FINAL DRAFT

Integrated Natural Resources Management Plan

Volunteer Training Site – Smyrna

Tennessee Army National Guard
Nashville, Tennessee

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Volunteer Training Site – Smyrna
Integrated Natural Resources Management Plan

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 200-3, 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. 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 this second iteration. Cooperating agencies were contacted 2 June 2006 and informed of the TNARNG intent to revise the INRMP for the VTS-S (Appendix C). At this time, TNARNG requested input from both the United States Fish and Wildlife Service (USFWS) state field office and from the Tennessee Wildlife Resources Agency (TWRA); no objections were raised from either organization toward the prospect of developing a complete revision of the existing INRMP. Therefore, the formal "five year review for operation and effect" was incorporated into the revision process.

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) 4715.3 – 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.

Table of Contents

Appendices

A. Record of Environmental Consideration
B. Finding of No Significant Impact
C. Agency Correspondence
D. Public Comment
E. Environmental Regulations
F. Species List
G. Descriptions of Natural Areas located within 15 miles of VTS-S
H. American Indian Tribes
I. Pest Management Forms and Guidance
J. Annual Review Documentation

Management Plan Annexes

1. Forest Management Plan
2. Prescribed Fire Plan
3. Invasive Pest Plant Control Plan

List of Tables

List of Figures

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 original VTS-S INRMP which covered the period 2001-2006, and 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 has been honored. Documentation of this cooperation is included in Appendix C.

This Revised INRMP for VTS-S 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 4715.3 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 higher headquarters for the TNARNG. The Sikes Act Coordinator in the Environmental Programs Division (NGB-ILE) is responsible for reviewing the INRMP and advising the Environmental Office before the state formally submits the plan for public review. The Environmental Directorate 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.

The Installations Directorate (NGB-ILI) provides policy guidance and resources to create, sustain, and operate facilities that support the Army National Guard. The Installations Directorate coordinates proposed construction projects and provides design and construction support, as well as environmental management that is directly related to property maintenance (e.g., grounds maintenance, pest control).

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 were contacted, informed of this decision, and given the opportunity to object or concur; there was no opposition to this proposal. TNARNG requested contributions to the revision process from both agencies. The cooperating agencies have reviewed and contributed to this new 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 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.

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 GWRD 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 Chapter 4, Table 4.3, 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.

Operations and Maintenance Environmental Funds:
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 4715.3). 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 programs

CHAPTER 2
TRAINING SITE OVERVIEW

2.1 LOCATION AND REGIONAL CHARACTER

2.1.1 Location, Size, General Description

The 868-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

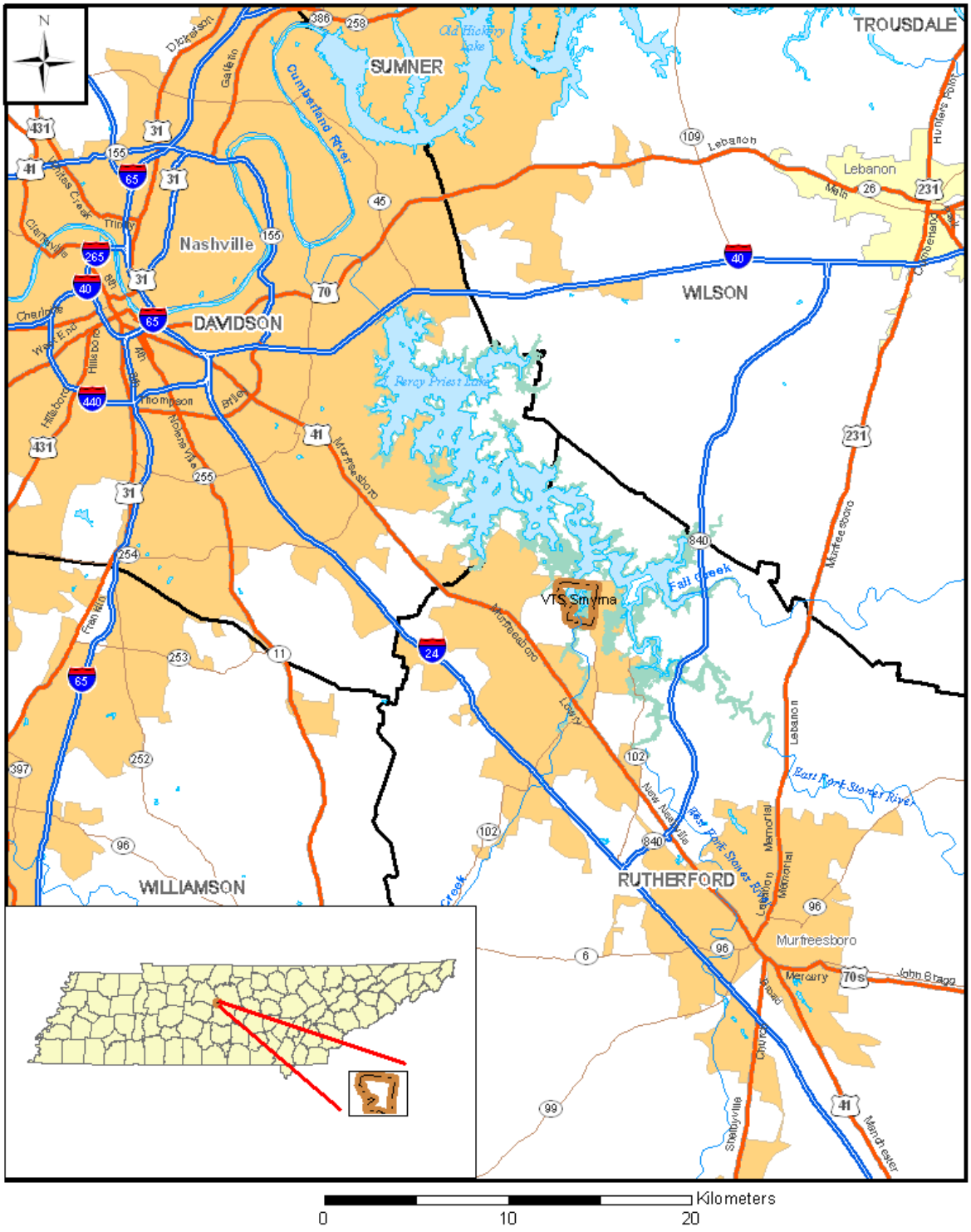

Figure 2.1: Location of the Volunteer Training Site – Smyrna

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

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 228,829 (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 (estimate)*	% Persons Below the Poverty Line (estimate)*	% Unemployment Rate
Rutherford	228,829	$48,400	11.8	3.5***
Tennessee	6,156,719	$38,947	15.6	5.6**
United States	301,621,157	$46,242	13.3	5.1**

*U.S. Census Bureau (2007a; 2007b) **U.S. Bureau of Labor Statistics (2007) ***TN Division of Employment Security (2007)

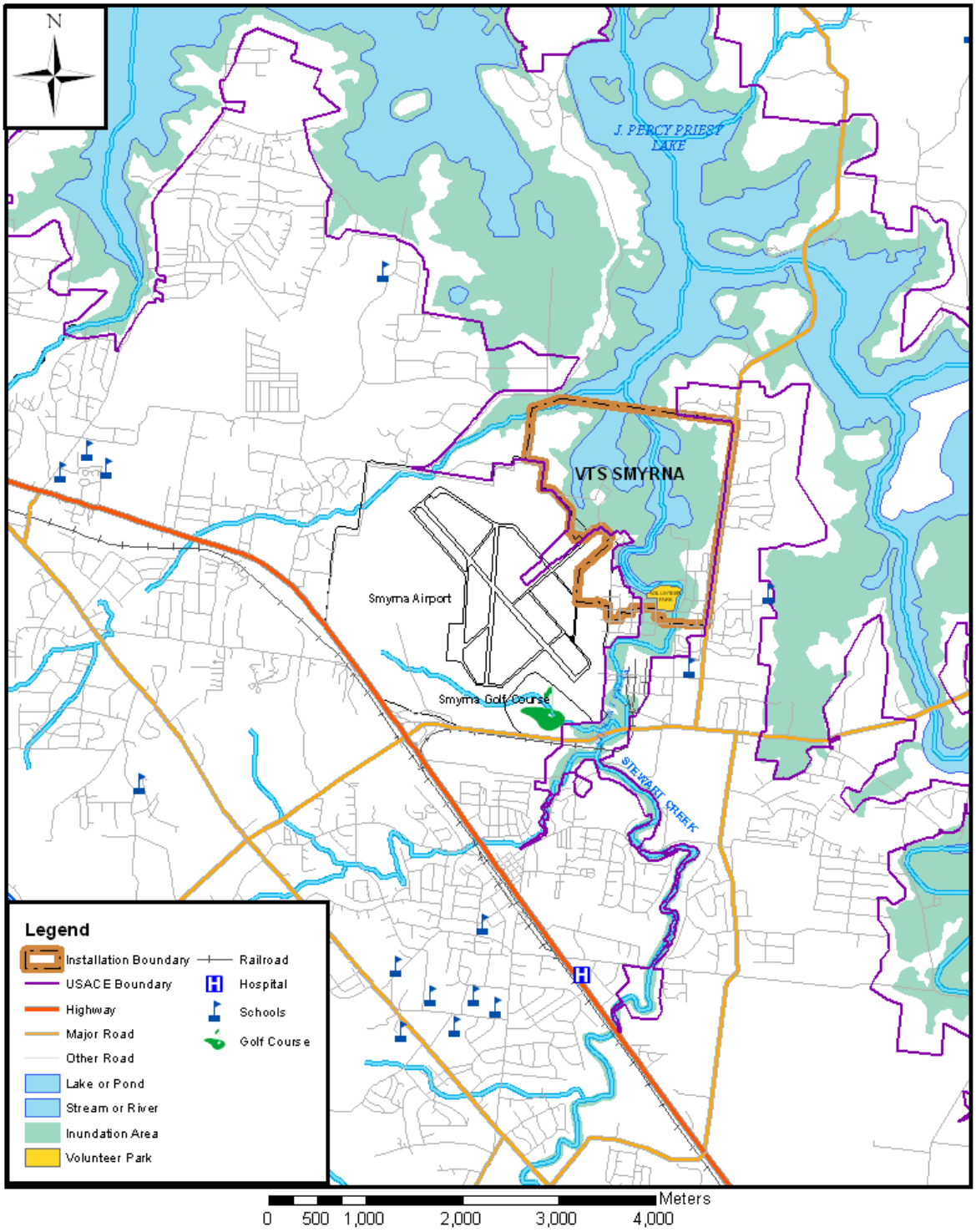

Figure 2.2: Local surroundings of VTS-Smyrna

Rutherford County has earned the designation of the second fastest growing county in Tennessee and is the 84th fastest growing county (of 3,141 counties) in the U.S.--a tribute to its solid pattern of consistent growth since the early 1980s. Rutherford County experienced a 53.5% population increase from 1990 to 2000. The population projection for 2010 is 226,778.

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 dependants 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
- Army Aviation Support Facility #1
- Combined Support Maintenance Shop #1
- Facilities Maintenance Shop #16
- Regional Training Institute
- National Guard Bureau Visual Information Support Center
- Simulation Training Center
- Eight barracks, with 402 bed capacity
- Unaccompanied personnel housing
- 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 only 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—used for ceremonies and drilling
2	262	Used for dismounted training maneuvers. Contains LANDNAV course. Plan to thin cedar forests, improve roads, and use for wheeled and tracked training. Off limits to vehicles until road network completed. The northeast corner of TA2 contains numerous marked 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.
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, channel crossing connecting to TA5, and a POW camp. An Urban Assault Course (UAC) and an obstacle course are being planned for TA 4.
5	55	Used for wheeled vehicle and dismounted maneuvers. Contains a Virtual Convoy Operations Trainer (VCOT), a boat ramp, four mine detection pits, and an eight point land navigation course (inactive).
6	116	Used for wheeled vehicle and dismounted maneuvers; training for Bradley drivers, night driving, rail loading, and aviation swing-load maneuvers. Contains small arms firing range, an M203 grenade launcher practice range, a hand grenade practice course, bivouac sites, and an active twelve point land navigation course. Cannon Cemetery is located in the northern portion of TA 6 and is fenced off from the rest of the training area
Bldg 425		Used for a variety of classroom and simulation training activities. Contains an engagement skills trainer, WARFIGHTER simulation unit, a STAFFEX facility, Firearms Training System (FATS), and several classrooms. An Aviation Combined Arms Tactical Trainer (AVCTT) pad is located next to the building.

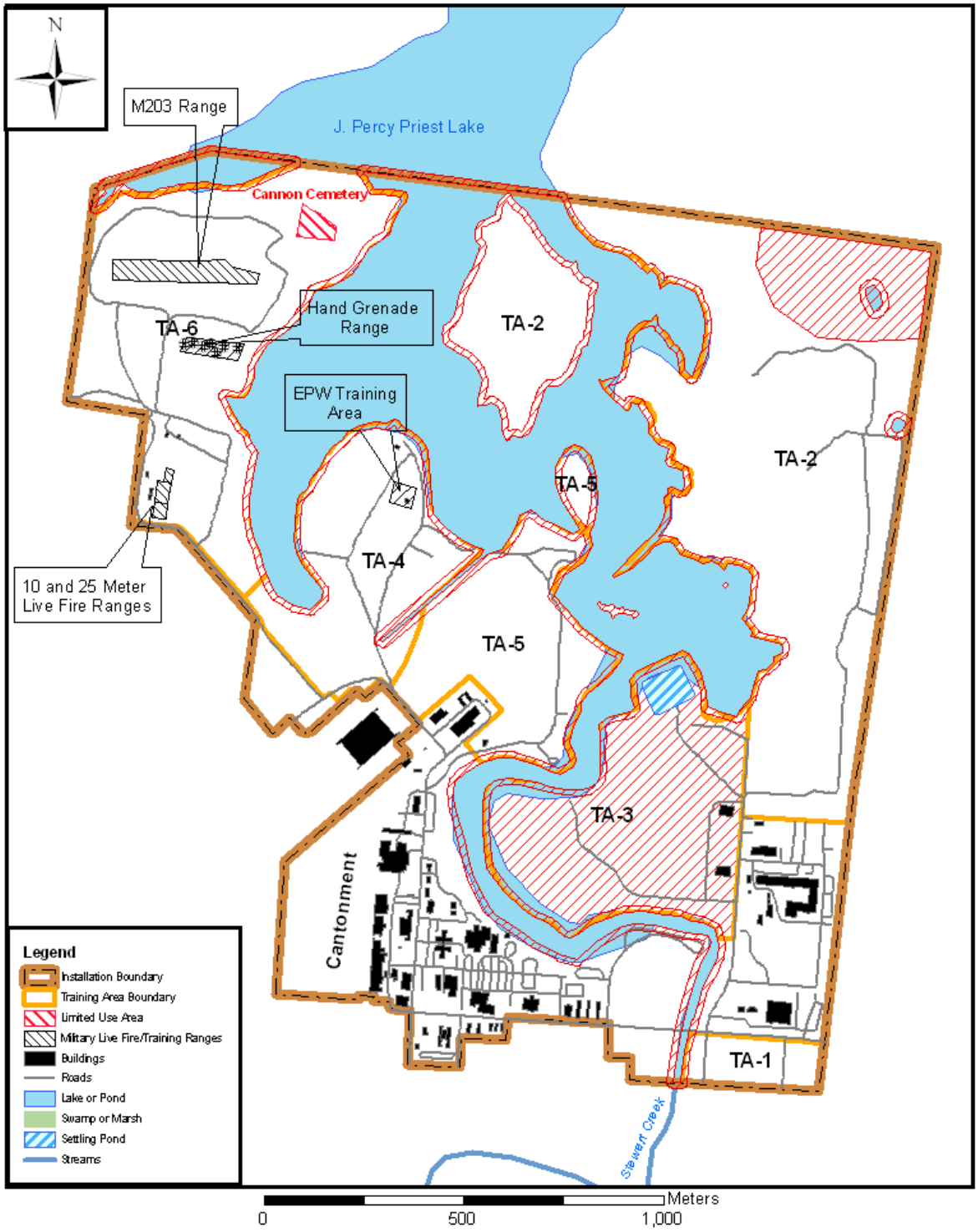

Figure 2.4: VTS-Smyrna Training Areas and Facilities

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

- 25-meter Rifle Range: M-16A1, M-16A2 and M193; targets are paper silhouettes on wooden frames; 24 firing points in TA 6.
- 25-meter Pistol Range: .22 cal., .28 cal., .45 cal., and 9mm ball; targets are paper silhouettes on wooden frames; 24 firing points in TA 6.
- 10-meter M60 Machine Gun Range: M60/SAW and 7.62/5.56 ball; targets are paper silhouettes on wooden frames; 10 firing points in TA 6.

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 at least 30 days prior to training dates. Units request training areas based their mission requirements, and training areas are assigned on a “first come, first served basis”. 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.

Available data on troop utilization of the VTS-S for the period spanning 2002-2006 is summarized in Table 2.3 and Figure 2.5 in man-days per year, and by indicating monthly usage trends over those years in Figures 2.6 and 2.7. Average training site usage for 2002-2006 was approximately 79,095 man-days per year.

Training site utilization data from 2002-2006 shows that 66% of all training occurs during the spring and summer months between April and September. An unusually high number of man-days were reported during April 2004. This anomaly was due to the mobilization of the 278th Army Cavalry Regiment, which affected approximately 3,000 soldiers. December is historically the slowest month of the year for training and averages approximately two percent of all annual training at VTS-S.

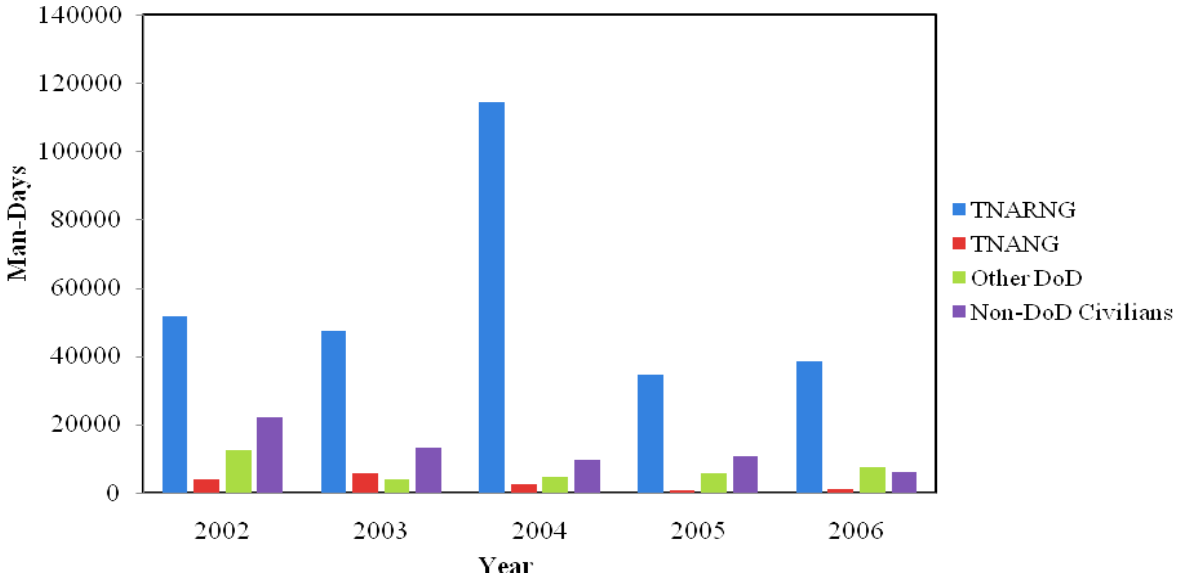

Figure 2.5: Training man-days by user at VTS-S, FY 2002-2006

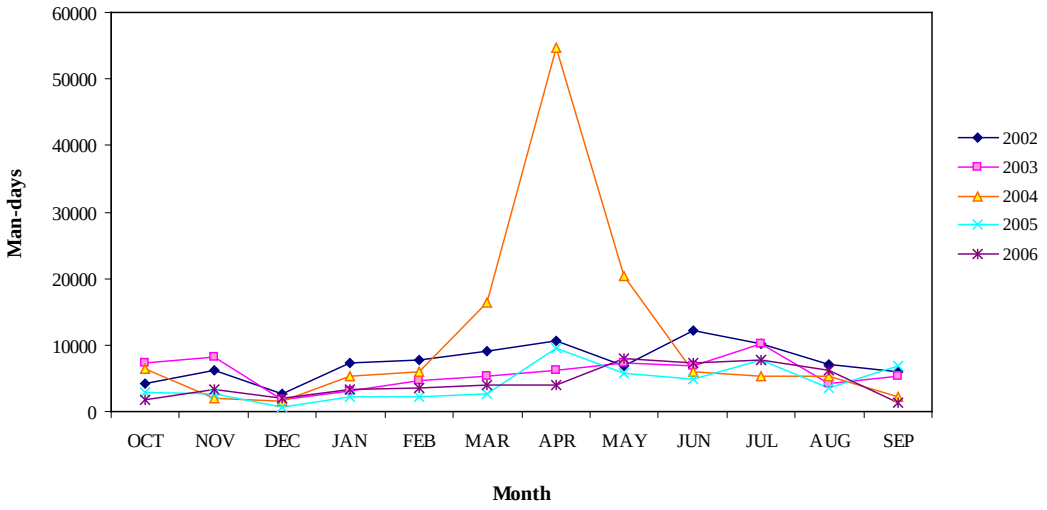

Figure 2.6: Monthly trends in total man-day usage at VTS-S, FY 2002-2006

Table 2.3: Training site utilization by National Guard, other military, and civilian users, 2002-2006.

TY2002	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TNARNG/TNANG	3254	2699	1514	5871	5696	4954	6299	4707	6536	4228	4375	5274	55407
Other Military	396	1765	445	386	1324	2532	714	715	1944	354	1361	110	12046
Civilian	625	1640	607	1146	651	1625	3515	1374	3798	5557	1313	535	22386
TOTALS	4275	6104	2566	7403	7671	9111	10528	6796	12278	10139	7049	5919	89839
TY2003	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TNARNG/TNANG	6224	7457	1195	2227	3815	3077	4982	5379	5264	6309	3035	4285	53249
Other Military	232	137	186	306	548	910	483	0	75	0	894	180	3951
Civilian	845	569	326	644	211	1425	826	1819	1470	3945	213	795	13088
TOTALS	7301	8163	1707	3177	4574	5412	6291	7198	6809	10254	4142	5260	70288
TY2004	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TNARNG/TNANG	4501	1272	1380	3801	4464	14748	53368	18773	3716	4687	4798	1409	116917
Other Military	859	0	0	900	750	470	279	111	243	347	300	80	4339
Civilian	1067	676	80	550	757	1112	948	1530	1970	182	197	689	9758
TOTALS	6427	1948	1460	5251	5971	16330	54595	20414	5929	5216	5295	2178	131014
TY2005	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TNARNG/TNANG	2129	1012	192	1613	1865	1937	8489	3325	2549	5531	2617	3928	35187
Other Military	458	1611	397	267	217	302	382	131	447	546	721	170	5649
Civilian	328	40	68	308	171	407	691	2264	1791	1656	287	2801	10812
TOTALS	2915	2663	657	2188	2253	2646	9562	5720	4787	7733	3625	6899	51648
TY2006	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TNARNG/TNANG	742	744	1753	2780	2781	3312	3354	6794	5901	5409	5031	769	39370
Other Military	404	2262	210	283	680	393	326	610	154	914	1034	73	7343
Civilian	556	240	110	289	88	384	402	550	1310	1476	140	428	5973
TOTALS	1702	3246	2073	3352	3549	4089	4082	7954	7365	7799	6205	1270	52686

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 redcedar. 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.

Unclear documentation and conflicting information have created confusion about the status of Training Area 3. At this time no training activities are conducted in TA 3 due to the uncertainties over allowable use. The land area is needed for training, however. When the situation is reconciled, the overstory should be thinned and existing openings should be enlarged for training purposes.

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, and access to TA 3. 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 precaution

possible 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 following finalization of this INRMP 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).

The following climatic data was obtained from the National Oceanic and Atmospheric Administration's National Climatic Data Center (2004).

Temperature: The average annual temperature for 1971-2000 was 58ºF. July and August are the warmest months with average daily maximum temperatures of 89°F. January is the coldest month, with an average maximum temperature of 46ºF and an average minimum temperature of 25ºF.

Precipitation: Normal annual precipitation measured during the years 1971-2000 for Murfreesboro, TN, near VTS-S, was approximately 55 inches. Annual snowfall (usually between the months of November and March) average is four 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.

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 57°F, with average daily temperatures of 48.3°F in March and 65.7°F in May. Fall (September through November) temperatures are slightly higher than spring temperatures, with a mean temperature of 59°F.

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 60 percent in the afternoon to 85 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 windspeed 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.

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.

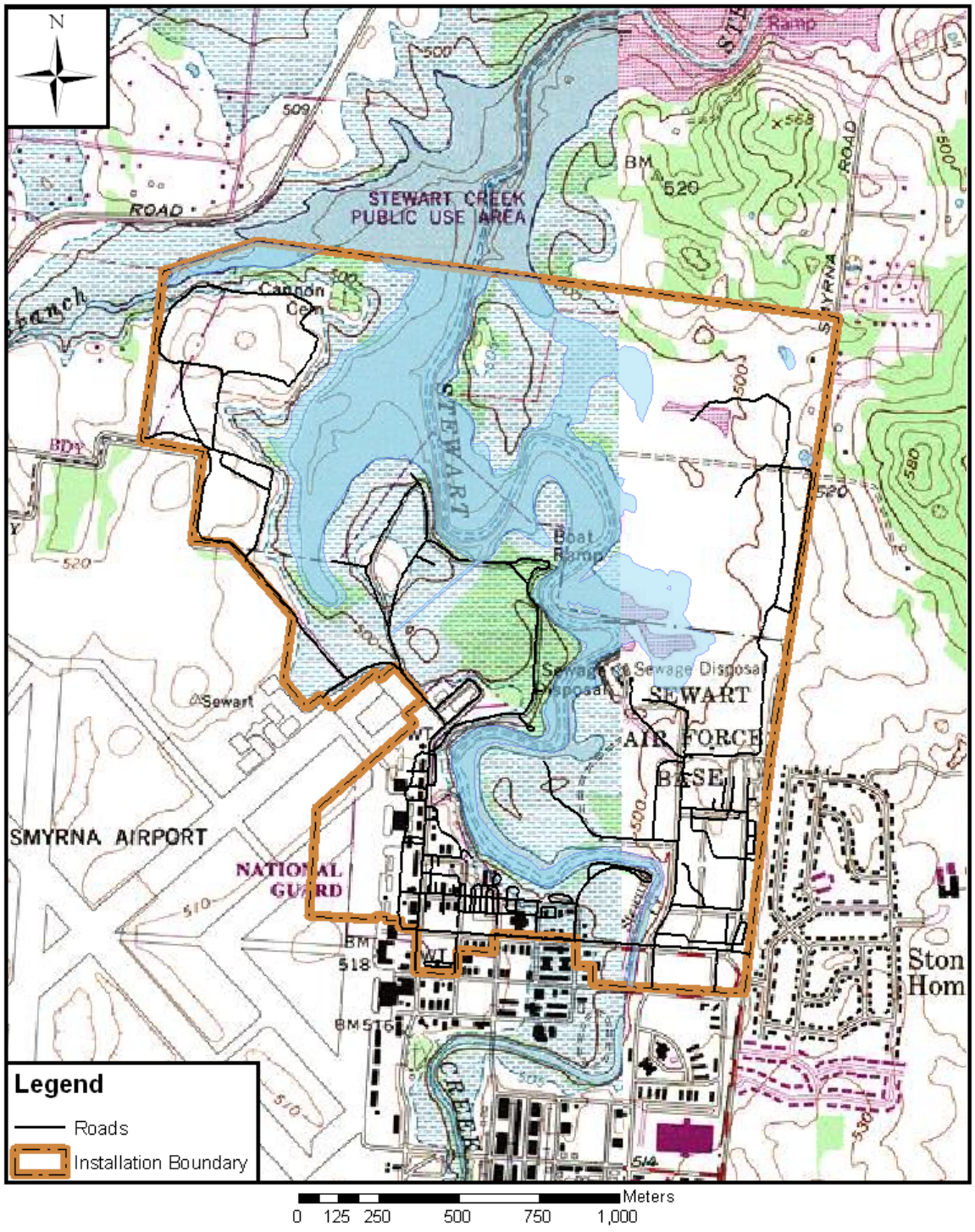

Figure 3.1: Topography of VTS-Smyrna

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.

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

Table 3.2 Soil types onVTS-S

Soil Symbol (Figure 3.1)	Soil Name	Acres
Am	Armour Silt Loam, 0-5 % slopes	14.1
Ar	Arrington Silt Loam, depressed and occasionaly 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, severly 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, rollling	≤ 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 waterlevels of the J. Percy Priest Reservoir

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.

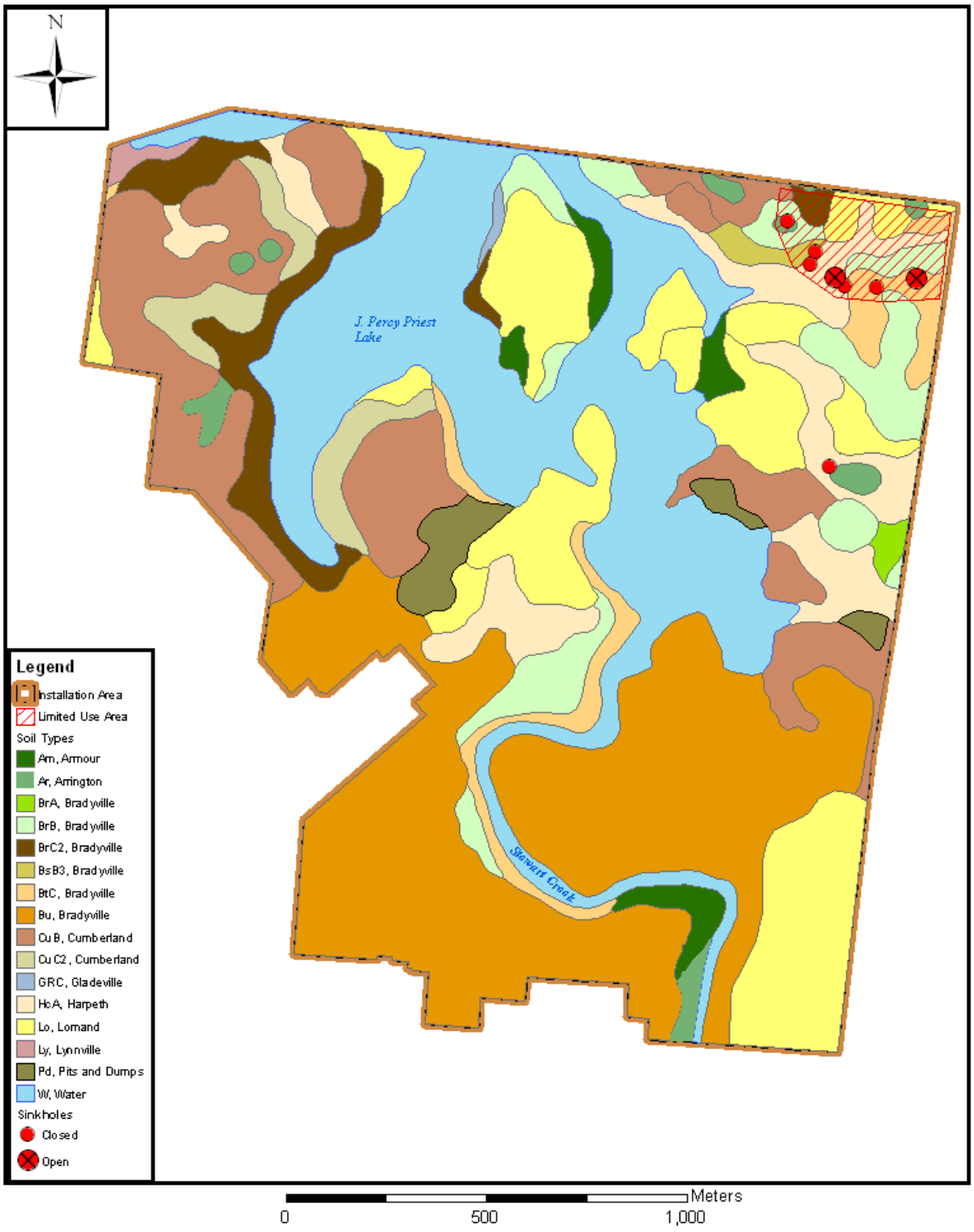

Figure 3.2: Soil Types on VTS-Smyrna

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 redcedar 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

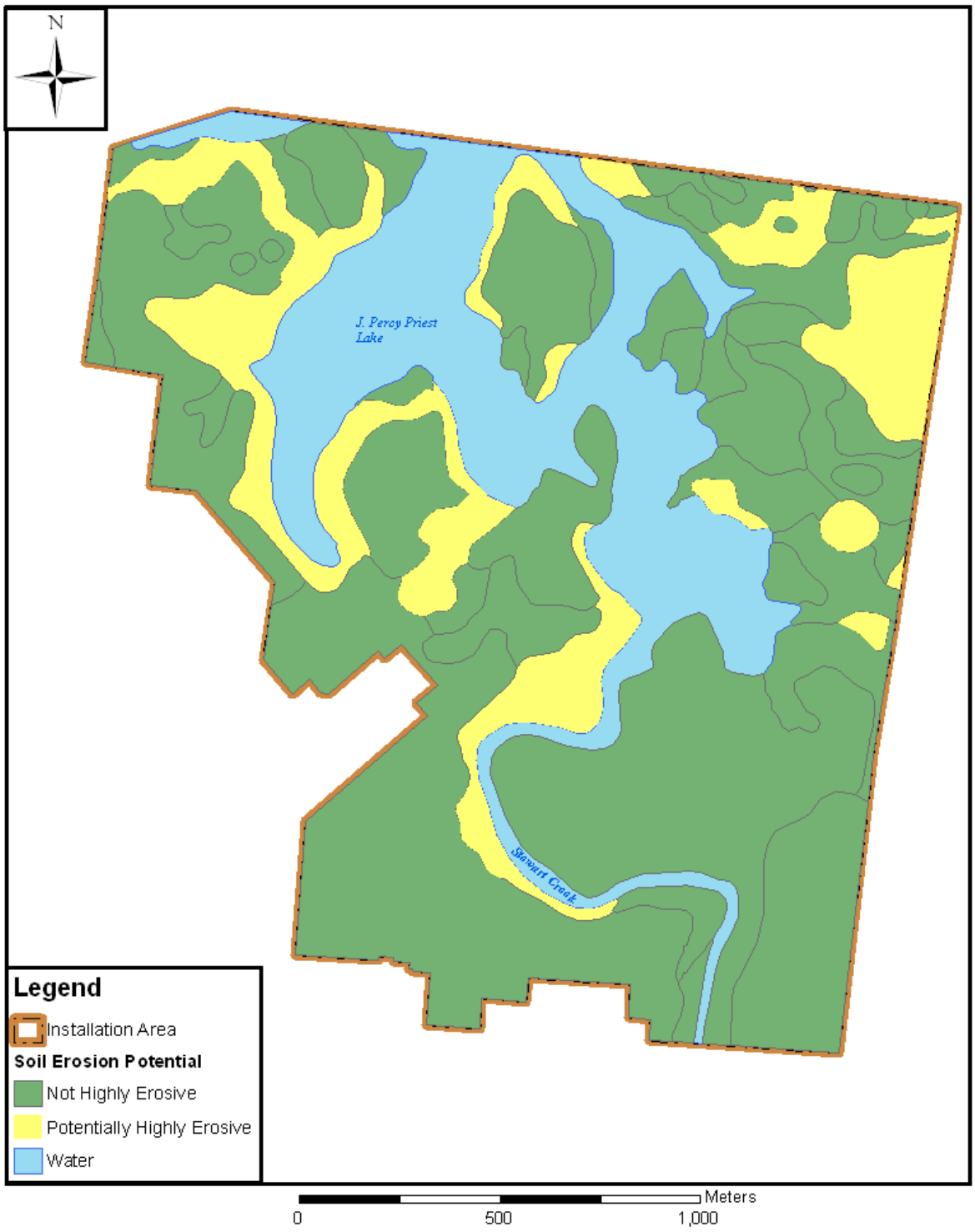

Figure 3.3: Soil erosion potential on VTS-Smyrna

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.

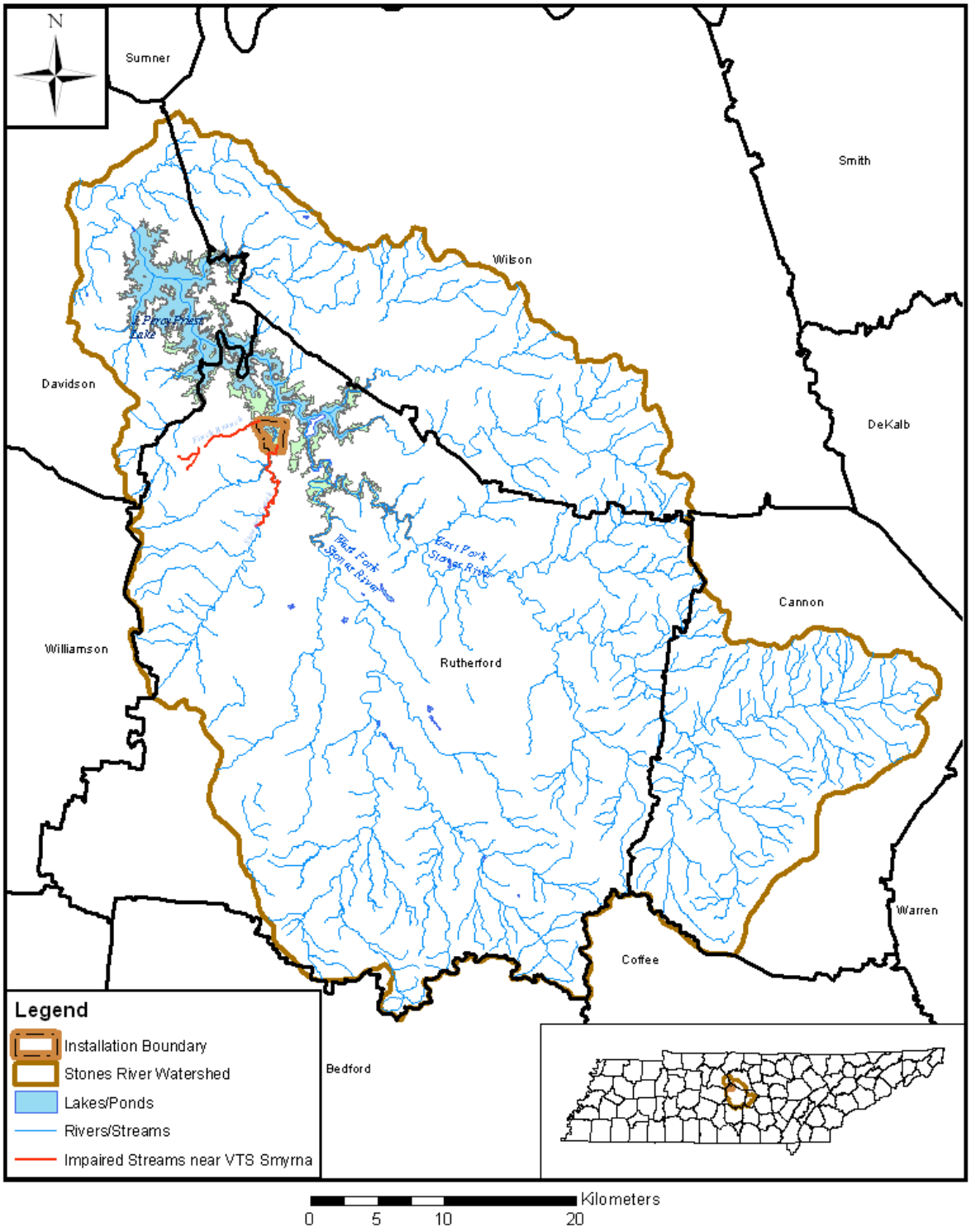

Figure 3.4: Stones River Watershed, noting impaired streams on or near VTS-Smyrna.

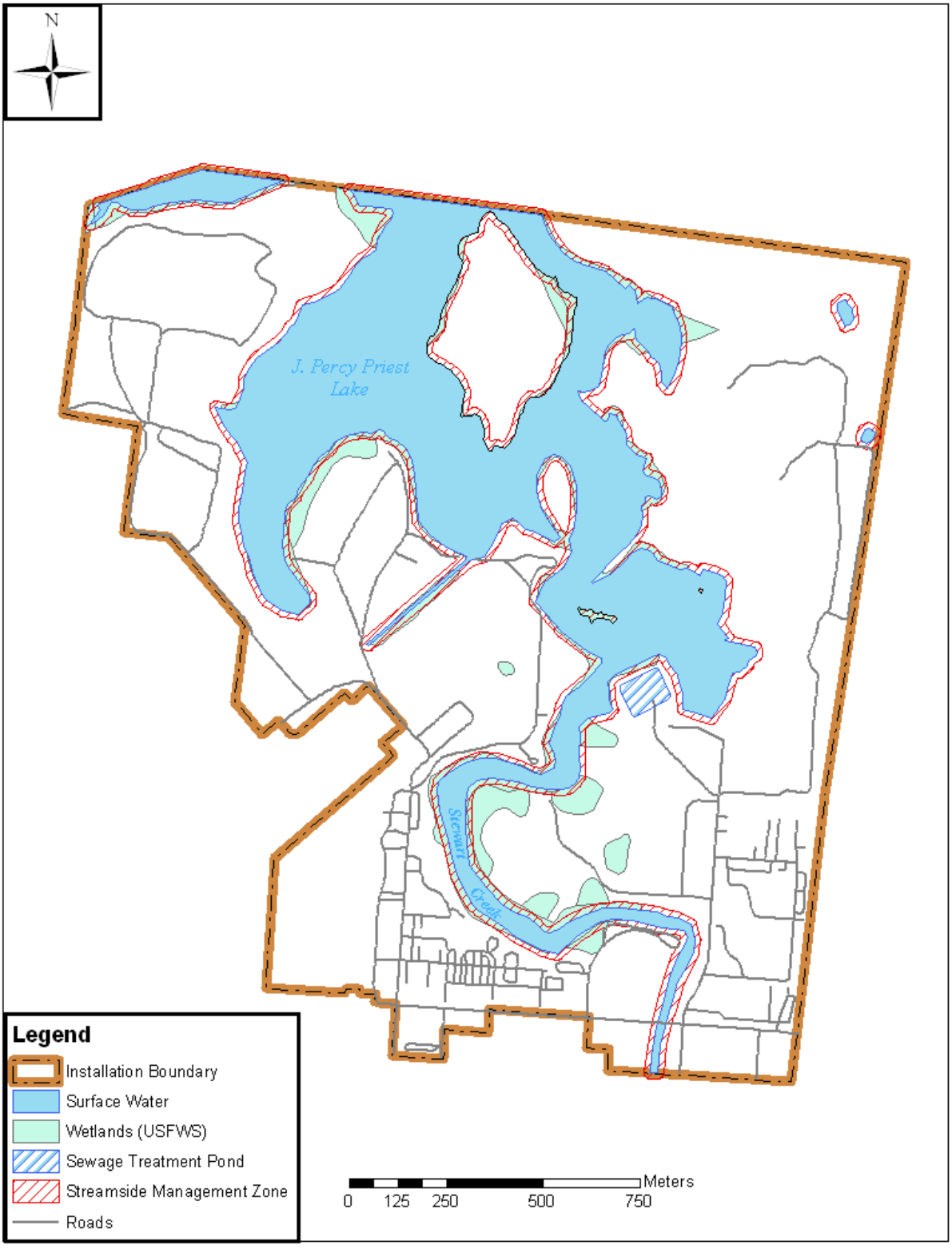

Figure 3.5: Surface water resources on the VTS-Smyrna.

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). 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 waster 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 2007-8 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 2007-8 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 regularly to identify changes from previous investigations. In addition, as more thorough macroinvertebrate study is recommended to determine whether the variation between the 1999 and 2008 results is due to differing sampling efforts 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.

3.5.3.1 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.

3.5.3.2 Wastewater Discharge

All domestic wastewater at VTS-S, as well as process wastewater produced from the CSMS, including its associated wash rack, is discharged to the Town of Smyrna sanitary sewer system. The industrial processes that generate wastewater at the AASF, CSMS, and FMS include, in part, floor cleaning, parts washing, and equipment washing at the washracks. The CSMS also has a paint booth operation that generates wastewater. Wash racks located at the FMS and the AASF are discharged to J. Percy Priest Lake through the stormwater system. Wastewater from all washracks passes through oil/water separator devices before being discharged. Industrial stormwater from AASF, CSMS, and FMS is discharged directly to Stewart Creek and/or J. Percy Priest Lake. 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 outdated and in need of modification. Particular updates needed include the installation of new water quality units into the existing drain line that serves the flight line

area and installation of a new “oil stop” valve into the existing drain line from the aviation fuel farm. This would provide primary treatment to the stormwater being conveyed to Stewart Creek by reducing the amount of sediment, floatables, and free oil and grease present in the site’s stormwater emissions. In addition, the total number of stormwater outfalls into J. Percy Priest Lake and Stewart Creek need to be reduced. Stormwater flows should be separated so that the industrial flows from the AASF and Shop areas are directed to one or two dedicated outfalls.

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.

Formal USACE wetlands delineation mapping has not yet occurred at the training site; this would more precisely describe the conditions and coverage of wetlands at VTS-S than the survey performed in 2000 and guide appropriate management practices. The wetlands inventory performed at that time assembled subjective field data to form a rough approximation of possible wetlands found at VTS-S and is not to be considered exhaustive. GIS data was not captured during that initial assessment of the training site's wetlands; therefore, detailed maps of these areas are not available at this time. A resurvey of the wetland areas was initiated in FY10; results are expected in mid-2012. This resurvey includes collection of GIS information for all wetlands on the training site.

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.

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 3.7.

3.7.1.1 Upland, Mixed, *Juniperus virginiana* Forests (map unit R1, Figure 3.7)

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.

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.

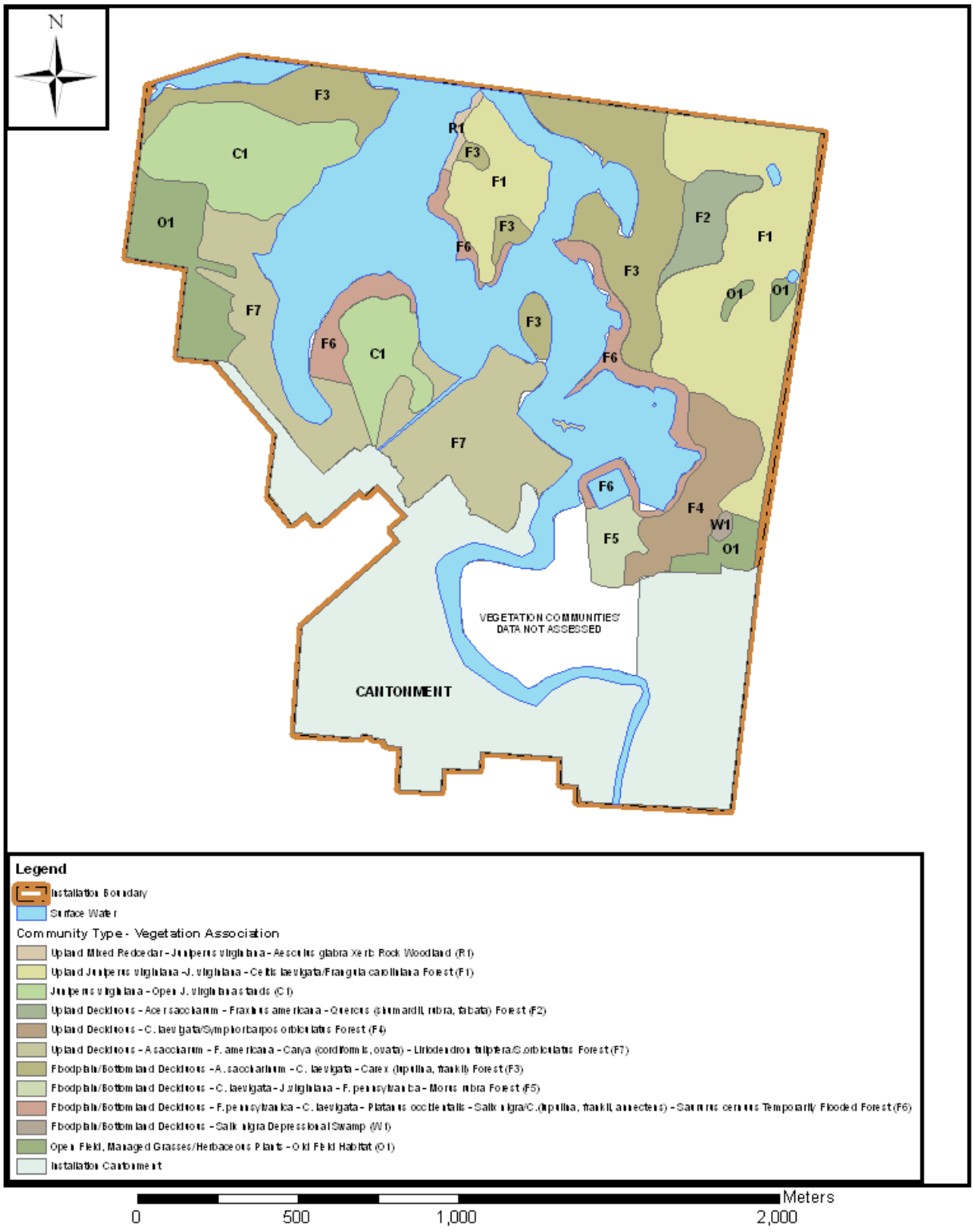

Figure 3.7: Vegetation communities on VTS-Smyrna

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 3.7.

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 3.4. 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 3.4 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). Chief among the problem species are: privet (*Ligustrum* spp.), multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus umbellata*), silver thorn olive (*Eleagnus pungens*), tree of heaven (*Ailanthus altissima*), sericea lespedeza (*Lespedeza cuneata*), Japanese honeysuckle (*Lonicera japonica*), Japanese grass (*Microstegium vimineum*), Johnson grass (*Sorghum halapense*), mimosa

(*Albizia julibrissin*), 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 in 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 defined in part 10, Title 50 of the U.S. Code of Federal Regulations as:

> …any bird, whatever its origin and whether or not raised in captivity, which belongs to a species listed in Sec. 10.13, or which is a mutation or a hybrid of any such species, including any part, nest, or egg of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof…

and include species with at least some populations breeding in the United States and/or Canada. A list of the protected bird species is available at http://www.fws.gov/migratorybirds. Songbirds, shorebirds, and waterfowl may fall into this category, as well as birds that may be perennial residents in some areas. Attention has been placed on such a large number of species since many birds in this group are experiencing steep rates of population decline. 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 military mission.

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 seven species are Migratory Birds as defined above. The native wild turkey (*Meleagris gallopavo*) and northern bobwhite (*Colinus virginianus*), are excluded because populations of these species are typically year-round residents of an area and do not migrate seasonally. The non-native bird species found at VTS-S, Eurasian collared dove (*Streptopelia decaocto*), rock pigeon (*Columba livia*), European starling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), and house sparrow (*Passer domesticus*), are excluded because their occurrences in the United States are due to either unintentional or intentional human-influenced release.

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).

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.

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. If any measurable negative effects on migratory bird populations at VTS-S are identified, the TNARNG will develop a MOU with the USFWS within two years.

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). Egglaying 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 migrating 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.

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 3.5). 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.

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."

Table 3.5 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	E	E	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	PS	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	PS	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

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.

The meadow jumping mouse is federally listed as having partial status in the State of Tennessee. This indicates that the species is designated as threatened or endangered in a portion of its national range but that populations found in Tennessee have been determined to be secure at this time.

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*). The sharp-shinned hawk, like the meadow jumping mouse described above, is listed as having partial federal status in Tennessee; however, statewide populations appear to be currently stable.

In this most recent bird study, AMEC identified 14 additional 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*). State conservation status of all VTS-S avian species may be found in Appendix F.

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 3.5). While gray bats may potentially use some of the waterways on the training site for foraging, none were recorded with ultrasonic detectors used during the mammal survey in 2005 (Conservation Management Institute).

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.

3.10.3 Historic Overview

<u>European Contact, Colonization, and Early Statehood</u>
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.

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 Training Area 2 for use by the Bradley training school.
- Thin TA 2 overstory and create two small (1 acre) openings for platoon assembly areas.
- Clarify accessibility and allowable use status for TA 3.
- Thin TA 3 overstory and enlarge existing opening.

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.

4.2.1 Ecosystem Management and Maintenance of Biodiversity

In 1994, the Office of the Under Secretary of Defense for Environmental Security issued a memordandum 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 4715.3, “Environmental Conservation Program”, implements policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources on property under DoD control.

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 ensure 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).

Goals:

- Provide the ecosystem types needed for training.
- Maintain or improve ecosystem and habitat diversity.
- Maintain or improve species diversity.
- Protect unique communities.

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

Tasks	Targets
Identify natural resources characteristics needed for training activities on VTS-S through consultation with training site manager, training site commander, units, and trainers.	1a. Missionscape statement development FY11
Determine appropriate acreage and locations for given mission habitats based on training needs and VTS-S characteristics.	1b. Missionscape plan development FY12
Develop and implement management actions to create, improve or expand mission habitats, as needed.	

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

Tasks	Targets
Repeat vegetation community survey every ten years.	1c. Vegetation community PLS FY16
Repeat wetland survey using USACE formal delineation guidelines every ten years.	1d. Wetland PLS FY10 (in progress) and FY20
Repeat surface water quality assessment every 5 years.	1e. Surface water quality assessment FY14

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

Tasks	Targets
Conduct a baseline survey for potential threatened and endangered species and repeat every 5 years.	1f. Rare species PLS FY 12 and FY17
Conduct a bat survey and repeat every 5 years.	1g. Bat PLS FY 13 and FY18
Repeat bird survey every 5 years.	1h. Avian PLS FY12 and FY17

Conduct an insect survey.	1i. Insect PLS FY14
Repeat aquatic fauna survey, including macroinvertebrate and vertebrate organisms every 5 years.	1j. Aquatic fauna PLS FY14
Repeat mammal survey every 5 years.	1k. Mammal PLS FY15
Repeat herpetofauna survey every 5 years.	1l. Herpetofauna PLS FY14

Objective 1-4: Develop management strategies to protect ecotypes/habitats of importance, including former barrens/cedar glade systems.

Tasks	Targets
Identify and prioritize ecotypes of significance at regional and local scales.	1m. Map and priority list of extant ecosystems FY12
Identify training or other threats to significant habitats.	
Determine the necessity of significant habitats to training activities, and identify alternate areas for training where feasible.	1n. Threat and usage details collected FY12
Develop protection plan for significant habitats	1o. Protection plan FY13
Implement measures of biodiversity at multiple scales to monitor habitat health (see Section 4.2.11).	

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

Tasks	Targets
Eliminate invasive exotic species where feasible (see Section 4.2.10)	
Initiate conversion to native species to restore natural vegetation communities, especially in grassland areas, where there is no conflict with military training.	1p. Identify locations for native species restoration FY11 1q. Develop restoration plan 1r. Implement restoration plan as possible
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).	
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

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'. Meadow jumping mouse and sharp-shinned hawk also have partial Federal status in the State of Tennessee, meaning that while threatened or endangered in other portions of their range, populations in Tennessee demonstrate sufficient stability that they do not warrant protection under ESA. However, in case their protected range should expand in the future, 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) did not reveal 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 should change, and/or if management protocols are developed for them.

Goals:

- Avoid conflicts between the training mission and species protection.
- Maintain native plant communities that support state and federal rare, threatened, or endangered species.
- Cooperate with the U.S. Fish and Wildlife Service and the Tennessee Wildlife Resources Agency.
- Ensure that VTS-S remains in compliance with the Endangered Species Act.

Objective 2-1: Quantify and monitor populations of state and federal RTE species of VTS-S.

Tasks	Targets
Resurvey for Stone's River bladderpod in appropriate habitats on the training site following significant shoreline disturbance events.	2a. Bladderpod survey FY12
Investigate extent of sharp-shinned hawk populations occurring at VTS-S, as well as habitat use and potential nesting sites.	2b. Sharp-shinned hawk survey FY13
Investigate extent of meadow jumping mouse populations on VTS-S as well as habitat specifications.	2c. Meadow jumping mouse survey FY15
Incorporate Indiana bat survey protocol into regularly scheduled bat surveys.	See target 1g
Perform a comprehensive survey for RTE species every 5 years.	See target 1f
Develop management plan and monitoring protocol for any new species identified on VTS-S, as needed.	

Objective 2-2: Identify and manage native communities currently supporting or potentially supporting RTE species.

Tasks	Targets
Integrate community information with RTE information and develop community-based habitat management plans and monitoring protocols for significant habitats, as needed.	
Control invasive pest plant species where impacting RTE habitats (see Section 4.2.10)	
Monitoring health of communities of interest through long-term vegetation monitoring program and repeat surveys (see Section 4.2.11).	

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.

Goals:

- Investigate restoration of unused areas on VTS-S.

Objective 3-1: Investigate TNARNG use agreements with the USACE regarding Training Area 3.

Tasks	Targets
Investigate terms of license with the USACE regarding the former landfill in TA 3.	
Determine whether other historical documents, beyond the license, state conditions of TNARNG use of TA 3.	
Develop guidance for TNARNG use of TA 3.	3a. Summary document FY12

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.

Goals:

- Keep topsoil in its place.
- Minimize the development of erosion and sedimentation problems on the training land.
- Rehabilitate existing erosion problems.
- Protect shorelines from unnecessary erosion.

Objective 4-1: Identify and rehabilitate degraded and eroding training land.

Tasks	Targets
Develop a reporting form for TNARNG soldiers and training site personnel to report erosion problems identified during other daily activities.	4a. Form prepared FY11
Install reporting form on the Environmental webpage for easy access for all personnel.	4b. Form on website FY11
Establish regular surveys of training areas to identify and prioritize degraded or eroded areas requiring rehabilitation.	4c. Annual surveys beginning FY12
Develop a system for compiling erosion reports, prioritizing projects, and tracking project progress and budget through the ENV office.	4d. Tracking system FY12
Repair erosion problems as identified. (Typically a facility responsibility).	
Develop an "erosion guide" for VTS-S that identifies areas experiencing repeated erosion and gives guidance in appropriate repair and avoidance methodology.	4e. Erosion guide FY12
Develop training for soldiers, commanders, and planners in Best Management Practices and their applicability to TNARNG actions.	4f. BMP training module FY13

Objective 4-2: Protect shoreline of J. Percy Priest Lake and all riparian areas from potential causes of erosion.

Tasks	Targets
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).	
Post and maintain signs identifying SMZs.	4g. Posting complete FY11 and checked biennially
Maintain SMZs during all timber harvests and other clearing activities, retaining all trees that exist within the buffer zone.	
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.	4h. SMZ training module FY13
Monitor erosion at the boat ramp in TA 4 and repair 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.

Goals:

- Minimize nutrient and sediment inputs from watersheds.
- Minimize non-point source pollution in watersheds through use of Best Management Practices.
- Understand the ecosystem dynamics and stressors within the watersheds.
- Retain/rehabilitate vegetative buffers on waterways.
- Incorporate watershed management concerns into training and land management planning.

Objective 5-1: Improve knowledge of existing riparian areas and their conditions.

Tasks	Targets
Vegetation community surveys and aquatic fauna surveys as noted in Section 4.2.1.	
Survey streams as part of regular erosion surveys as noted in Section 4.2.4.	
Develop and implement monitoring protocol for water resources to assess water quality across the training site and at in-flow and out-flow points.	5a. Implement water monitoring FY12
Resurvey karst features every 10 years to monitor change.	5b. Karst survey FY15

Objective 5-2: Improve buffering quality of the riparian areas.

Tasks	Targets
Perform riparian habitat assessments to identify degraded riparian corridors and prioritize restoration efforts.	5c. Riparian habitat assessments FY13
Restore degraded buffers with appropriate native vegetation, as needed.	
Repair erosion and sedimentation problems as identified, in accordance with Section 4.2.4. (Generally a Facilities responsibility).	
Control invasive species in the riparian communities to allow native species to re-establish (see Section 4.2.10).	
Monitor riparian ecosystems to determine effects of management through long-term vegetation monitoring and repeat surveys (see Section 4.2.11).	

4.2.6 Wetlands Protection

VTS-S has approximately 6.4 acres of wetland ecosystem, the majority of which are located on the eastern shore of J. Percy Priest Lake in Training Area 2. 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 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.

Goals:

- Minimize operational impact of the military mission on wetlands.
- Maintain functional, healthy wetlands that are resilient to minor, inadvertent encroachments and impacts.
- Manage for no net loss of wetland acreage, function, or value.

Objective 6-1: Improve knowledge of existing wetlands and their conditions.

Tasks	Targets
Wetland surveys as noted in Section 4.2.1.	
Develop protocol for and implement regularly scheduled wetland condition monitoring.	6a. Monitoring protocol FY12
Conduct a floristic study of wetland habitats. Significant flora will be subject to appropriate monitoring.	6b. Floristic study FY13
Conduct a faunal study of wetland habitats. Significant fauna will be subject to appropriate monitoring.	6c. Fauna study FY13

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

Tasks	Targets
Post signs identifying 50' wetland buffers.	6d. Post after 2010 survey complete
Identify areas surrounding wetlands that require a vegetative buffer or filterstrip (or repair thereto) for protection.	6e. Buffer zone vegetative assessment FY13

Educate troops, management staff, and other site users on the importance of wetland buffers, the limitations to their use, and regulatory and permitting issues involved in wetland area activities.	6f. Wetland training module FY13
Visually monitor wetlands annually to ensure compliance with SMZs.	

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.

Goals:

- Provide optimum forestland training opportunities for TNARNG.
- Improve forest health and wildlife habitat through appropriate forest management techniques.
- Manage for native forest species appropriate to the region.

Objective 7-1: Maintain forest inventory and other information needed for forest management planning.

Tasks	Targets
Repeat forest inventory every 10 years.	7a. Timber inventory FY15
Conduct planning level surveys as noted in Section 4.2.1	

Objective 7-2: Improve training areas by selected timber harvesting.

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

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

Tasks	Targets
Identify stands requiring improvement through forest inventory, planning level surveys, and general observation.	7c. Annual update of FMP
Perform timber stand improvement activities IAW Annex 1.	7d. Annual timber ROA
Conduct prescribed burning, where appropriate, to improve forest	

health and wildlife habitat, IAW Annex 2 (see Section 4.2.8).
Control invasive exotic species within the forest ecosystem IAW Annex 3 (see Section 4.2.10).
Maintain appropriate stand conditions along and around waterways with streamside management zones and best management practices.
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 can occur. 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.

Goals:

- Minimize threat of wildfire to the training site.
- Utilize prescribed fire, as appropriate, to maintain training area conditions and native ecosystems.

Objective 8-1: Ensure sufficient firebreaks for protection of VTS-S resources and to prevent fire escape from the training site.

Tasks	Targets
Identify additional firebreak locations needed.	8a. Consult with TDF and training site FY12
Create firebreaks where needed, with consideration for erosion potential and 508-line. Facility responsibility.	
Develop and implement schedule of maintenance for firebreaks. Facility responsibility.	

Objective 8-2: Perform prescribed burning as appropriate for training and ecosystem management needs, IAW Annex 2.

Tasks	Targets
Obtain training for TNARNG personnel for prescribed burning and wildland fire fighting.	8b. Annual refresher training. Additional training opportunities as needed.
Obtain equipment for prescribed burning, as needed.	
Coordinate with the TN Division of Forestry or other organizations to provide a trained prescribed fire burn boss, as needed.	
Implement prescribed fire program in Annex 2 for fuel reduction, training area, and ecosystem management.	

Conduct postburn evaluations to monitor efficacy of prescribed fire program.	
Review Wildland Fire Management plan annually and update as needed.	8c. Annual WFMP review

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.

Goals:

- Limit negative impacts on wildlife or wildlife management by training activities or land management.
- Improve wildlife habitat where possible through management of native communities and use of native plant species.

Objective 9-1: Gain updated and complete data on wildlife use of VTS-S.

Tasks	Targets
Perform baseline biological surveys as noted in Section 4.2.1.	

Objective 9-2: Manage habitats for all native species, not just game species.

Tasks	Targets
Protect and maintain native species vegetative buffers around water sources, in accordance with SMZ protocols (see Section 4.2.5).	
Install and maintain nest boxes for appropriate bird species, as possible.	9a. Annual wood duck box maintenance
Convert grassland areas to native plant species where feasible. See Section 4.2.1.	
Educate troops, management staff, and other site users on protection of wildlife species and habitats.	9b. Wildlife training module FY13

Objective 9-3: Determine the necessity/feasibility of a hunting program for VTS-S.

Tasks	Targets
Consult with Training Office and training site personnel to determine if the military mission can be coordinated with limited public access hunting.	9c. Hunting discussion FY11
Consult with TWRA about the potential need for additional public hunting opportunities in Rutherford County and the suitability of VTS-S	9d. Consultation FY12

to fill that need.	
Gather information about game species populations on the training site and in the region.	9e. Games species population counts FY13
Consult with TWRA about the carrying capacity of the training site and whether additional population control is needed for any game species.	

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. All chemical pesticide applications must be reported to the TNARNG 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.

Goals:

- Implement Integrated Pest Management according to the TNARNG Integrated Pest Management Plan (IPMP).
- Minimize the use of chemical pesticides and herbicides while achieving needed control.
- Ensure compliance with all legislation, regulations, and guidelines for pest management.
- Control animal and plant pests on the installation.

Objective 10-1: Control invasive species (IAW Executive Order 13112) to protect the natural ecosystems of the training site.

Tasks	Targets
Repeat survey to identify and map invasive pest plant infestations every 5 years.	10a. IPP survey FY12
Implement appropriate pest plant controls IAW Annex 3.	10b. Annual implementation efforts
Monitor change in IPP infestations through long-term vegetation monitoring (see Section 4.2.11).	

Objective 10-2: Control invasive species for improvement of training areas.

Tasks	Targets
Identify problem plant species that may interfere with training activities and develop control plan.	10c. Training-specific IPP control plan FY14
Implement appropriate controls to eliminate problem plants from training areas. Facility or Range responsibility.	
Monitor change in IPP infestations through long-term vegetation monitoring (see Section 4.2.11).	

Objective 10-3: Control pest species for safety and comfort of training site users.

Tasks	Targets
Install, as feasible, and maintain bat boxes and bird nest boxes for biological control of mosquitoes around buildings and bivouac sites.	10d. Annual box maintenance
Regularly monitor training site for presence of imported fire ant infestations.	10e. Annual fire ant survey
Control pest animal populations as needed. Facility responsibility.	

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:

- To use data collected from analyses of long-term vegetation plots to monitor effects of training activities and land management practices on VTS-S.

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

Tasks	Targets
Develop vegetation monitoring protocols for VTS-S.	11a. Monitoring protocol in FY12
Establish vegetation monitoring plots.	11b. VTS-S plots in place in FY14
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.

Goals:

- Maintain an attractive, functional landscape appropriate to TNARNG needs.
- Minimize the disconnect between "maintained" and "natural" landscapes.
- Decrease the use of chemical pesticides and herbicides.

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

Tasks	Targets
Use native grasses to seed exposed soils except where the native warm season grass growth habit is incompatible with use (e.g., firing ranges).	
Use native shrubs, trees, and wildflowers for aesthetic plantings.	
Use native species for all reclamation plantings.	
Create a list of non-native plants to avoid and a list of native alternatives and their planting requirements for landscaping purposes.	12a. Native planting guide FY11

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.

Tasks	Targets
Survey the training site for appropriate boundaries between natural and maintained landscapes.	
Develop and implement a program to create more gradual edges. *Ensure that changes to the vegetation structure will not affect training or safety.*	12b. Edge conversion plan FY14

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

Tasks	Targets
Create list of values that may be impacted by grounds maintenance and determine appropriate scheduling and process for their protection.	12c. List and details FY14
Modify the grounds maintenance calendar in the INRMP to reflect these protection efforts.	12d. Calendar finalized FY14

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.

Goals:

- Take precautions to minimize conflict between training and nearby recreational activities so that such recreational use will 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.

Tasks	Targets
Identify locations on VTS-S at which access limitations may be unclear or unstated, especially along the facility's shorelines.	13a. Survey FY12
Post and maintain regulations and signs to inform public of site access limitations as needed. 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 marked with signs and surveyors tape. 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.

Goals:

- Identify natural-occurring hazards present at VTS-S.
- Minimize risk of such hazards for TNARNG staff, soldiers, and members of the public utilizing the training facility.

Objective 14-2: Identify and make known naturally-occurring, concealed features that may present risks on VTS-S.

Tasks	Targets
Karst feature survey every ten years to track changes in the landscape.	14a. Karst resurvey FY15
Post and maintain regulations and signs that delineate boundaries and use restrictions of areas with concentrated karst features. 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.

Goals:

- Manage cultural resources in support of the military training mission.
- Identify conflicts between cultural resources management and the training mission. Reconcile conflicts by ensuring continuance of the military mission while protecting cultural resources.
- Avoid impacts to historic, prehistoric, and archaeological resources on VTS-S in accordance with cultural resources laws and regulations.
- Maintain good relations with the American Indian tribes that have interest in TNARNG lands.

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

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.

Goals:

- Continue to expand the information contained in the database and meet the ever growing demand to make data more readily available via interactive web applications.
- Utilize the data for training and management planning and for reporting purposes.

Objective 16-1: Maintain a constantly improving GIS.

Tasks	Targets
Identify the data layers captured and those still needed.	
Update older data layers and create new, as needed, or as information becomes available.	
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.	16a. Review contract wording annually.

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 and Army National Guard policy; and,
- Provide National Guard Bureau 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.

4.3 NATURAL RESOURCES PROJECTS

4.3.1 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
Phase I Natural Resources Survey	Sept 1994	Lose and Associates, Inc.	NA
Natural Resources Aquatic Survey	Aug 1999	Science Applications International Corporation	2008
Phase II Natural Resources Terrestrial Survey	March 2000	Science Applications International Corporation	NA
Phase I Vegetative Communities Survey	March 2001	Environmental Resources Management	NA
Karst Survey	June 2005	Dynamic Solutions, LLC	2015
Planning Level Mammal Survey	Nov 2005	Conservation Management Institute	2015
Biological Survey for Invasive Species	Nov 2005	Dynamic Solutions, LLC	2010
Forest Inventory	Sept 2006	Forest Management Group	2015
Vegetation Community Survey	Jan 2007	AMEC Earth and Environmental , Inc.	2017
Planning Level Avian Survey	Sept 2008	AMEC Earth and Environmental, Inc.	2012
Survey for Stones River Bladderpod	April 2008	SpecPro, Inc.	2012
Aquatic Fauna Planning Level Survey and Surface Water Quality Assessment	Jan 2009	URS Corporation	2014
Herpetological Fauna Baseline Survey	April 2010	URS Corporation	2014
Planning Level Wetlands Survey	In progress	URS Corporation	2020

4.3.2 Implementation of INRMP 2002-2006

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 previous INRMP was found to be ineffective in guiding actual land management efforts. It is hoped that many of its weaknesses have been eliminated in this iteration of the plan.

Despite the flaws in the first INRMP, natural resources management has progressed on VTS-S during the time since its implementation: a great deal of basic information has been gathered through planning level surveys 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 the original INRMP 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 4.3).

Table 4.2: Project status from the 2002-2006 INRMP.

Project / Management Action	Status
Conduct planning level floristics survey.	Completed 2007
Conduct planning level mammal trapping and audio surveys.	Completed 2005
Conduct survey of invasive exotic plants.	Completed 2005
Monitor effects of prescribed fire through post burn evaluations.	Prescribed burns have not been conducted.
Conduct breeding and migratory bird survey.	Completed 2008
Conduct planning level wetlands survey.	In progress
Revegetate areas that are incapable of natural regeneration with native plant materials.	All portions of training site carry appropriate vegetative cover
Remove invasive exotic shrub species as necessary to provide habitat for native species.	On-going
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.	On-going
Establish a 50-foot riparian buffer zone on either side of Stewart Creek, marking with Seibert stakes where necessary.	Completed 2009
Replace riparian vegetation that is impacted by construction/maintenance activities at a 3:1 slope.	On-going
Use BMPs for tank trail maintenance to eliminate impacts to riparian areas and streams.	On-going
Conduct planning level topographic 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 in progress
Conduct water quality monitoring of Stewart Creek.	Completed 2009
Build wood duck boxes, place adjacent to emergent wetlands, and maintain annually.	Completed 2005; maintenance on-going
Certify and maintain certification of pesticide applicators.	On-going
Eradicate invasive pest plants using prescribed fire, cutting, and herbicidal controls.	On-going
Update and implement pest management plan.	Completed 2010

4.3.3 Natural Resources Projects for Revised INRMP

Many natural resources and training site improvement projects are planned for upcoming years. Most are identified in Chapter Four of this plan. Table 4.3 lists all of these projects, grouped according to management sphere (ecosystem management, endangered species, wetlands, etc.) and objective.

An estimated cost is provided for projects which are expected to involve any expenditure beyond manpower. Most of these projects have been entered into the appropriate budget system; however, implementation is 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 Environmental (ENV) or the Facilities office. 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.

Table 4.3: VTS-S Natural Resources Projects

Management Area	Targets (Objectives in blue)		Project Origin[1]	Year	Est. Cost & Method[2]	Proponent[3]	Status	Actual Cost
1. Ecosystem Management	1-1	Manage for mission-suitable habitats or "missionscape"						
	1a	Missionscape statement development	N	2011	IH	ENV		
	1b	Missionscape plan development	N	2012	IH	ENV		
	1-2	Identify ecotypes present on the training site and maintain up to date information regarding those systems						
	1c	Vegetation community planning level survey every 10 years	R	2016	C $45,000	ENV		
	1d	Wetland survey every 10 years	R	2010 2020	C $40,000 C $50,000	ENV	In Prog	$42,354 sw
	1e	Surface water quality assessment every 5 years	R	2014	C $20,000	ENV		
	1-3	Characterize the species composition, ecosystem health, and wildlife use of the significant habitats on VTS-S.						
	1f	RTE planning level survey every 10 years	N	2012	C $40,000	ENV		
	1g	Bat baseline survey and repeat every 5 years	N	2012 2017	C $40,000 C $45,000	ENV		
	1h	Avian survey every 5 years	R	2013 2018	C $35,000 C $37,500	ENV		
	1i	Insect baseline survey	N	2014	C $35,000	ENV		
	1j	Aquatic fauna survey every 5 years	R	2014 2019	C $25,000 C $30,000	ENV		
	1k	Mammal survey every 5 years	R	2015	C $35,000	ENV		
	1l	Herpetofauna survey every 5 years	R	2014	C $35,000	ENV		
	1-4	Develop management strategies to protect ecotypes/habitats of importance.						
	1m	Map and priority list of extant ecosystems	N	2012	IH	ENV		
	1n	Threat and training use details	N	2012	IH	ENV		
	1o	Habitat protection plan development	N	2013	IH	ENV		
	1-5	Manage for ecosystem health, wildlife, and improved habitat quality.						
	1p	Identify locations for native species restoration	N	2011	IH	ENV		
	1q	Develop restoration plan	N	2011	IH	ENV		
	1r	Implement restoration plan	N	As feasible	IH	ENV		

[1] 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] Probably method of conducting project: C = contract; IH = in-house. 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; SITE = training site staff.

RTE Management	2-1	Quantify and monitor populations of state and federal RTE species on VTS-S.						
	2a	Stone's River bladderpod survey	R	2012	IH	ENV		
	2b	Sharp-shinned hawk survey	N	2013	C $30,000	ENV		
	2c	Meadow jumping mouse survey	N	2015	C $35,000	ENV		
Reclamation / Mitigation	3-1	Investigate use agreements with the USACE regarding Training Area 3						
	3a	Summary document	N	2012	IH	ENV/SITE		
Erosion Control	4-1	Identify & rehabilitate degraded training lands.						
	4a	Develop erosion reporting form	N	2011	IH	ENV		
	4b	Install reporting form on ENV webpage	N	2011	IH	ENV		
	4c	Annual erosion surveys	N	2012/ Annual	IH	ENV		
	4d	Erosion report tracking system	N	2012	IH	ENV		
	4e	Develop erosion repair guide	N	2012	IH $2,000	ENV		
	4f	BMP training module	C	2013	IH $1,000	ENV		
	4-2	Protect J. Percy Priest Lake shoreline and riparian areas from erosion.						
	4g	Post signs designating SMZs	C	2011	IH $1,000	ENV		
	4h	SMZ training module	N	2013	IH $1,000	ENV		
Watershed Management	5-1	Improve knowledge of riparian areas & conditions.						
	5a	Implement water quality monitoring	C	2012 / Annual	IH $2,000 per year	ENV		
	5b	Karst feature survey every 10 years	R	2015	C $25,000	ENV		
	5-2	Improve buffering quality of riparian areas						
	5c	Riparian habitat assessments	N	2014	IH $5,000	ENV		
	5d	Restore degraded riparian areas as needed	N	As feasible	IH	ENV		
Wetlands Protection	6-1	Increase knowledge of wetlands & conditions.						
	6a	Develop and implement wetland monitoring protocol	N	2012	IH/C $10,000	ENV		
	6b	Wetland floristic survey	C	2013	C $25,000	ENV		
	6c	Wetland fauna survey	C	2013	C $25,000	ENV		
	6-2	Implement and enforce buffer areas around wetlands.						
	6d	Post signs identifying 50' buffer zones	N	2012	IH $3,000	ENV		
	6e	Buffer zone vegetative assessment	N	2013	IH	ENV		
	6f	Wetland buffer training module	C	2013	IH $1,000	ENV		
Forest Management	7-1	Maintain needed forest information.						
	7a	Repeat forest inventory every 10 years	R	2015	C $25,000	ENV		
	7-2	Improve training areas via forest management						
	7b	Consult with training site staff	C	Annual	IH	ENV		
	7-3	Improve forest health & habitat quality						

	7c	Review data and update forest management plan	C	Annual	IH	ENV		
	7d	Annual timber ROA and RPTS system info	C	Annual	IH	ENV		
Fire Management	8-1	Ensure effective firebreak system						
	8a	ID additional firebreak locations needed	C	2012	IH	ENV		
	8-2	Implement prescribed fire program						
	8b	Annual refresher training	C	Annual	IH $1,000 per year	ENV		
	8c	Annual WFMP review/update	C	Annual	IH	ENV		
Fish & Wildlife Management	9-1	Gain updated and complete data on Wildlife use of VTS-S.						
	9-2	Manage habitats for all native species.						
	9a	Annual wood duck box maintenance	R	Annual	IH	ENV		
	9b	Wildlife training module	C	2013	IH $1,000	ENV		
	9-3	Determine the necessity/feasibility of a hunting program for VTS-S.						
	9c	Discussion with training site on the potential	N	2011	IH	ENV		
	9d	Consult with TWRA on need in region	N	2012	IH	ENV		
	9e	Game species population counts	N	2013	C $30,000	ENV		
Pest Management	10-1	Control IPP for ecosystem health						
	10a	Invasive pest plant survey every 5 years	R	2012 2017	C $25,000 C $27,500	ENV		
	10b	Annual implementation of IPP control plan	C	Annual	IH/C $10,000	ENV		
	10-2	Control pest species for training are improvement						
	10c	Develop training specific IPP control plan	N	2014	IH	ENV		
	10-3	Control pests for TNARNG safety & comfort.						
	10d	Install and maintain bat boxes & bird nest boxes	C	Annual	IH $1,000	ENV		
	10e	Annual fire ant survey	N	Annual	IH	ENV/FAC		
Long-term Monitoring	11-1	Develop and implement a vegetation monitoring program						
	11a	Develop monitoring protocol	C	2012	IH/C $10,000	ENV		
	11b	Establish vegetation monitoring plots	C	2014	IH	ENV		
Grounds Maintenance	12-1	Utilize regionally native species for all planting.						
	12a	Develop native planting guide	N	2011	IH $500	ENV		
	12-2	Blur the “edge” between maintained and natural areas.						
	12b	Develop edge conversion plan	N	2014	IH	ENV		
	12-3	Adjust maintenance schedules to benefit environment.						
	12c	Create list of values impacted by grounds maintenance	N	2014	IH	ENV		
	12d	Modify maintenance calendar in INRMP	N	2014	IH	ENV		
Recreational Use Management	13-1	Identify and make known the legal public access restrictions on VTS-S.						
	13a	Survey site for posting needs	N	2012	IH	ENV/SITE		
	13b	Post shoreline thoroughly	N	2013	IH	FAC/SITE		

Environmental Hazards	14-1	Identify and make known naturally-occurring, concealed features that present a risk.						
	14a	Resurvey karst features	R	2015	C $25,000	ENV		
Cultural Resources		Projects are defined in the TNARNG ICRMP.						
GIS	16-1	Maintain a constantly improving GIS.						
	16a	Review contract wording	C	Annual	IH	ENV		

CHAPTER 5
RESOURCE PROTECTION GUIDELINES

The projects identified in the previous chapter are intended to improve the management and conservation of the 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

- Only existing roads and trails will be utilized. No new entrances will be made into any training area or range without the approval of VTS-S Range Control.
- Track vehicles are restricted to trails and hardened crossings when authorized to move between training areas.
- Vehicular use of cedar and hardwood stands is limited to roads as much as possible, except for special training areas. Bivouac sites and other training areas should be rotated to minimize impact on the soils and vegetation.
- 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 food plots, experimental exclosures, or other wildlife management equipment or facilities.
- Trees will not be cut without prior approval of the Environmental Office and the VTS Commander. Brush and small vegetation may be used for camouflage and training barricades. Upon completion of the exercise, camouflage and trail barricades will be properly policed.

Streams and Wetlands

- Streamside Management Zones (SMZs) shall be identified around all water bodies see (Figure 3.5). 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 an SMZ 50 feet wide surrounding all wetland areas.
- Avoid operating vehicles in SMZs.
- Road 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 his 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 trained TNARNG personnel. 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 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 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 drainageways 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 activites 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 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, the following:

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 5.1.5 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.
- 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 all forest resources on VTS-S and is responsible for maintaining the health and integrity of the forest ecosystem. Key factors in the utilization of forestlands on VTS-S are:

- Only existing roads and trails will be utilized. No new entrances will be made into any training area or range without the approval of VTS Range Control.
- Vehicular use of forest stands is limited to roads, except for special training areas (e.g., bivouac sites, designated training points).
- 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.
- Trees will not be cut without prior approval of the Environmental Office and the VTS Commander. Brush and small vegetation may be used for camouflage and training barricades. Upon completion of exercise, camouflage, and trail barricades will be property policed.
- 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:

- Avoid use of non-native species for reseeding grassland areas. Utilize a native mix appropriate to the site and intended use. In particular, 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*).
- Prescribed fire is a useful tool for maintaining grassland ecosystems. See Annex 2 for details of the VTS-S Prescribed Burn Plan.
- Existing roads and trails will be utilized whenever possible. No new entrances will be made into any training area or range without the approval of VTS 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 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 "Approved Pesticide 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 are no known federally threatened or endangered species at VTS-S. 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 Fertilize Plant cool season grasses	April 15 -> Plant native grass seed Fertilize Plant cool season grasses	Plant native grass seed Plant warm season grasses	Plant warm 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.

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).

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.

National Oceanic and Atmospheric Administration. 2004. Climatography of the United States No. 20, 1971-2000, Station: Murfreesboro 5 N, Tennessee. National Climatic Data Center, Asheville, North Carolina. Available at: http://cdo.ncdc.noaa.gov/climatenormals/clim20/tn/406371 (Accessed January 2008).

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).

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 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.

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