privet and honeysuckle can be treated in the late fall to winter, as well, as long as they retain a significant portion of their leaf cover.

2.6 Herbicides

Table A3.2 reflects the recommended herbicide and standard concentration to use per plant species and the primary method of control. These recommendations must be corroborated with the concentrations approved on each product label. **The label is the law.**

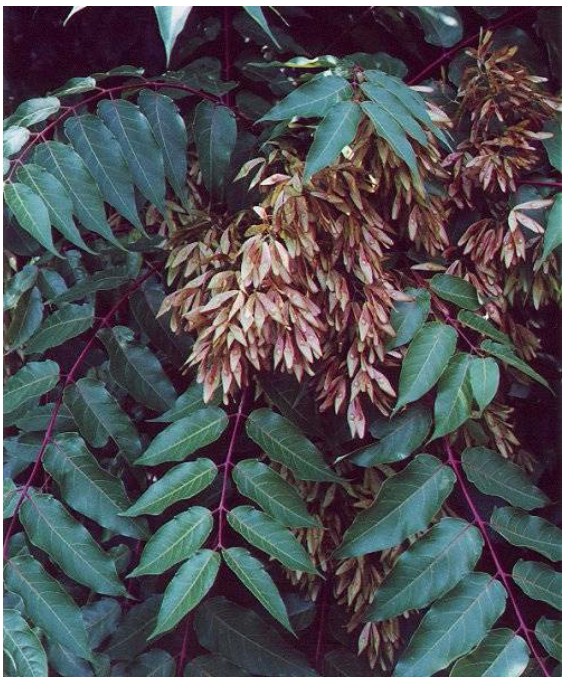
Table A3.2: Herbicide concentrations for use on VTS-S invasive pest plants.

Species	Season	Method	Chemical	Concentration	Additive
Canada thistle	July	Foliar/Mowing	Glyphosate	2%	Surfactant
Japanese honeysuckle	Late fall	Foliar	Garlon 3A	5%	Surfactant
Japanese grass	June & July	Foliar	Glyphosate	2%	Surfactant
	June & July	Foliar	Sethoxydim	Label	
Mimosa	Fall/winter	Cut stump	Garlon 3A	Label	
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Garlon 4	2%	Surfactant
Multiflora rose	Summer	Sprout-Foliar	Garlon 3A	Label	
	Summer/Fall	Basal bark	Garlon 4	20%	Basal oil + penetrant
Olives	Summer	Foliar	Arsenal AC	1%	Surfactant
	Mid winter/summer	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Fall/winter	Cut stump	Glyphosate	20%	Surfactant
Princess tree	Fall/winter	Cut stump	Glyphosate	Label	
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Garlon 4	2%	Surfactant
Privet	Fall/winter	Cut stump	Arsenal AC	10%	Surfactant
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Arsenal AC	1%	Surfactant
Tree-of-heaven	Fall/winter	Cut stump	Garlon 3A	Label	
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Garlon 4	2%	Surfactant
White poplar	Summer	Foliar	Glyphosate	2%	Surfactant
	Fall/winter	Cut stump	Garlon 3A	Label	
	Fall/winter	Basal bark	Garlon 4	Label	
Winter creeper	August	Hand cut	N/A	N/A	N/A
	Winter	Foliar	Garlon 4	2%	Surfactant

3.0 DETAILED PLANT SPECIES LIST AND PRESCRIPTION

Ailanthus altissima (tree of heaven)

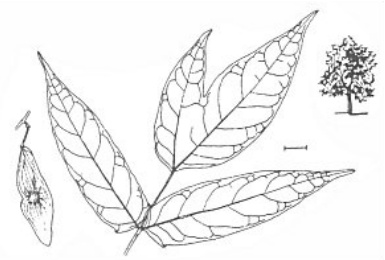
- Description: Tree of heaven is a rapidly growing small tree but can reach up to 80 feet in height and 6 feet in diameter. It has pinnately compound leaves that are 1-4 feet in length with 10-41 leaflets. Tree of heaven resembles the sumacs and hickories, but is easily recognized by the glandular, notched base on each leaflet. It is extremely tolerant of poor soil conditions and has been known to grow even in cement cracks. It cannot grow in heavily shaded conditions but thrives in disturbed forests or edges. Dense clonal thickets displace native species and can rapidly take over fields and meadows.



- Extent of the Infestation: Population rapidly increasing at VTS-S. Occurs frequently along roadsides and forest edges in TA-6, with small populations observed in TA-2 along the edge near the eastern boundary fence and scattered populations in TAs 4 and 5.

- Specific Control Prescription: Small trees may be effectively controlled by hand pulling. Pulling may be done any season. Moist soil facilitates pulling.

  During growing season, re-inspect pulled sites in 30 days for regrowth from unpulled roots. Larger trees should be cut at the stump during the growing season. Treat the cut stump immediately with Garlon 3A applying a 2% solution of herbicide and water to the cut stump, making sure to cover the outer 20% of the stump. As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.



Present in Training Areas	
2	4
5	

***Albizia julibrissin* (mimosa)**

- Description: Mimosa is a small tree that is 10 to 50 feet in height, often having multiple trunks. It has delicate looking bi-pinnately compound leaves that resemble ferns. Mimosa has very showy, pink flowers that are fragrant, giving way to small, flat bean-pod like fruits. Mimosa invades any type of disturbed habitat. It is commonly found in old fields, stream banks, and roadsides. Once established, mimosa is difficult to control due to the long-lived seeds and its ability to re-sprout vigorously.

- Extent of the Infestation: Mimosa occurs sparsely along riparian zone of Stewart Creek and along edges and roads in TAs 1, 2, 4, and 6.

- Specific Control Prescription: Small trees may be effectively controlled by hand pulling any time of year. Areas where pulling has been done should be re-inspected during the growing season after 30 days to look for sprouts.

  Larger trees should be cut at the stump. Treat the cut stump immediately with Garlon 3A applying a 25% solution of herbicide and water to the cut stump making sure to cover the outer 20% of the stump.

  As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

Present in Training Areas	
1	**2**
4	**6**

***Cirsium arvense* (Canada thistle)**

- Description: Canada thistle is a tall, erect, spiny herbaceous plant that grows to 4 feet tall. It has an extensive creeping rootstock. The leaves are lance-shaped, irregularly lobed with very prickly margins. The stems are ridged and hairy. The flowers are purple to white and can be up to .5 inch in diameter. The small seeds, called achenes, are 1 to 1.5 inches long and have a feathery structure attached to the base, which lets them float through the air. Canada thistle can invade a variety of open habitats including prairies, savannas, fields, pastures, wet meadows, and open forests. It forms dense stands, which can shade out and displace native vegetation. Once established it spreads rapidly and is difficult to remove.

- Extent of the Infestation: Canada thistle occurs sparsely throughout entire training site. It blooms in late August to early-September and is easier to locate during that time.

- Specific Control Prescription: Canada thistle control can be achieved through hand cutting, mowing, and controlled burning, and chemical means, depending on the level of infestation and the type of area being managed. Due to its perennial nature, entire plants must be killed in order to prevent regrowth from rootstock. Hand cutting of individual plants or mowing of larger infestations should be conducted prior to seed set and must be repeated until the starch reserves in the roots are exhausted. Because early season burning of Canada thistle can stimulate its growth and flowering, controlled burns should be carried out late in the growing season for best effect.

  In natural areas where Canada thistle is interspersed with desirable native plants, targeted application of glyphosate may be effective. For extensive infestations in disturbed areas with little desirable vegetation, broad application of this type herbicide may be the most effective method. Repeated applications are usually necessary due to the long life of seeds stored in the soil.

Present in Training Areas	
1	2
3	4
5	6
Cantonment	

***Dipsacus fullonum* (Fuller's Teasel)**

- Description: Fuller's Teasel grows as a basal rosette of leaves for a minimum of one year, then sends up a flowering stalk and dies after flowering. During the rosette stage, leaves are oval or oblong. Leaves may be "hairy" in older rosettes. Common teasel blooms from June through October. Flowering plants have large, oblong, opposite, sessile leaves that form cups (the cups may hold water) and are prickly. Stems also are prickly. Teasel's unique flower head makes the plant easy to identify when blooming. Flowers are small and packed into dense, oval-shaped heads at the tip of the flowering stems and usually have purple flowers. Flowering stems may reach six to seven feet in height. A single teasel plant can produce more than 2,000 seeds. Teasel grows in open sunny habitats. It sometimes occurs in high quality prairies, savannas, seeps and sedge meadows, though roadsides, dumps and heavily disturbed areas are its most common habitats.

- Extent of the Infestation: One isolated population of teasel occurs to the west of the entrance gate to TA-4.

- Specific Control Prescription: For small populations such as this one, mechanical methods work quite well. Young rosettes can be dug up using a dandelion digger. Just as in digging up dandelions, as much of the teasel root needs to be dug up as possible. Once the rosettes get large, it is difficult to dig the roots up without damaging the area around the plant. Very small seedlings can be pulled up by hand when the soil is moist.

  Flowering plants can be cut before seed set slightly below ground level. Bag and dispose of burn all seed heads. Cutting off the flowering stalks just at flowering time will usually prevent resprouting from the root crown. Cutting flowering stalks prior to flowering should be avoided since the plants will resprout and flower again. A later inspection should be performed to catch any root crowns that do resprout. It may take three to five years of control efforts to exhaust the seed stock.

Present in Training Area
4

***Elaeagnus pungens and Elaeagnus umbellata (*silver thorn olive and autumn olive)**

- Description: Silver thorn olive is a dense evergreen shrub that has invaded natural areas throughout the southeastern United States. The shrub is often multi-stemmed. Short, sharp shoots give it a thorny appearance. The alternate leaves are oval to elliptical in shape with irregular wavy margins and silvery surfaces. The axillary clusters of small, white to brown flowers give way to small, red fruit that are dotted with small brown scales. Closely resembles autumn olive. A high shade tolerance allows thorny olive to invade both in open areas as well as under forest canopies. The seeds are dispersed by animals, giving this plant the potential for rapid spread.

- Autumn olive is a deciduous shrub from 3 to 20 feet in height. It is easily recognized by the silvery, dotted underside of the leaves. Axillary clusters of small, yellowish flowers and red, juicy fruits are abundant. Autumn olive invades old fields, woodland edges, and other disturbed areas. Autumn olive can form a dense shrub layer that displaces native species and closes open areas. This species has been widely planted for wildlife habitat, mine reclamation, and shelterbelts since its introduction to America in 1830.

- Extent of the Infestation: Both olive species are present in edge areas in TA-2 and are pervasive in TAs 4, 5, and 6.

- Specific Control Prescription: Small plants may be may be effectively controlled by hand pulling any season. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may re-sprout. These species are likely to require mechanical assistance in pulling with tools once they are larger than approximately .25 inches at the root collar.

Larger or un-pullable plants require cutting at ground level with saws. Cutting is most effective when trees have begun to flower to prevent seed production. Cutting is an initial control measure, and success will require either an herbicidal control or repeated cutting of re-sprouting. Cutting during winter and follow-up spraying of resulting tender sprouts in spring and mid-summer is likely to provide effective control.

Treat the cut stump immediately with glyphosate applying a 20% solution of herbicide and water to the cut stump making sure to cover the outer 20% of the stump. As a follow-up when and if stump sprouting occurs, apply Arsenal AC in a 1% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Dispose of all plant parts in bags or by burning.

Present in Training Areas	
2	4
5	6

***Euonymus fortunei* (winter creeper)**

- Description: Winter creeper, also known as climbing euonymus, is an evergreen, clinging vine. It can form a dense groundcover or shrub to 3 feet in height, or climb 40-70 foot high vertical surfaces with the aid of aerial roots. Dark green, shiny, egg-shaped leaves, from 1 - 2 1/2 inches long, with toothed margins and silvery veins, occur in pairs along the stems. Stems are narrow, minutely warty, and have abundant rootlets or trailing roots. Clusters of inconspicuous green-white flowers are produced on a long stalk from June to July and are followed in the autumn by pinkish to red capsules that split open to expose seeds adorned with a fleshy orange seed coat, or aril.

- Extent of the Infestation: There are populations of this species in the cantonment: two concentrated occurrences serving as ground cover at the bases of landscape trees in the cantonment and occasional infestations are present within the vegetative buffer maintained along Stewart Creek and J. Percy Priest Lake. Occasional populations of winter creeper may also be found in TA 5 and, in some cases, may actually be large enough to pose a threat to timber species.

- Specific Control Prescription: For small populations, individual vines should be pulled up by the roots and removed from the area. Follow-up during the winter with an application of 2% Garlon 4. A squirt bottle may be used for spot treatment or individual stumps can be painted by hand using a sponge applicator. Treatment should be in late winter when most native vegetation is dormant and prior to the emergence of spring wildflowers.

Present in Training Areas
Cantonment
5

***Lespedeza cuneata* (sericea lespedeza)**

- Description: Sericea lespedeza is an upright semi-woody forb, 3 to 6 feet in height with one to many slender stems. It has thin, alternate, abundant, three-parted leaves. Flowers are small and whitish-yellow. It is an extremely aggressive invader of open areas, out competing native vegetation. Once it is established is very difficult to remove due to the seed bank, which can remain viable for decades. Native to Asia and introduced into the Unites States in the late 1800s, sericea lespedeza has been widely planted for wildlife habitat, erosion control, and mine reclamation.

- Extent of the Infestation: This lespedeza is ubiquitous at VTS-S in open and grassy areas with full sun. Upon close inspection of closely mowed turf areas, it serves as an important component of the mowed "grassy" areas. It is likely that it may have been planted for its erosion control and wildlife habitat benefits. This species is currently recommended by the Tennessee Wildlife Resources Agency under certain conditions for those uses.

- Specific Control Prescription: The best control of lespedeza combines both mechanical and chemical treatments. Hand pulling is impractical due to its extensive perennial root system, but mowing plants at the flower bud stage for two to three consecutive years can significantly reduce the vigor of stands as well as control further spread. Mowing followed by an herbicide treatment is likely the most effective option for the successful control.

  The herbicides triclopyr, clopyralid, and glyphosate are known to control this lespedeza. Herbicide should be applied in early to midsummer, during the flower bud stage. A 2% triclopyr solution or a 0.5% clopyralid solution is effective at control during the vegetative stage prior to branching or during flowering. Note that lespedeza and Johnson grass were observed to be growing together and any treatment of one will harm or benefit the other, so plan accordingly.

Present in Training Areas	
1	2
3	4
5	6
Cantonment	

***Ligustrum sinense &/or Ligustrum vulgare* (privet)**

- Description: Privet is a thick, semi-evergreen shrub to 30 feet in height. Trunks usually occur as multiple stems with many long, leafy branches attached at near right angles. Leaves are opposite, oval and .5 to 1.5 inches long. White flowers are very abundant and occur at the end of branches in clusters. Fruits ripen to a dark purple to black color and persist into winter. Although several species occur they are hard to distinguish. It commonly forms dense thickets in fields or in the understory of forests. It shades and outcompetes many native species and, once established, is very difficult to remove.

- Extent of the Infestation: Privet is found pervasively throughout the entire training site. It occurs in all settings with better growth and larger plants found where sunlight is more available.

- Specific Control Prescription: Privet is mostly evergreen in Tennessee and thus can be identified and treated at any time during the year. Small plants may be may be effectively controlled by hand pulling. Plants should be pulled as soon as they are large enough to grasp, but prior to seed production. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may re-sprout. Smaller privets are usually easy to pull; larger individuals are likely to require mechanical assistance in pulling.

Mowing or other mechanical reduction of plant mass is effective for providing safer spraying access but is not an effective control by itself**.** Foliar Spraying can be effective for large thickets of privet where risk to non-target species is minimal. Timing applications for late fall or early spring when many native species are dormant will help minimize damage to non-target species. Generally foliar herbicides offer better control in warmer weather, as plants are growing faster, but privet keeps its leaves which can make it easier to locate when most other plants do not have leaves. To spray, apply a 2% solution of Garlon 4 to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray-drift damage to non-target species.

Larger or unpullable plants require cutting at ground level with saws. Cutting is most effective when plants have begun to flower to prevent seed production. Cutting is an initial control measure, and success will require either an herbicidal control or repeated cutting of re-sprouting.

Present in Training Areas	
1	**2**
3	**4**
5	**6**
Cantonment	

Treat the cut stump immediately with Arsenal AC applying a 10% solution of herbicide and water to the cut stump making sure to cover the outer 20% of the stump. As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

***Lonicera japonica* (Japanese honeysuckle)**

- Description: Japanese honeysuckle is a perennial vine that climbs by twisting its stems around vertical structures, including limbs and trunks of shrubs and small trees. Leaves are oblong to oval, sometimes lobed, have short stalks, and occur in pairs along the stem. In Tennessee, Japanese honeysuckle leaves often remain attached through the winter. Flowers are tubular, with five fused petals, white to pink, turning yellow with age, very fragrant, and occur in pairs along the stem at leaf junctures. Stems and leaves are sometimes covered with fine, soft hairs. Japanese honeysuckle blooms from late April through July and sometimes into October. Small black fruits are produced in autumn, each containing 2-3 oval to oblong, dark brown seeds about 1/4 inch across.

- Extent of the Infestation: Japanese honeysuckle occurs throughout the training site. It is present across all light regimes and is more dominant in edges where more sunlight is available.

- Specific Control Prescription: Mowing and fire are effective at reducing the aboveground mass of plant material, but require herbicide follow-up for effective control of honeysuckle.

Foliar spraying with triclopyr herbicides is very effective for controlling Japanese honeysuckle. Timing applications for late fall or early spring when many native species are dormant will help minimize damage to non-target species. Generally foliar herbicides offer better control in warmer weather, as plants are growing faster, but honeysuckle keeps its leaves which can make it easier to locate when most other plants don not have leaves. To spray, apply a 5% solution of Garlon 4 plus a 0.5% non-ionic surfactant to thoroughly wet all leaves.

Larger or unpullable plants require cutting at ground level with saws. Cutting is most effective when plants have begun to flower to prevent seed production. Re-sprouting is common after treatment. Cutting is an initial control measure, and success will require either an herbicidal control or repeated cutting of re-sprouting.

Treat the cut stump immediately with Garlon 3A applying a 20% solution of herbicide and water to the cut stump making sure to cover the outer 20% of the stump. As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 5% solution to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

Present in Training Areas	
1	2
3	4
5	6
Cantonment	

Microstegium vimineum* (Japanese grass, Nepalese brown top*)

- Description: Japanese grass, also known as Nepalese brown top and other names is an annual plant. It has a sprawling habit and grows slowly through the summer months, ultimately reaching heights of 2 to 3 1/2 ft. (6-10 dm.). The leaves are pale green, lance-shaped, asymmetrical, 1-3 in. (3-8 cm.) long, and have a distinctive shiny midrib. Slender stalks of tiny flowers are produced in late summer (August - September). The fruits or achenes mature soon after flowering and the plant dies back completely by late fall. It forms a dense carpet that chokes out other species and maintains an abundant seedbank.

- Extent of the Infestation: Microstegium dominates shaded road edges and wooded understories in all training areas. It occurs ubiquitously in shaded, moist soils, but is not present in areas near the lake that are subject to inundation. It will grow well in full sun, but appears to have difficulty competing with other invasives under those conditions.

- Specific Control Prescription: Mow plants as close to the ground as possible using a weedeater or similar grass-cutting tool. Treatments should be made when plants are in flower and before seeds are produced. Treatments made earlier may result in plants producing new seed heads in the axils of lower leaves.

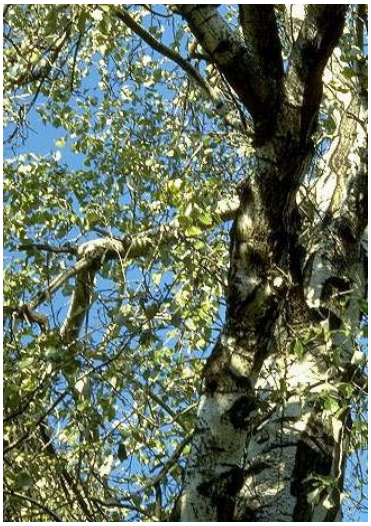
  Herbicide treatments should be made late in the growing season but before the plants set seed. Treatments made earlier in the growing season may allow a second cohort of plants to produce seeds. Apply a 2% solution of glyphosate to thoroughly wet all foliage. Do not spray to the point of runoff. Ambient air temperature should be above 65°F to ensure translocation of the herbicide to the roots. Do not apply if rainfall is expected within two hours following application. Additional treatments are likely to be necessary to exhaust the supply of seed in the soil.

  An alternative chemical treatment is to use grass selective sethoxydim or clethodim. Apply a 1.5% solution of sethoxydim and water plus 1% non-phytotoxic vegetable-based oil to all foliage on a spray-to-wet basis. Do not spray to the point of runoff. Ambient air temperature should be above 65°F. Do not apply if rainfall is expected within one hour following application.

Present in Training Areas	
1	**2**
3	**4**
5	**6**
Cantonment	

Populus alba* (white poplar*)

- Description: White poplar is a tree that, at maturity, may reach 70 feet or more in height and 2 feet in diameter. The smooth, greenish-white bark becomes dark and rough with age. Young green or brown twigs are coated with dense, woolly hair, especially near the tip. A cross-section of the stem reveals five-pointed, star-shaped pith. The 2 to 5-inch long leaves are oval to maple-leaf in shape with 3-5 broad teeth or lobes, and are dark green above and covered with dense white hair below. Male and female flowers are borne in catkins on separate trees and appear in March and April. The small seeds are adorned with cottony fluff that is easily blown by the wind in late spring.



- Extent of the Infestation: An isolated population is present adjacent to the large gravel parking area on the south end of TA-2.

- Specific Control Prescription: White poplar can be controlled using a variety of physical and chemical controls. Removal of seedlings and young plants by hand will help prevent further spread or establishment. Plants should be pulled as soon as they are large enough to grasp. The entire root system of these pulled plants, or as much of it as possible, should be removed to prevent resprout from fragments. Hand removal of plants is best achieved after a rain, when the soil is loose.

  Trees of any size may be felled by cutting at ground level with power or manual saws. Because resprouts are common after cutting, this process may need to be repeated many times until the reserves of the tree are exhausted. Girdling, which kills the tree by severing tissues that conduct water and sugars, also may be effective for large trees, especially if accompanied by application of a systemic herbicide to the cut area. A hatchet or saw is used to make a cut through the bark encircling the base of the tree, approximately six inches above the ground and deep into the bark. Girdling will kill the parent tree but may require follow-up cutting or treatment of sprouts with an herbicide.

  Chemical control of white poplar seedlings and small trees has been achieved by applying a 2% solution of glyphosate to the foliage until the leaves are thoroughly wet. Use of low pressure and a coarse spray with large droplet size will reduce spray drift and damage to non-target plants.

  The cut stump herbicidal method should be considered when treating individual trees or where the presence of desirable species precludes the use of foliar herbicides. Stump treatments can be made at any time of year as long as the ground is not frozen. After cutting the tree near ground level, a 25% solution of Garlon 3A is applied to the stump by spray bottle or brush, making sure to cover the outer 20% of the stump. Basal bark herbicidal treatment is also effective throughout the year, as long as the ground is not frozen, and does not require cutting of the tree. A mixture of 25% Garlon 4 and 75% horticultural oil is applied to the bark in a wide band around the base of the tree to a height of 12-15 inches from the ground. Spray until run-off is just noticeable at the ground line, but not running off-site.

Present in Training Area
Cantonment

***Rosa multiflora* (multiflora rose)**

- Description: Multiflora rose is a thorny, perennial shrub with arching stems (canes), and leaves divided into five to eleven sharply toothed leaflets. The base of each leaf stalk bears a pair of fringed bracts. Beginning in May or June, clusters of showy, fragrant, white to pink flowers appear, each about an inch across. Small bright red fruits, or rose hips, develop during the summer, becoming leathery, and remain on the plant through the winter.

- Extent of the Infestation: Multiflora rose occurs in all training areas but is not widespread or dominant like privet. Where it occurs, this plant thrives under sunny conditions.

- Specific Control Prescription: Mowing/Cutting is appropriate for small initial populations or environmentally sensitive areas where herbicides cannot be used. Repeated mowing or cutting will control the spread of multiflora rose but will not eradicate it. Stems should be cut at least once per growing season as close to ground level as possible. Hand cutting of established clumps is difficult and time consuming due to the long arching stems and prolific thorns.

Three methods using herbicides are practical for different plant situations. The foliar spray method should be considered for large thickets of multi-flora rose where risk to non-target species is minimal. Air temperature should be above 65°F to ensure absorption of herbicides. Apply Garlon 3A in concentration recommended on product label. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

The cut stump method should be considered when treating individual bushes or where the presence of desirable species precludes foliar application. This treatment remains effective at low temperatures as long as the ground is not frozen. Horizontally cut multiflora rose stems at or near ground level. Immediately apply a 20% solution of Garlon 4 to the cut stump making sure to cover the entire surface.

The basal bark method is effective throughout the year as long as the ground is not frozen. Apply a mixture of 20% Garlon 4 and 75% horticultural oil to the basal parts of the shrub to a height of 30-38 cm (12-15 in) from the ground. Thorough wetting is necessary for good control; spray until run-off is noticeable at the ground line.

Present in Training Areas	
1	2
3	4
5	6
Cantonment	

***Sorghum halepense* (Johnson grass)**

- Description: Johnson grass grows as tall as six feet and is a rhizomatous perennial grass that invades open areas throughout the United States. The two-foot long, lanceolate leaves are arranged alternately along a stout, hairless, somewhat upward branching stem. Flowers occur in a loose, spreading, purplish panicle. Johnson grass is adapted to a wide variety of habitats including open forests, old fields, ditches, and wetlands. It spreads aggressively and can form dense colonies, displacing native vegetation and restricting tree seedling establishment.

- Extent of the Infestation: Johnson grass occurs as part of the mix of plants present in virtually all of the mowed and bushhogged areas of VTS-S. Its presence is diminished in these mixes by the dominance of sericea lespedeza.

- Specific Control Prescription: Johnson grass reproduces through rhizomes and seeds. It cannot be controlled simply by mowing or cutting. It is recommended that mowing followed by herbicide treatment, several times during the growing season for several seasons. Repeated applications of 1% glyphosate, taking care to thoroughly wet all leaves, will be necessary to control Johnson grass.

Present in Training Areas	
1	2
3	4
5	6
Cantonment	

***Verbascum thapsus (*Wooly mullein)**

- Description: Wooly or common mullein is a biennial most commonly found in sites that have experienced disturbance. First year mullein plants are low-growing rosettes of bluish gray-green, felt-like leaves that range from 4-12 inches in length and 1-5 inches in width. Mature flowering plants are produced the second year, and grow to 5 to 10 feet in height, including the conspicuous flowering stalk. The five-petaled yellow flowers are arranged in a leafy spike and bloom a few at a time from June-August. Leaves alternate along the flowering stalks and are much larger toward the base of the plant. The tiny seeds are pitted and rough with wavy ridges and deep grooves and can germinate after lying dormant in the soil for several decades.

- Extent of the Infestation: A population of woolly mullein was observed along the road edges in TA-6 north of the firing range during the July, 2005 data collection. These plants had been bushhogged and were not found during a late-August 2005 visit to VTS-S.

- Specific Control Prescription: Common mullein can be very difficult to eradicate. There are a variety of management methods available, depending on the particular situation. Because mullein seedling emergence is dependent on the presence of bare ground, sowing sites with early successional native grasses or other plants may decrease seed germination and the chance of successful emergence of mullein seedlings.

  Mullein plants are easily hand pulled on loose soils due to relatively shallow tap roots. This is an extremely effective method of reducing populations and seed productivity, especially if plant is pulled before seed set. If blooms or seed capsules are present, reproductive structures should be removed, bagged, and properly disposed of in a sanitary landfill. Care should be taken, however, to minimize soil disturbance since loose soil will facilitate mullein seed germination.

  For situations where hand-pulling of plants is not practical or safe, for example, on very steep slopes where hand pulling is dangerous or would cause significant soil disturbance, herbicidal control is an effective option. Apply a 2% solution of glyphosate, using a tank or backpack sprayer to thoroughly cover all leaves. Do not apply so heavily that the herbicide drips off the leaf surface.

Present in Training Area
6