INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

VOLUNTEER TRAINING SITE – CATOOSA

Tennessee Army National Guard
Nashville, Tennessee
September 2018

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Volunteer Training Site – Catoosa
Revised 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 200-1, and the "Executive Summary and Scope" within this plan. It has set appropriate and adequate guidelines for conserving and protecting the natural resources of the Volunteer Training Site at Catoosa

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ACRONYMS AND ABBREVIATIONS

AR	Army Regulations
ARNG	Army National Guard
BMP	Best Management Practice
CACTF	Combined Arms Collective Training Facility
CEQ	Council for Environmental Quality
CFMO	Construction and Facilities Management Office
CPX	Command Post Exercise
DA	Department of Army
DBH	Diameter at Breast Height
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	U.S. Environmental Protection Agency
EPD	Georgia Environmental Protection Division
FFT2	Firefighter Type 2 (wildland fire fighter NWCG standards)
FMO	Facilities Maintenance/Engineering Office (of the TNARNG)
FONSI	Finding of No Significant Impact
FTX	Field Training Exercise
GFC	Georgia Forestry Commission
GIS	Geographic Information System
GPS	Global Positioning System
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IPMP	Integrated Pest Management Plan
IPP	Invasive Pest Plant
ISO	International Standard Organization
ITAM	Integrated Training Area Management
LCES	Lookouts, Communications, Escape Routes, and Safety Zones
LCTA	Land Condition Trend Analysis (now RTLA)
LRAM	Land Rehabilitation and Maintenance
METL	Mission Essential Task List
MOA	Memorandum of Agreement
MOSQ	Military Occupational Skill Qualification
MP	Military Police
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NCVS	North Carolina Vegetation Survey
NEPA	National Environmental Policy Act

NFDRS	National Fire Danger Rating System
NFPA	National Fire Protection Act
NGB	National Guard Bureau
NGB-ILE	National Guard Bureau - Director of Environmental Programs
NGO	Non-Government Organization
NLEB	Northern Long-Eared Bat (*Myotis septentrionalis*)
NPS	Non-Point Source Pollution
NRM	Natural Resources Manager (of the TNARNG)
NWCG	National Wildfire Coordinating Group
NWS	National Weather Service
NWSG	Native Warm Season Grasses
O&M	Operations and Maintenance
POTO	Plans, Operations, and Training Officer (of the TNARNG)
PPE	Personal Protective Equipment
PPK	Projectile Point/Knives
REC	Record of Environmental Consideration
ROA	Report of (timber) Availability
RTE	Rare, Threatened, or Endangered Species
RTLA	Range and Training Land Assessment (previously LCTA)
RTLP	Range and Training Land Program
SAIA	Sikes Act Improvement Act of 1997
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
SRA	Sustainable Range Awareness
SRP	Sustainable Range Program
STEP	Status Tool for Environmental Program
SWPPP	Storm Water Pollution Prevention Plan
TA	Training Area
TAG	The Adjutant General
TDEC	Tennessee Department of Environment and Conservation
TNANG	Tennessee Air National Guard
TNARNG	Tennessee Army National Guard
TNC	The Nature Conservancy
TN-EPPC	Tennessee Exotic Pest Plant Council
TNIPC	Tennessee Invasive Plant Council
TRI	Training Resources Integration
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USACE	United States Army Corps of Engineers

USAEC	United States Army Environmental Center
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Service
VFD	Volunteer Fire Department
VOC	Volatile Organic Compounds
VTS-C	Volunteer Training Site -- Catoosa
WFMP	Wildland Fire Management Plan

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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 – Catoosa (VTS-C). The original VTS-C INRMP was implemented in 2002 and most recently revised in 2012. Revisions to this iteration of the INRMP are largely changes in formatting to make the document more easily used and updated, and updates to current regulations, guidelines, species lists, and status of resource surveys. No significant changes in training site use or natural resource management have occurred since the last version was developed. This iteration does include the addition of one new federally listed species, the Northern Long-Eared Bat (NLEB, *Myotis septentrionalis*) to the Rare, Threatened, and Endangered Species Management Plan, along with one Georgia state listed species (Chickamauga Crayfish, *Cambarus extraneus*). Addition of these species to the plan did not create any significant changes to the document or management guidance within, as their requirements were already accomplished under guidance for other ecosystem, habitat, or species management purposes.

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

The National Environmental Policy Act (NEPA) of 1969 dictates that planners of public actions using federal monies, such as those on military installations, shall consider the environmental impacts and effects of "major federal actions." Section 1508.18 in the Council for Environmental Quality (CEQ) regulations lists the adoption of a formal Integrated Natural Resource Management Plan as a major federal action. An Environmental Assessment (EA) was prepared for this action during the last revision (see Appendix A), and is still valid due to the lack of substantive changes. In addition, in accordance with §670a(2) of the Sikes Act, approval of the INRMP by the U.S. Fish and Wildlife Service and the Georgia Department of Natural Resources has been indicated through their signatures on the document.

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; and,

- To provide management guidelines that will be effective in maintaining and improving the sustainability and biological diversity of terrestrial and aquatic ecosystems on the training site and that will support the military training mission through integrated, cooperative, and adaptive management.

Benefits to the military mission include improved maneuver lands and better distribution of military activities at VTS-C. This plan will increase training realism in the natural environment. It will also enhance long-range planning efforts at VTS-C. 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-C 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-C are presented in Chapter Three. Chapter Four addresses the management goals for VTS-C 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 nine Appendices of this document contain supplemental material, including NEPA documentation, additional biological data, and records of the annual review process. Five detailed management plans are included as annexes to this document: the Rare, Threatened, and Endangered Species plan, Forest Management Plan, Wildland Fire Management Plan, Invasive Pest Plant Control Plan, and the Herbicide Spray Plan for Grounds Maintenance. The Rare, Threatened, and Endangered Species Management Plan (Annex 1) also contains an assessment of the impacts of this plan on the federally listed species occurring in VTS-C and the U.S. Fish and Wildlife Service's concurring Biological Opinion.

Table of Contents

Acronyms and Abbreviations i
Executive Summary v
Table of Contents vii
List of Appendices ix
List of Management Plan Annexes ix
List of Tables x
List of Figures x

Chapter 1. General Information 1
1.1 Purpose 1
1.2 Management Philosophy 2
1.3 Responsibilities 2
1.3.1 National Guard Bureau 2
1.3.2 TNARNG 3
1.4 Relevant Environmental Regulations 4
1.5 Environmental Review 4
1.6 Implementation and Revision 5
1.6.1 Personnel 6
1.6.2 Outside Assistance 6
1.6.3 Training 7
1.6.4 Funding 7
1.6.5 Priorities and Scheduling 9
Chapter 2. Training Site Overview 11
2.1 Location and Regional Character 11
2.1.1 Location, Size, General Description 11
2.1.2 Property Ownership 11
2.1.3 Neighboring Land Ownership and Encroachment 11
2.1.4 Demographics 11
2.1.5 Nearby Natural Areas 14
2.2 Installation History 14
2.3 Military Mission 15
2.4 Facilities 15
2.5 Training Site Utilization 17
2.6 Effects of Training on Natural Resources 21
2.7 Natural Resources Needed to Support Military Mission 22
2.8 Natural Resources Constraints to Mission/Mission Planning 24
2.8.1 RTE Species 24
2.8.2 Topography 24
2.8.3 Surface Water 24
2.9 Geographic Information System (GIS) Assets 25
Chapter 3. Physical and Biotic Environment 27
3.1 Climate 27
3.2 Physiography and Topography 28
3.3 Geology 30
3.4 Soils 30
3.4.1 Soil Descriptions 30
3.4.2 Soil Erosion Potential 32

3.4.3 Prime Farmland 33
3.5 Water Resources 35
3.5.1 Surface Water 35
3.5.2 Ground Water 37
3.5.3 Water Quality 37
3.6 Wetlands 38
3.7 Vegetation 38
3.7.1 Vegetation Community Classification 39
3.7.2 Forest Inventory and Management 43
3.7.3 Invasive Pest Plants 45
3.8 Fish and Wildlife 47
3.8.1 Migratory Birds 47
3.8.2 Wildlife and Game Species 48
3.8.3 Aquatic Species 48
3.8.4 Pest Species 49
3.9 Rare, Threatened, or Endangered Species 50
3.9.1 Large-flowered Skullcap 52
3.9.2 Gray Bat 55
3.9.3 Northern Long-Eared Bat 56
3.9.4 Tricolored Bat 56
3.9.5 Chickamauga Crayfish 58
3.10 Cultural Resources 58
3.10.1 Paleoenvironment 58
3.10.2 Prehistoric Background 58
3.10.3 Historic Overview 59
3.10.4 American Indian Resources and Tribes 60
3.10.5 Cultural Resources Identified on VTS-C 61
Chapter 4. Resource Management Goals 65
4.1 Military Mission Goals and Objectives 65
4.2 Natural Resources Goals and Objectives 65
4.2.1 Ecosystem Management and Maintenance of Biodiversity 65
4.2.2 RTE Management 67
4.2.3 Reclamation/Mitigation 69
4.2.4 Erosion Control and Soil Conservation 69
4.2.5 Watershed Management 70
4.2.6 Wetlands Protection 72
4.2.7 Forest Management 72
4.2.8 Fire Management 73
4.2.9 Fish and Wildlife Management 74
4.2.10 Pest Management 75
4.2.11 Long-term Vegetation Monitoring 76
4.2.12 Grounds Maintenance 77
4.2.13 Recreational Use Management 78
4.2.14 Cultural Resources Management 78
4.2.15 Geographic Information Systems 79
4.2.16 Environmental Management Systems 79
4.2.17 Climate Change 79
4.2.18 Pollinator Management 81
4.3 Sustainable Range Program 81
4.3.1 Range and Training Lands Program (RTLP) 82
4.3.2 Integrated Training Area Management (ITAM) 82

4.4 Natural Resources Projects 85
4.4.1 Survey History 85
4.4.2 Implementation of 2002-2018 INRMPs 86

Chapter 5. Resource Protection Guidelines 91
5.1 Land Management Guidelines 91
5.1.1 Training Operations 91
5.1.2 LRAM and Construction 92
5.1.3 Facilities Management 94
5.1.4 Road Construction and Maintenance 95
5.1.5 Water Resources 97
5.1.6 Forestland Use 99
5.1.7 Grassland Use 100
5.1.8 Pest Management 101
5.1.9 Cultural Resources Management 101
5.2 Management Schedule 102

References 105

Appendices
A. Environmental Assessment A-1
B. Finding of No Significant Impact B-1
C. Agency Correspondence C-1
D. Public Comment D-1
E. Environmental Regulations E-1
F. Species Lists for VTS-Catoosa F-1
G. American Indian Tribes G-1
H. Pest Management Forms H-1
I. Annual Review Documentation I-1
J. Upcoming INRMP Projects J-1

Management Plan Annexes
1. Rare Species Management Plan 1-1
2. Forest Management Plan 2-1
3. Wildland Fire Management Plan 3-1
4. Invasive Pest Plant Control 4-1
5. Grounds Maintenance – Herbicide Spray Plan 5-1

List of Tables

2.1 Selected demographic data from Catoosa County, Georgia 11
2.2 Training site utilization, 2007-2016 18
2.3 Types of training anticipated 20
2.4 Military training and land use activities that may cause soil or vegetation disturbance 21

3.1 Soil types on VTS-C 30
3.2 Soil erosion potential on VTS-C 33
3.3 Forest product volume summary for VTS-C 44

4.1 Surveys completed at VTS-C 85
4.2 Project status from the 2002-2006 INRMP 86

5.1 Erosion Control Best Management Practices (BMPs) for LRAM and Construction Projects 93
5.2 Forestry Best Management Practices 95
5.3 Perennial and Intermittent Stream SMZs 98
5.4 Natural Resources Calendar 103

List of Figures

2.1 Location of VTS-Catoosa 12
2.2 Local surroundings of VTS-Catoosa 13
2.3 VTS-Catoosa training areas and facilities 16
2.4 Total training site use, FY 2007-2016 17
2.5 VTS-C Average Monthly Training Use FY 2007-2016 20

3.1 Mean daily temperature and mean monthly precipitation for Dalton, Georgia, 1961-1990 27
3.2 Topography of VTS-Catoosa 29
3.3 Soil types on VTS-Catoosa 31
3.4 Soil erosion potential on VTS-Catoosa 34
3.5 Surface water at VTS-Catoosa 36
3.6 Vegetation communities on VTS-Catoosa 42
3.7 Invasive pest plant species identified on VTS-Catoosa 46
3.8 Large-flowered skullcap occurrences on VTS-Catoosa 54
3.9 Large-flowered skullcap signs 55

CHAPTER 1
GENERAL INFORMATION

1.1 PURPOSE

The Tennessee Army National Guard (TNARNG) maintains the federally owned Volunteer Training Site –Catoosa (VTS-C) in Catoosa County, Georgia, for the purpose of training members of the Tennessee National Guard. The TNARNG manages the land on this training site for the goal that no net loss of training land result from training or natural resources management 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-C is the principle guiding document for TNARNG land management activities taking place on the training site. It is a revision of the 2012-2017 VTS-C INRMP, which was revised from the 2002-2006 INRMP. This INRMP will remain in effect until a revision is deemed necessary.

The Sikes Act, Public Law 105-85, "Sikes Act Improvement Act of 1997," (SAIA) November 18, 1997, requires the preparation of an Integrated Natural Resources Management Plan (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 Georgia Wildlife Resources Division (GWRD) are required to be cooperators in the process of developing the INRMP.

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 GWRD. The original VTS-C INRMP was implemented in 2002. In this year, a federally listed threatened species, the large-flowered skullcap (*Scutellaria montana*) was found in large numbers on the training site. The need to develop management guidelines for this species and the unsatisfactory nature of the original INRMP drove an internal decision by TNARNG in 2003 to initiate a full revision in coordination with the cooperating agencies. In 2005, Interim Guidance was provided by NGB requiring a joint decision with the cooperating agencies to initiate a full revision. As this revision was begun prior to the publication of the Interim Guidance, the agencies were not party to the initial decision, though they were a part of the assessment of the need for a rare species management plan. They were contacted when the revision process was begun and have contributed to the development of the new INRMP. Therefore, while conducting the formal five-year review, as defined in the Interim Guidance, would not have been useful, the spirit of the interagency cooperative effort has been honored. Documentation of this cooperation is included in Appendix C.

This Revised INRMP for VTS-C 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 during the five years. Barring earlier need for substantial revision, five years following the date of implementation of this document, the USFWS, GWRD, 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 INRMPs will serve to shape the direction of that process in order to support the military mission of the TNARNG,

encourage sustainable management of natural resources, and 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-C 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 environmental protection should not be seen as opposing. Rather, the one – a healthy environment – supports and enhances the other – training potential.

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

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

1.3 RESPONSIBILITIES

1.3.1 National Guard Bureau

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

The Sikes Act Coordinator at ARNG-I&E is responsible for reviewing the INRMP and advising the TNARNG before the state formally submits the plan for public review. ARNG-I&E ensures operational readiness by sustaining environmental quality and promoting the environmental ethic and is also responsible for tracking projects, providing technical assistance, quality assurance and execution of funds. Additionally, ARNG-I&E provides policy guidance and resources to create, sustain, and operate facilities that support the Army National Guard. ARNG-I&E coordinates proposed construction projects with Operations/Training and provides design and construction support, as well as environmental management that is directly related to property maintenance (e.g., grounds maintenance, pest control).

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

1.3.2 TNARNG

The Adjutant General (TAG) of the TNARNG is directly responsible for the operation and maintenance of VTS-C, 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 among environmental, training, and engineering staffs.

TAG has an Environmental (ENV) office to provide professional expertise in the environmental arena for VTS-C 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, 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 coordinating the ITAM program; by 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; planning for land use based on accomplishing training requirements while minimizing negative environmental effects; prioritizing and scheduling Land Rehabilitation and Maintenance (LRAM) projects with the Environmental Office and the Training Site Manager; and allocating funds and resources to accomplish ITAM requirements.

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 ITAM, 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-C. 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 Conservation Branch of the Environmental Office.

1.4 RELEVANT ENVIRONMENTAL REGULATIONS

Natural resources management at VTS-C 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 and are 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 as listed in 32 C.F.R. Part 651, Appendix B, a Record of Environmental Consideration (REC) 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 (FONSI) 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 (EIS) 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-C 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-C.

An Environmental Assessment (Appendix A) has been written to review the implementation of this plan. Topics addressed are related to the effects of the proposed plan on natural and cultural resources. The details are discussed in the following chapters and include but are not limited to: endangered species, wildlife, riparian zones, floodplains, wetlands, archaeological and historic sites, off-road vehicle use, sedimentation, erosion, timber harvesting and non-point source pollution.

1.6 IMPLEMENTATION AND REVISION

The original VTS-C 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. In addition, the discovery of a federally listed threatened plant species required substantive changes in the VTS-C management plan. TNARNG decided in 2003 to initiate a full revision of the document to bring the structure and project lists more in line with actual management practices and provide for the protection of the listed species. The cooperating agencies were informed of this decision and requested to contribute to the revision process; there was no opposition to this proposal. Both the USFWS and the GDWR contributed substantially to the development of the rare species management guidelines. This occurred prior to the publication of the DoD Supplemental Guidance (2004) and NGB Interim Guidance (2005) which defined the process for a review for operation and effect. 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. It will be reviewed and updated annually and will remain in effect until a review finds that significant revision is necessary. It was developed in cooperation with the USFWS Athens, GA, Field Office, and the GWRD. Those agencies have approved the document, as has the Regional Office of the USFWS. It was subjected to public review to satisfy both the Sikes Act and the NEPA process. Public comments were reviewed by the cooperating agencies and incorporated into the final document where appropriate. Public comments are recorded in Appendix D. In addition, Annex 1, the Rare Species Management Plan contains a Biological Assessment of the impacts of this management plan on the federally threatened large-flowered skullcap. The determination was made that impacts were not expected to be detrimental to the protected plant. The USFWS has concurred with this determination in its Biological Opinion, also attached to Annex 1.

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, GWRD, 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 I. 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 the date of implementation of this revision, a full scale review for operation and effect will occur in accordance with the SAIA. A revision or update at that time will be initiated based on this review effort conducted jointly with the USFWS and the GWRD.

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 4.2 will provide a basis for monitoring and evaluating accomplishments toward 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-C include:

- Permanent Staff
  - VTS-C Training Site Manager
  - VTS-C Range Control Officer
  - Two state-funded maintenance workers
  - Environmental Branch Personnel
    - TNARNG Environmental Program Manager
    - Natural Resources Manager
    - Integrated Pest Management Coordinator
    - Biologist
    - Cultural Resources Manager
- Part-time Staff
  - Training Site Detachment (8-10 people per weekend)
  - Summer Interns
- 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, development of a confidence course, and hardened bivouac site construction. A minimum of 100 man days per year are required to complete necessary LRAM projects and 95 man days for environmental projects using troop labor at VTS-C.

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:

- Georgia Department of Natural Resources
  - Wildlife Resources Division
  - Historic Preservation Division
- Georgia Forestry Division
- U.S. Fish and Wildlife Service, Athens Field Office
- U.S. Forest Service
- Natural Resources Conservation Service, La Fayette (Walker County) 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
- University of Tennessee at Chattanooga
- University of Georgia at Athens
- 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/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 National Environmental Workshop
- Sustainable Range Program Workshop
- Land Rehabilitation and Maintenance Conference
- Kansas State University GIS training
- Utah State University ARCVIEW training
- Colorado State University-Center for Ecological Management of Military Lands RTLA Training
- Pesticide Application and Licensing through Georgia 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 the 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.

<u>Operations and Maintenance Environmental Funds:</u>
Environmental funds are a special category of Operations and Maintenance (O&M) funds and are controlled by the Status Tool for Environmental Program (STEP) budget process. They are special in that they are restricted by the DOD solely for environmental purposes, but they are still subject to restrictions

of O&M funds. Compliance with appropriate laws and regulations is the key to securing environmental funding. The program heavily favors funding high priority projects with a goal of achieving compliance with federal or state laws, especially if non-compliances are backed by Notices of Violation or other enforcement agency action.

Training Funds:
The VTS-C natural resources management program does not receive training funds except for projects administered through the ITAM program. ITAM funding requests are not submitted via the STEP process. Instead, a 5-year ITAM workplan is used to channel ITAM funding requests from TNARNG, through NGB, to the U.S. Army's Office of the Deputy Chief of Staff for Operations (ODCSOPS). ITAM funding is controlled by the POTO.

Agriculture, Forestry, and Hunting Permit Funds:
The forestry program at VTS-C participates in the U.S. Army's Conservation Reimbursable and Fee Collection Program. Through this program income from the sale of forest products is used to support forestry activities on the site. At the end of each fiscal year, forestry work plan expenses are deducted from actual forestry proceeds to determine net proceeds. Forty percent of the installation's net proceeds in a given fiscal year is distributed to the county in which the sales took place in accordance with DoD Financial Management Regulation 7000.14-R, Volume 11A, Chapter 16 (August 2002). These state entitlements are to be used to build, maintain, and fund roads and schools. State entitlements are made by DFAS. Any remaining proceeds are transferred to the DoD Forestry Reserve Accounts. Funds from the account can be requested each year for projects directly related to forest management. Activities that can be funded through the forestry program 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-C, 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 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.

The 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.denix.osd.mil/Legacy-public for information on current grant proposal criteria.

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

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

1.6.5 Priorities and Scheduling

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

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

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

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

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

- Initial documenting and cataloging of archaeological materials

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

- Compliance with future requirements that have deadlines
- Conservation and Geographic Information System mapping to be in compliance
- Efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives
- Wetlands enhancement, in order to achieve the Executive Order for "no net loss" or to achieve enhancement of existing degraded wetlands
- Environmental awareness and education programs for troops and the public

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

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

CHAPTER 2
TRAINING SITE OVERVIEW

2.1 LOCATION AND REGIONAL CHARACTER

2.1.1 Location, size, general description

The Volunteer Training Site – Catoosa (VTS-C) is located in east-central Catoosa County in northwestern Georgia (Figure 2.1), approximately two miles east of Ringgold, the county seat, and 13 miles east of Fort Oglethorpe, Georgia. The 1,628-acre training site is approximately 90 miles northwest of Atlanta, the state capital, and approximately 20 miles southeast of Chattanooga, Tennessee. Georgia State Highway 2 borders the site on the south, and Salem Valley Road accesses the northern boundary (Figure 2.2). The site is approximately 16,000 feet at its maximum length by approximately 6,625 feet at its maximum width.

2.1.2 Property Ownership

The VTS-C is owned by the U.S Army Corps of Engineers and has been licensed for use to the TNARNG since 1960. The Tennessee Military Department operates the VTS-C for the TNARNG through a license (DA Outgrant Number DACA21-3-72-0401) from the U.S. Army Corps of Engineers. The TNARNG is responsible for upkeep of the entire licensed area.

2.1.3 Neighboring Land Ownership and Encroachment

The property surrounding VTS-C is primarily privately owned residential and agricultural land. The helicopter landing pad is approximately 100 feet north of the closest residence. Land to the north of the maneuver area and rifle range and west of VTS-C is composed of cultivated land, cattle pasture, and hardwood forest. A school (Tiger Creek Elementary) is located approximately 0.5 mile west of the training site on Highway 2.

2.1.4 Demographics

The total resident population in 2016 for Catoosa County, Georgia, was 66,050 (Table 2.1). The unemployment rate for the county is less than the state average. Median household income is slightly higher than the median income for the state.

Table 2.1: Selected demographic data for Catoosa County, Georgia.

	Total Resident Population, 2016 *	Median Household Income, 2011-15 *	% Persons Below the Poverty Line, 2011-15 *	Unemployment Rate (%), 2015 **
Catoosa County	66,050	$50,876	13.1 %	5.1 %
Georgia	10,310,371	$49,620	17.0 %	5.9 %
U.S.	323,127,513	$53,889	13.5 %	5.3 %

* U.S. Census Bureau (2016) ** U.S.D.A. Economic Research Service (2016)

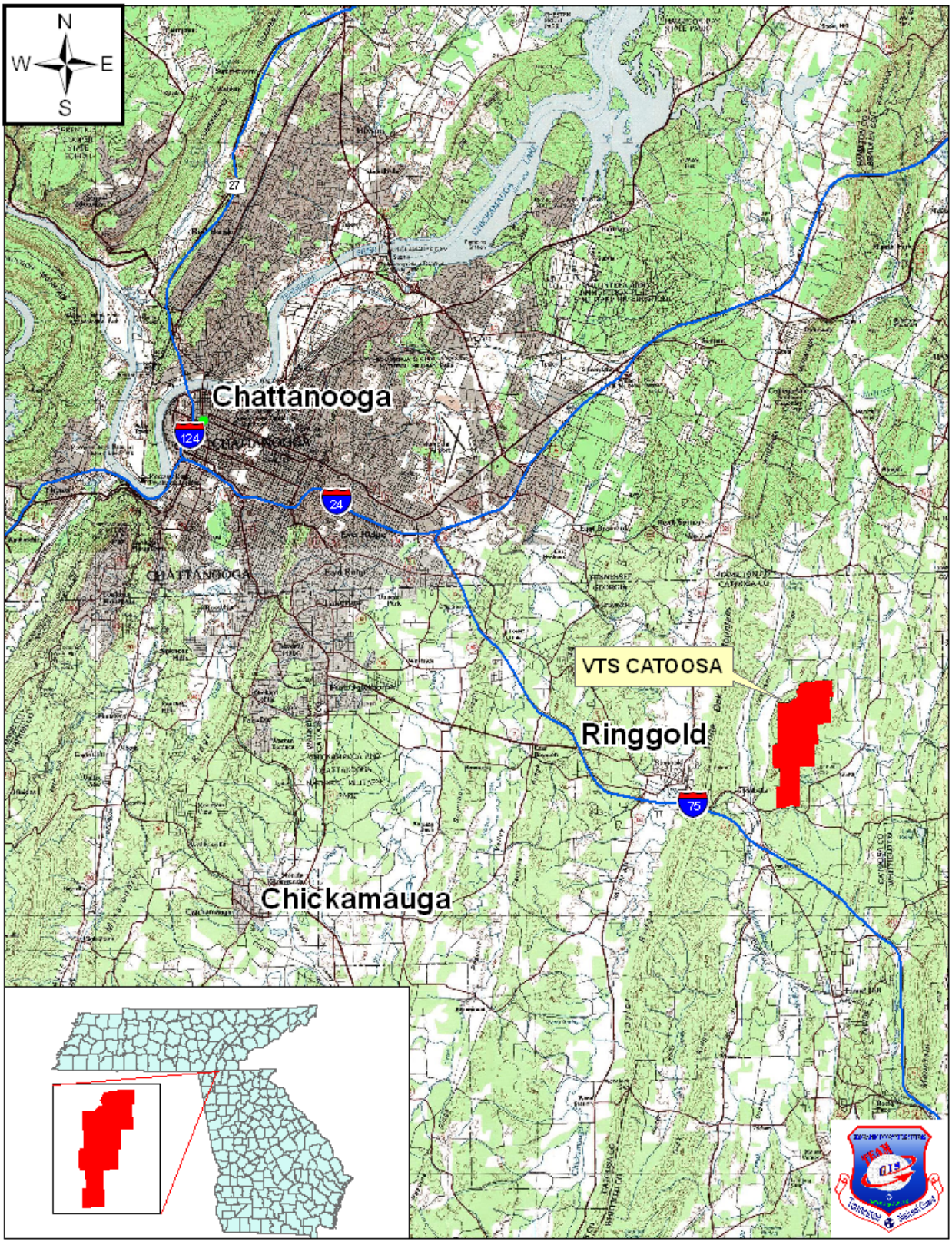

Figure 2.1: Location of the Volunteer Training Site – Catoosa.

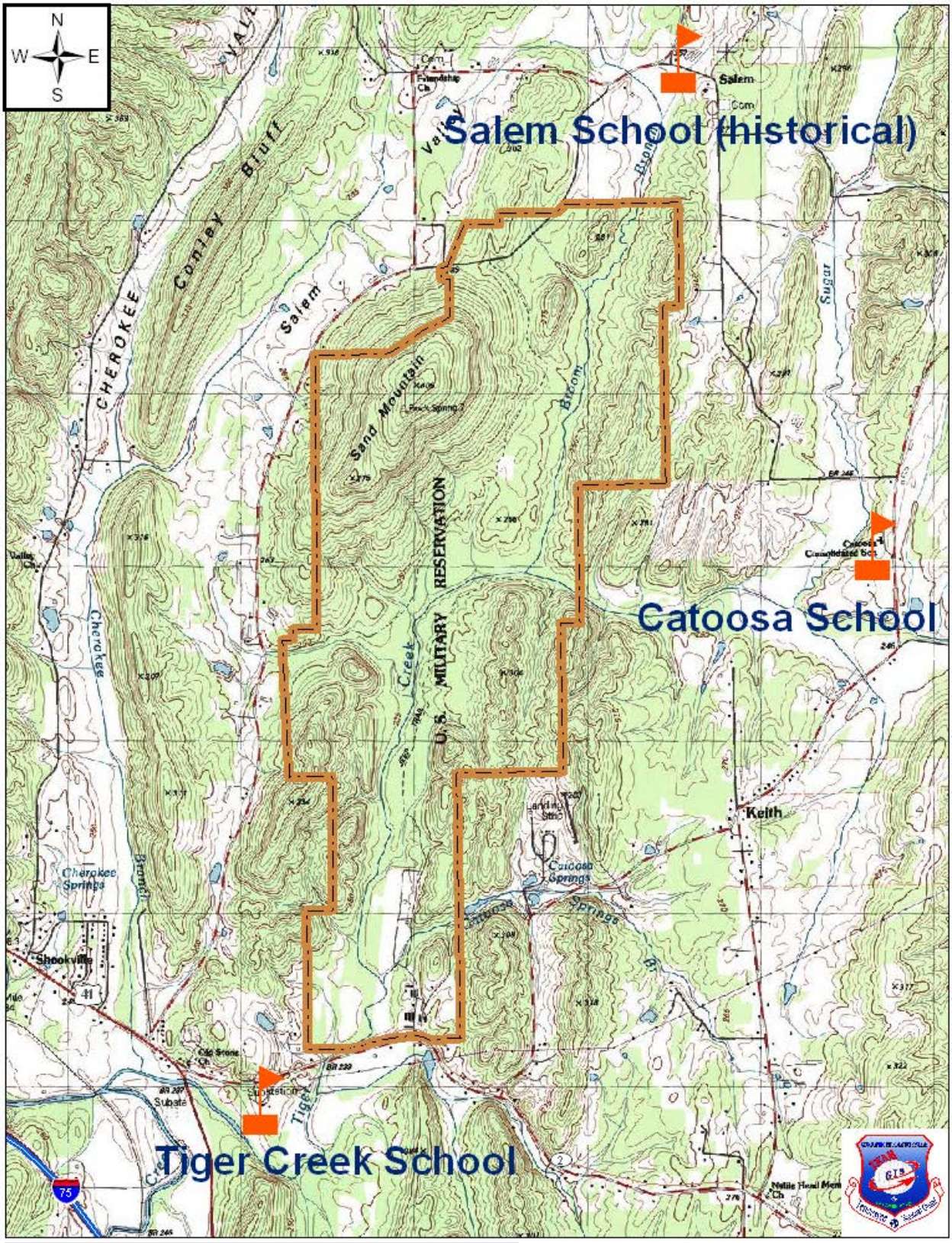

Figure 2.2: Local surroundings of VTS-Catoosa.

2.1.5 Nearby Natural Areas and Parks

A large portion of northwest Georgia is protected natural lands, the bulk of which falls within the Chattahoochee National Forest which covers parts of 18 counties in Georgia. The following list of natural areas within 30 miles of VTS-C was collected from multiple sources, including US Forest Service 2006, US National Park Service 2006, and Henry Chambers, GADNR, personal communication.

Chattahoochee National Forest – 750,502 acres in northwest Georgia – six acres of forest fall in Catoosa County and 11,719 acres are within Whitfield County, to the southeast of Catoosa. Both of these acreages are part of the Armuchee-Cohutta Ranger District, headquartered in Chatsworth, GA

Chickamauga and Chattanooga National Military Park – 9,059 acres south of Chattanooga in both Georgia and Tennessee

Cloudland Canyon State Park – 2300 acres in Dade and Walker Counties, straddling the deep gorge cut by Sitton Gulch Creek

Crockford-Pigeon Mountain Wildlife Management Area (WMA) – 16,400 acres in Walker County, west of Lafayette, GA

Elsie Holmes Nature Park (county park) – 66 acres in Catoosa County, approximately 5 miles from the training site, which has a protected population of large-flowered skullcap

Fort Mountain State Park – 3712 acres in Murray County within the Chattahoochee National Forest, including a 17 acre lake

JH (Sloppy) Floyd State Park – 500 acres in Chattooga County, including a 16 acre lake and a 34 acre lake

Johns Mountain WMA – 24,000 acres in Gordon and Walker Counties, located on the Chattahoochee National Forest

Otting Tract WMA – 700 acres in northwest Chattooga County.

Zahnd Tract Natural Area – 1400 acres in Dade and Walker Counties, including a 161 acre WMA.

2.2 INSTALLATION HISTORY

Catoosa County was established from Walker and Whitfield Counties by an act of the General Assembly of Georgia in 1853 (Lawrence 1993). The name is derived from the Cherokee word “Catoosa,” meaning “between two hills.” Cherokee Indians originally occupied Catoosa County, but a treaty signed in 1835 allowed the state to take control of lands formerly held by the Cherokee Nation. In 1838, the Cherokee people were forced from the area. In 1863, a fierce Civil War battle took place in and around Ringgold, the county seat (Lawrence 1993).

Military use of the lands that comprise VTS-C began in 1904 when the army utilized land adjacent to Catoosa Springs as a target range for training troops from Fort Oglethorpe. The land was originally leased by the Army and later purchased as two separate acquisitions in 1906-07 (876 acres) and 1910 (additional 751.41 acres).

The Catoosa property was referred to as the "Target Range" or "Rifle Range" during its years of association with Fort Oglethorpe, from 1910 until the end of World War II. The "Fighting" 6th Cavalry trained at Catoosa from 1919-1941, and members of the Woman's Army Corps (WACs) were trained there during World War II. Soldiers were transported from the post to a 1,000 yard rifle range at the south end of the VTS-C property. Apparently the site held 13 buildings at that time, four located near Catoosa Springs Road and eight located along Tiger Creek at the base of Sand Mountain.

When Fort Oglethorpe closed in 1945, the associated property including the Catoosa Target Range was offered for public sale. In 1948, the rifle range was withdrawn from surplus and placed under the jurisdiction of the Army Corps of Engineers in an inactive status to be used by the Tennessee National Guard for training its Ground Force Unit. Since 1960, the TNARNG has had operational control through a license from the Corps of Engineers. The name of the facility was changed to the National Guard Catoosa Rifle Range in 1966, to Catoosa Area Training Center in 1976, and finally to the Volunteer Training Site – Catoosa in 2003.

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-Catoosa 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 not likely to change significantly during the life of this document.

2.4 FACILITIES

VTS-C has a 65.5-acre Cantonment Area, which is the improved portion of the training site. Developed facilities include an administrative building, VTS-C command headquarters building, four 100 bed open bay barracks (occupied by visiting TNARNG personnel only during training periods), maid service lodging for 50 soldiers, a 100 seat catered dining facility (no-kitchen), a 150 seat dining facility (with kitchen), three supply buildings, a guardhouse, a 200 soldier latrine (with shower), one 50 soldier classroom, asphalt roads, paved sidewalks, and paved parking.

The training site is divided into eleven training areas and the cantonment area (Figure 2.3). Facilities in the small arms range area include two support buildings; one range tower; a weapon cleaning station; target storage house; and a parking area. There is a new simulation building, Tactical Training Base, land navigation course, Cave complex Trainer (buried shipping containers), and a three bay maintenance shelter. Available ranges on the site include:

- 25-meter Berm and Baffle Range
- 25-meter Berm and Baffle Range
- 10-meter Berm and Baffle Range
- Known Distance Rifle Range (600 yard)
- M-203 Grenade Launcher Range
- Hand Grenade Qualification Course (non-live fire)
- Multi-Purpose Machinegun Range (digital usage only)
- Simulation Building
- Tank Table VII range (non-live fire)
- Tank Gunnery Range (non-live fire)
- MK-19 Range
- Urban Assault Course (non-live fire)
- Gas Chamber

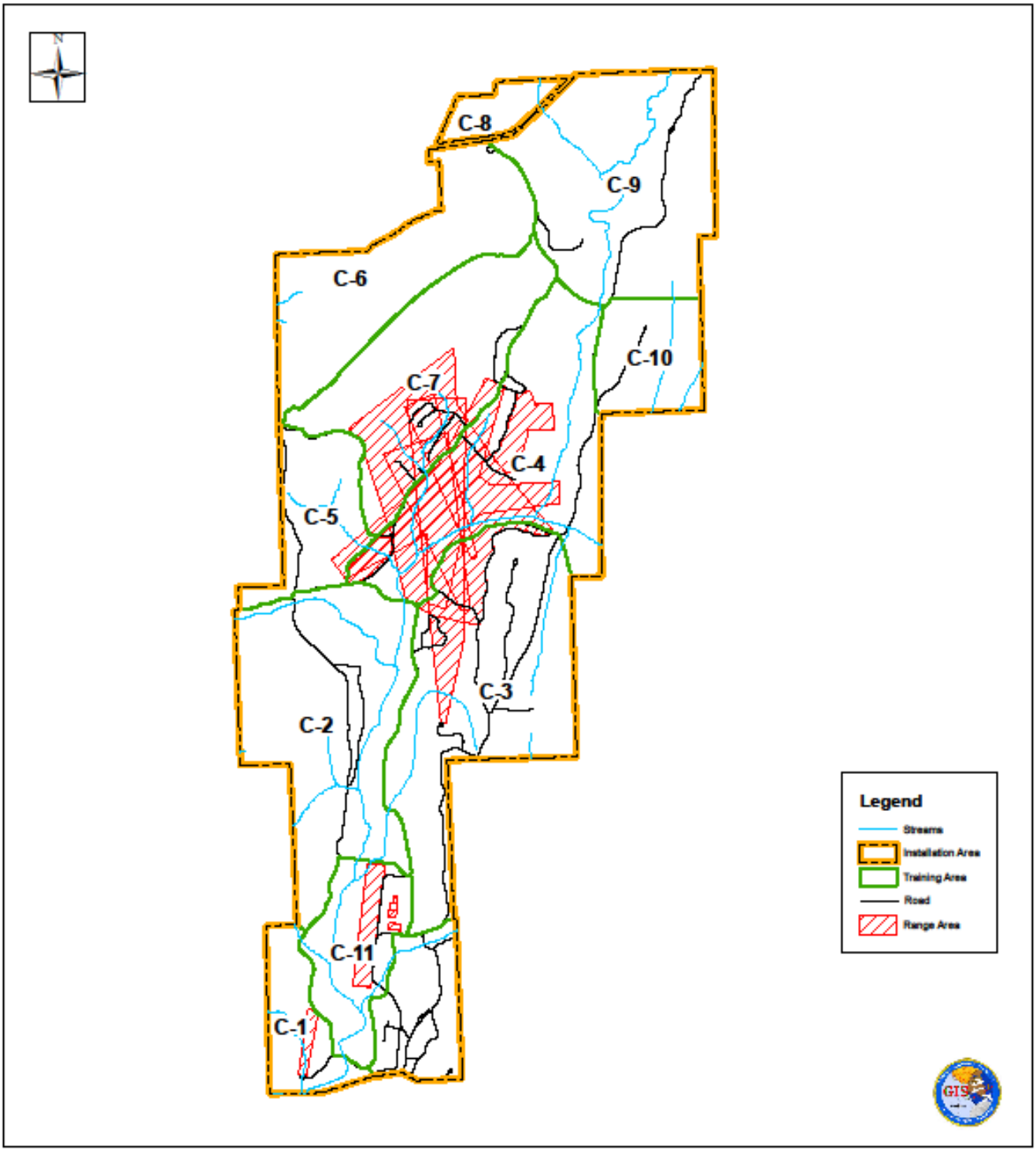

Figure 2.3: VTS-Catoosa Training Areas and Facilities.

Non-hardened landing zones are utilized for rotary wing aircraft. The nearest aviation fuel point is the Chattanooga Metropolitan Airport. The existing facilities are considered sufficient to accommodate the current level of activities at VTS-C; however, to support the changing nature of the TNARNG mission, future plans include additional barracks and classrooms in the Cantonment Area, and renovating the berm and baffle ranges to accommodate new enhanced performance ammunition (5.56 and 7.62 mm NATO).

2.5 TRAINING SITE UTILIZATION

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

1-181st HIMARS BN
TEC/AMS (Air Guard)
489 CA BN
4-14th Marines (M Bttry)
USARC History Group
Co H, 121 INF (ABN)(LRS)
265th ENG BN
171 AVN BN
300 QM BN
108 FA BN
3397th
212 Transportation BN
844th ENG BN
161st ASB BN
278 ACR

Total yearly VTS-C training utilization for FYs 2007-2016 is summarized in Figure 2.4. The monthly training use by four user groups (TNARNG/TNANG, Other Military, Civilian, and Undefined) from FYs 2007-2016 is presented in Table 2.2. An average total training use for the past five years (FYs 2012-2016) of 37,419 soldier use days represents an increase over that of the previous five years (FYs 2007-2011) of 32,729 soldier use days, in spite of FY 2016 having the lowest total training use of all ten years.

Seasonal distribution of training activities can be seen in Figure 2.5. Training site use is generally well distributed throughout the year, except for the months of December and January. April and June are the busiest months, though April activity is highly variable.

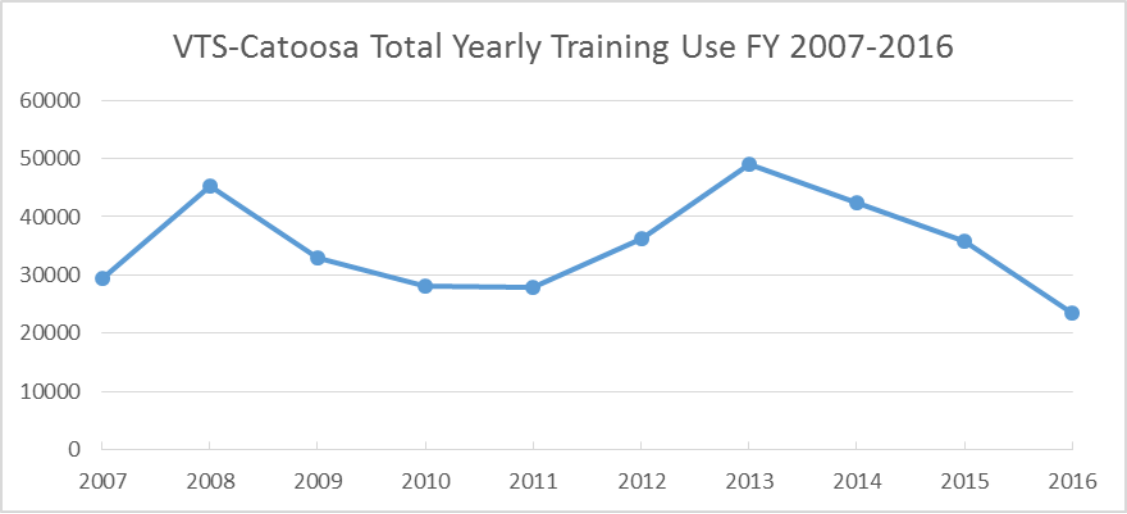

Figure 2.4: Total yearly VTS-Catoosa training use for FYs 2007-2016, from RFMSS data.

Table 2.2: Training site utilization by Tennessee National Guard, other military, civilian users, and undefined users FYs 2007-2016.

TY2007	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TNARNG/TNANG	0	12	75	536	1372	2344	191	54	220	2120	720	450	8094
Other Military	515	482	250	0	600	2967	2818	1197	4140	295	1680	5000	19944
Civilian	0	0	0	0	90	0	90	0	56	0	0	865	1101
Undefined	0	47	29	20	12	17	105	0	0	0	0	0	230
TOTALS	515	541	354	556	2074	5328	3204	1251	4416	2415	2400	6315	29369
TY2008	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	1469	1095	430	2730	230	968	9926	4130	284	624	868	596	23350
Other Military	440	3433	0	620	940	3235	1375	570	2776	1542	128	3591	18650
Civilian	225	0	0	210	260	625	50	150	190	851	377	366	3304
Undefined	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	2134	4528	430	3560	1430	4828	11351	4850	3250	3017	1373	4553	45304
TY2009	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	206	0	0	743	480	1324	4377	1617	1100	939	2474	227	13487
Other Military	1104	1951	279	288	818	1894	1227	429	1238	7	1748	1554	12537
Civilian	290	207	210	565	785	421	0	800	606	2188	6	210	6288
Undefined	0	0	0	0	0	0	0	212	399	0	124	0	735
TOTALS	1600	2158	489	1596	2083	3639	5604	3058	3343	3134	4352	1991	33047
TY2010	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	570	1092	0	0	0	256	532	412	6339	0	330	343	9874
Other Military	2830	1252	0	0	70	1332	1370	605	0	564	188	1366	9577
Civilian	165	170	0	0	760	362	391	431	80	685	920	250	4214
Undefined	0	0	0	0	0	300	10	188	0	2100	1745	0	4343
TOTALS	3565	2514	0	0	830	2250	2303	1636	6419	3349	3183	1959	28008
TY2011	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	104	0	0	120	965	500	2995	720	0	0	2252	680	8336
Other Military	2688	1941	200	210	175	1140	260	440	1327	1160	596	300	10437
Civilian	711	1376	80	120	286	176	190	180	713	631	256	35	4754
Undefined	180	286	637	130	20	1550	230	355	50	60	172	720	4390
TOTALS	3683	3603	917	580	1446	3366	3675	1695	2090	1851	3276	1735	27917

Table 2.2, continued:

TY2012	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TNARNG/TNANG	3000	1200	0	975	3980	2203	2711	537	5520	472	33	616	21247
Other Military	190	0	60	160	50	50	60	344	120	409	824	1007	3274
Civilian	0	270	15	0	0	160	330	2485	110	860	580	150	4960
Undefined	1460	240	0	0	0	0	990	3130	195	540	264	40	6859
TOTALS	4650	1710	75	1135	4030	2413	4091	6496	5945	2281	1701	1813	36340
TY2013	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	910	1716	390	1155	1906	2550	1554	2074	2456	0	5907	5445	26063
Other Military	570	75	112	2532	1052	941	360	800	411	360	530	909	8652
Civilian	1042	205	214	204	1025	553	519	210	163	732	360	187	5414
Undefined	0	0	300	280	0	115	1800	241	12	4072	375	1800	8995
TOTALS	2522	1996	1016	4171	3983	4159	4233	3325	3042	5164	7172	8341	49124
TY2014	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	103	1320	30	2933	1451	1212	3871	2911	2598	6	3938	390	20763
Other Military	200	639	660	60	739	2284	75	1212	821	3449	780	4582	15501
Civilian	406	286	48	18	480	435	312	130	40	1700	200	132	4187
Undefined	8	300	80	95	547	0	0	698	170	55	0	0	1953
TOTALS	717	2545	818	3106	3217	3931	4258	4951	3629	5210	4918	5104	42404
TY2015	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	517	1132	229	697	313	1687	3042	1545	7515	490	847	2533	20547
Other Military	167	2252	328	80	80	1343	1522	564	0	1132	2887	285	10640
Civilian	210	36	395	76	133	608	195	338	552	184	18	338	3083
Undefined	0	0	0	0	0	360	0	910	0	0	282	0	1552
TOTALS	894	3420	952	853	526	3998	4759	3357	8067	1806	4034	3156	35822
TY2016	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**TOTAL**
TNARNG/TNANG	300	2168	300	0	3820	682	341	62	4697	427	0	2096	14893
Other Military	398	178	513	596	255	509	525	0	60	2469	1045	166	6714
Civilian	0	10	0	105	155	0	125	21	460	26	196	295	1393
Undefined	0	0	0	0	46	0	0	0	0	0	360	0	406
TOTALS	698	2356	813	701	4276	1191	991	83	5217	2922	1601	2557	23406

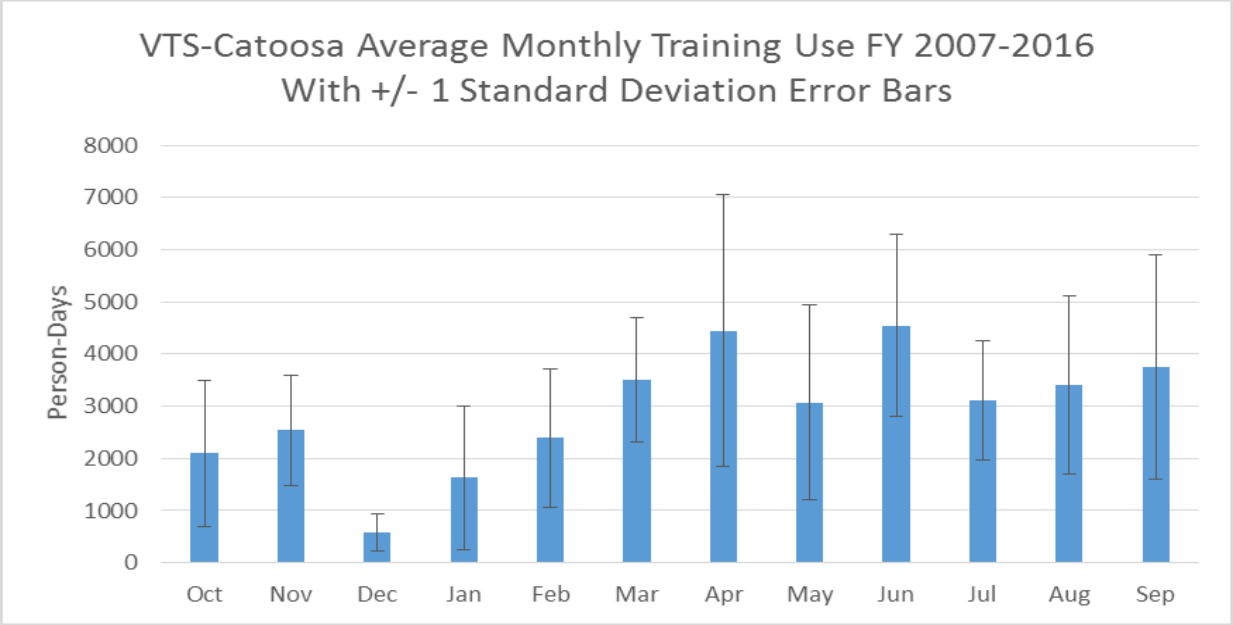

Figure 2.5: VTS-Catoosa FY 2007-2016 average monthly training use with error bars.

Training activities on VTS-C are variable. The types of training on VTS-C in the future are expected to be similar to previous years, as shown in Table 2.3. Typical uses include small arms range firing, maneuvering, and combined arms training including field bivouac; tracked and wheeled vehicle operations on developed roads and major trails; mounted and dismounted maneuvers; and weapons firing. Off-road maneuvers are permitted within designated open terrain areas and in designated fringe areas (concealment parking sites) within 100 feet of specified roads and trails within the maneuver area. Up to one battalion-size infantry, artillery, engineer, or combat service support unit, conducting non-live fire exercises, can be accommodated at one time.

Table 2.3. Types of training anticipated.

Type of Training
Airborne, air assault operations
Lane Training Event using WTBD Task (Warrior Task Battle Drills)
AWQ, IWQ, and Crew served weapons on small arms ranges
Field artillery units doing collective training to include maneuver from one firing position to another
Field Training Exercise (FTX) and Command Post Exercise (CPX) operations which include setting up the Unit Headquarters in a field Tactical Operations Center
Military Police (MP) unit operations primarily route security and surveillance, company sized units
Land Navigation Course for OCS, MP, and others
Obstacle Course, company or platoon size elements
Basic to Advanced classroom instruction
Tank and Bradley qualifications
Mounted Land Navigation Course – All unit types
Artillery Training and Familiarization
Grenade Launcher Training / Qualifications
Light Infantry Training – Primarily Company/Platoon Tactics
Urban Assault Course Training - Infiltration, breaching, and clearing operations

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-C. 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-C 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. 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.

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 – mounted and dismounted	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 or 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-C. Various high-technology methods have been implemented at VTS-C 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-C ecosystem. Vehicles used by TNARNG range from Humvees to Abrams tanks. Military vehicle training may involve single vehicle maneuvers up to platoon or squadron size elements. Soil compaction and erosion are the most probable results of vehicle maneuvers. Appropriate planning (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.

Vehicles may also be a significant factor in the introduction of non-native plant matter to the VTS-Catoosa natural areas. 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. To minimize the threat of introducing new invasive plant species, vehicles arriving at VTS-C from outside the county should be washed thoroughly to remove any soil, seeds, or plant parts before leaving the Cantonment to enter the 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 choice 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 tried to institute good land use practices such as reducing erosion and negative impacts on stream crossings and wetlands. Disturbances that significantly, and often permanently, change the landscape (for example, agricultural tillage, reduction of forest and wildlife habitat for development, and much recreational vehicle damage) are avoided on VTS-C, 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-C, multiple environmental conditions are needed for training:

- Open woodland areas for bivouac
- Wooded maneuver areas for foot and vehicle traffic
- Road networks

- Pull-off points along roads
- Firing ranges
- Land navigation course
- Urban Assault Course

According to the Training Site Manager, the current site conditions meet most training needs. The steep topography of the site is a major limiting factor that can be minimally altered. The vegetation coverage of the site is acceptable (81% forested, 15% grassland). Sufficient large open grassland areas exist within the center of the site for most training needs. The majority of the forestland is adequate for its training uses, though some areas could be improved by thinning the dense understory with prescribed fire.

There is, however, a need for additional small cleared areas for bivouac and other training within the woodlands of training areas C-4, C-5, and C-10. These open areas need to be less than 5 ac (1-2 ac typically) and situated far enough off the main roads to give a sense of seclusion. Six or eight desirable areas will be identified by training site staff for appropriate size, good location, and level ground. If the existing timber warrants, the areas will be incorporated into the timber sale schedule. If the areas do not contain merchantable timber, clearing will be conducted by the training site.

Additional clearing of trees is needed along the property boundary to create the mandated 25 ft. line-of-sight buffer for security purposes. Such a buffer will also function as a perimeter firebreak, allow access to the fence for monitoring and repair, and in one section at the north end of the facility (TA C-9) will be expanded into an unimproved trail for wheeled vehicle training.

The boundary line-of-sight clearing has been addressed in Section 7 consultation with the USFWS for potential impacts on the large-flowered skullcap. Other projects will have to be assessed for potential impact on this plant, as well as on the endangered gray bat and threatened Northern long-eared bat, which are also found on the training site, and the impacts reviewed with the USFWS through informal and/or formal consultation in accordance with the Endangered Species Act.

The beaver population on site has affected training lands in the past by causing extensive flooding. Attempts to manage the pond levels mechanically failed and the population ultimately reduced. The beaver population will need to be monitored and maintained at a lower levels through hunting and/or trapping to minimize impact on the training mission and facilities.

To achieve the currently desired missionscape, the VTS-Catoosa needs additional small openings within heavily forested training areas, thinning of forest understory in some areas, a cleared boundary fenceline, and control of the beaver population. With these additions and modifications, the overall landscape of the VTS-Catoosa should continue to meet TNARNG training needs. Any significant change in mission will require that the missionscape be reexamined.

2.8 NATURAL RESOURCE CONSTRAINTS ON MISSION/MISSION PLANNING

Certain features of the natural environment represent potential limitations on training activities. The most significant at VTS-C are rare, threatened, or endangered species; topography; and surface water. The challenge is to protect these sensitive resources 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 training scenario 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 RTE species

Large-flowered skullcap (*Scutellaria montana*) is a federally- and state-listed threatened plant species that grows at VTS-C in small groups ranging in numbers from a few to hundreds per group (see Figure 3.9). This herbaceous species typically occurs in the understory of mature oak forests on the mid-range of slopes. Initial studies started in 2002, and monitoring and training have been in progress since 2004 to gather information and manage this species. Tracked or wheeled vehicles could destroy large numbers of plants, and so the locations where skullcap is known to occur are off-limits to vehicular traffic. These areas are open to foot-traffic except for during the primary growing and flowering season of the plant (March 1-June 30) when trampling might interfere with reproduction.

The gray bat (*Myotis grisescens*) is a federal endangered species and the northern long-eared bat (NLEB, *Myotis septentrionalis*) a federal threatened species. They have been captured feeding over Tiger Creek on VTS-C. To date, no grey bat roost, maternity, or hibernation caves have been found on site. No NLEB roost or maternity roost trees, or hibernation caves are known to occur on the training site. Management is therefore currently directed at protecting foraging habitat and trees greater than three inches in diameter at breast height (DBH). Stream quality and riparian habitat protection are important to maintaining the food source for these protected species, and so best management practices associated with streamside management zones must be integrated into training and land management activities. Trees greater than three inches DBH are important for providing roost and maternity roost trees for the NLEB. Efforts have and will continue to be made to locate roosts and hibernacula that occur on site.

2.8.2 Topography

VTS-C is located in the foothills of the Southern Appalachian Mountains. Slopes on the training site range from nearly level along the creeks to greater than 50%. The steeper areas are not suitable to some mounted training activities. In addition, the steep slopes are more prone to significant erosion problems. Roads up Sand Mountain have been closed in the past due to the erosion gullies that have formed. Care must be taken with activities that will disturb the soil or vegetation along the slopes, including such projects as building roads, locating and scheduling training, and off-road maneuvers. Immediate reclamation of disturbed areas should be incorporated into all training and site management plans.

2.8.3 Surface Water

Two creeks cross a large part of the VTS-C training area: Tiger Creek and its tributary Broom Branch. Water quality in these creeks is high and supports a wide variety of aquatic life. This quality must be protected from sedimentation, chemical pollutants, and damage to the streamside ecosystems. Care must be taken in all activities that could directly or indirectly impact stream conditions, such as stream crossings, vehicular maneuvers and training, fueling activities, and vegetation clearing. Current conditions in lowland parts of the training site, including large portions of the tank range along the banks of Tiger Creek, are too wet for vehicle access throughout much of the year.

2.9 GEOGRAPHIC INFORMATION SYSTEM (GIS) ASSETS

TNARNG supports a Geographical Information System (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. The GIS Branch also supports data collection via GPS, surveying, and research. In addition to required GIS/GPS functions, the GIS Branch provides first line Information Technology support, database development, and web based publishing. Geospatial data must meet current federal, DOD, Army, and NGB standards, including (Federal Geographic Data Committee (FGDC) and Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) standards. 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, and compliance data, 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.

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CHAPTER 3
PHYSICAL AND BIOTIC ENVIRONMENT

3.1 CLIMATE

Catoosa County, Georgia, lies within the hot continental division of the humid temperate domain (Bailey 1996) and is characterized by hot summers and cool winters. Temperatures are not moderated much by the distant Atlantic Ocean or the Gulf Stream, and winter climates can be influenced by blasts of arctic air moving southward out of Canada (Georgia State Climate Center 1998). Overall, the climate is not considered a significant factor for the TNARNG. It rarely restricts or prevents training, but does account for what may be numerous state missions each year during weather related emergencies.

Temperature: The annual mean temperature for the 30-year period between 1961 and 1990 in Dalton, Georgia, was 59.5ºF. Daily temperatures in the summer range from an average low of 65.4ºF to an average high of 87.8ºF. In the winter the average low is 30ºF, and the average high is 51ºF (UGA State Climate Office 2007).

Precipitation: Average annual precipitation for Dalton, Georgia, for the years 1961-1990 was 57.36 inches. Rainfall is evenly spread across the year, though slightly heavier in the winter and spring (Figure 3.1). The region sees little snow, averaging only 2.6 inches per year over the same 30 year period (UGA State Climate Office 2007).

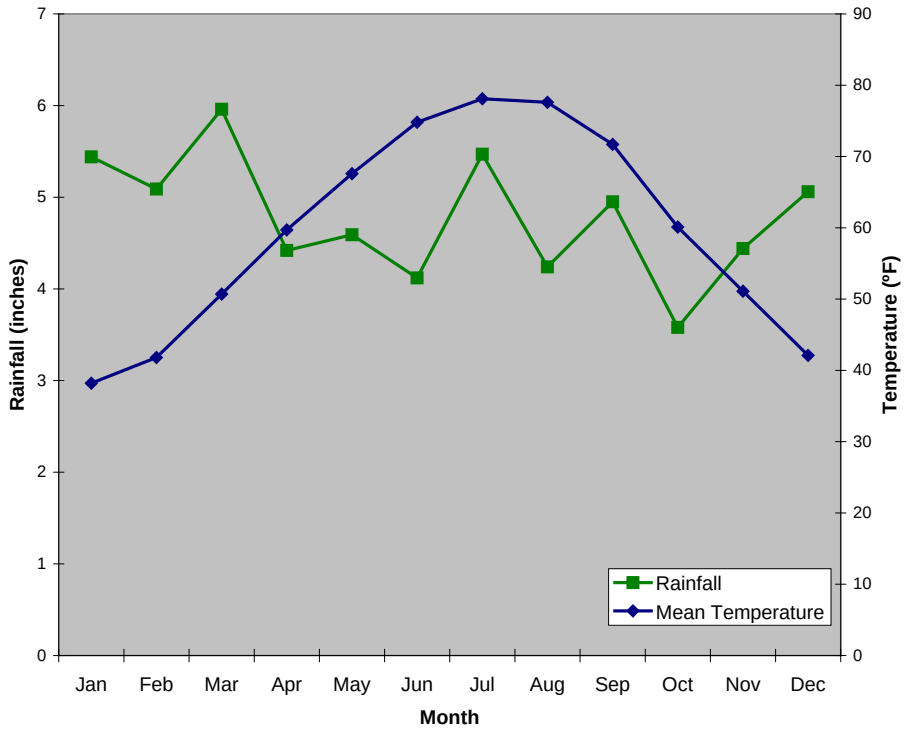


Figure 3.1: Mean daily temperature and mean monthly precipitation for Dalton, Georgia, 1961-1990 (data from UGA State Climate Office 2007).

Relative Humidity: Relative humidity is high in the region. In Chattanooga, the morning annual average humidity is approximately 86 percent, and the afternoon average is 56 percent. The highest rates for the year are 90-91 percent, occurring in the mornings in August-October. A little further south in Atlanta the relative humidity ranges from a morning average of 82 percent to an afternoon average of 56, with the highest rates of 87-89 occurring in the mornings in July-Sept (NOAA 2005).

Wind: The prevailing wind direction in Chattanooga is south; although during the winter months, the wind typically is from the north. The average annual wind speed is 6.4 miles per hour, and winds are strongest in the winter and spring. In Atlanta, wind speeds average 9.9 miles per hour and are also highest in the winter and spring. They tend to be northwest winds in the winter and spring and vary from west or east in the summer and fall (NOAA 1998).

Climate and Training Exercises: Average annual precipitation is a very important factor in determining the ability of natural resources to recover from military maneuver training effects. The seasonal distribution of rainfall at VTS-C (over 57 inches per year on average occurring evenly across the seasons) coupled with a growing season which averages 212 days (UGA State Climate Office 2007) allows vegetative cover to regenerate in a short period of time with minimal effort.

The regular rainfall also, however, results in wet soils during much of the year. Maneuver damage can be more extensive when soils are wet, and so training activity scheduling is very important in protecting the natural resources of VTS-C. Rainfall is lowest, and evaporation rates highest, in the summer months, which make those the ideal time for high impact training exercises. Damage to vegetation and soils can be decreased by scheduling high-impact training exercises during these months. Revegetation and maneuver damage repair is also most effective when performed in the winter months (November through March) or in the spring months (April and May) when temperatures begin to increase.

3.2 PHYSIOGRAPHY AND TOPOGRAPHY

The VTS-C lies in eastern Catoosa County, Georgia, within the Armuchee Ridge district of the Ridge and Valley physiographic province, a part of the Appalachian Valley (Hodler and Schretter 1986). This region is described as a series of prominent, narrow, chevron-shaped ridges that run southwest to northeast and rise steeply to 600 to 700 feet above the intervening stream valleys. The ridges are capped mostly by sandstone, while valley floors are generally underlain by less resistant shales and limestones (Hodler and Schretter 1986).

The land surface of the VTS-C ranges from nearly level in the Tiger Creek floodplain and stream terrace to very steep, with Sand Mountain dominating the landscape to the northwest (Figure 3.2). The highest point of elevation on the site is approximately 1,332 feet above the National Geodetic Vertical Datum of 1929, which is approximately sea level. Elevations on the training site range from approximately 755 feet above mean sea level (msl) to 1,332 feet above msl. Elevations of 755 feet msl generally occur along creek channels, and elevations of 1,200 feet msl and higher are characteristic of Sand Mountain and another unnamed mountain to the west. Slopes on VTS-C range from 0% to 53% (U.S. Geological Survey 1983).

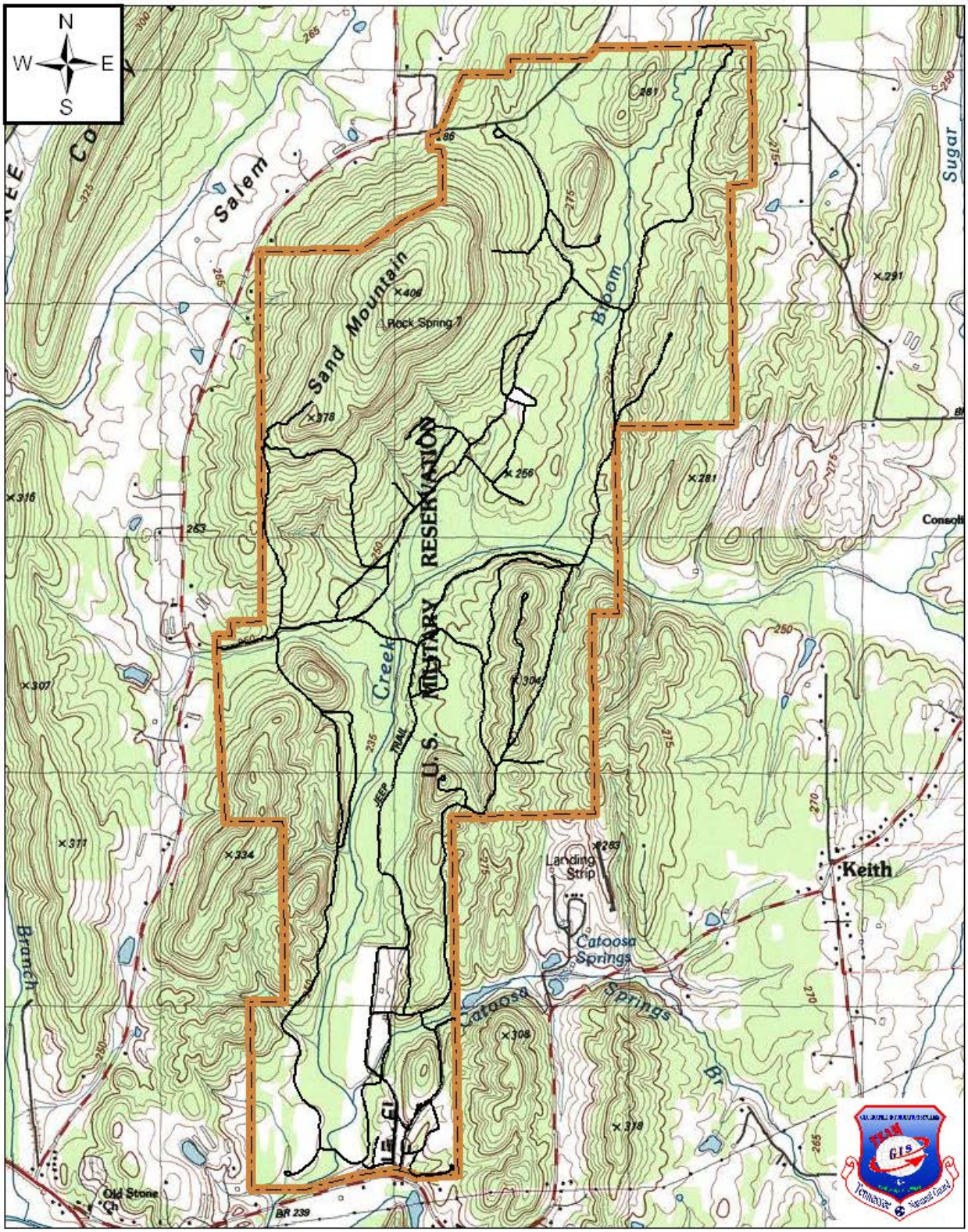


Figure 3.2: Topography of VTS-Catoosa.

3.3 GEOLOGY

VTS-C is underlain primarily by Paleozoic (Silurian-Devonian-Mississippian-Pennsylvanian) sedimentary rocks, including Rome and Red Mountain formations, Floyd Shale, and Pennsylvanian undifferentiated rocks (Georgia Department of Natural Resources 1976; Hodler and Schretter 1986). The hills and ridges of the region were created by compressional forces from the southeast causing giant folds. East of Sand Mountain, older rocks were thrust over and now overlie younger rocks, and other faults resulted in realignment of formations (Lawrence 1993). The Rome formation of the Early Cambrian period underlies much of the eastern part of Catoosa County. This formation consists mostly of sandstone, siltstone, and claystone. The Red Mountain Formation consists essentially of sandstone and shale but has a few beds of limestone and fossil iron ore.

3.4 SOILS

3.4.1 Soil Descriptions

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (then named the Soil Conservation Service) completed a soil survey for Catoosa County in 1993 (Lawrence 1993). Soils on VTS-C (Table 3.1 and Figure 3.3) are mapped in three major soil associations: Chenneby-Rome, Townley-Cunningham-Conasauga, and Townley-Tidings. These 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 part of an association. A total of thirteen soil series are found within the three associations on VTS-C. Slope further divides these thirteen series into the 19 soil types displayed in Table 3.1 and Figure 3.3.

Table 3.1: Soil Types on VTS-C (from Lawrence 1993).

Symbol	Soil Name	Acreage
AnB	Allen silt loam, 2 to 6 percent slopes	0.36
AnD	Allen silt loam, 6 to 10 percent slopes	8.33
AnE	Allen silt loam, 15 to 25 percent slopes	0.39
ArC	Armuchee channery silt loam, 6 to 10 percent slopes	25.69
Ce*	Chenneby silt loam, 0 to 20 percent slopes*	250.06
CuC	Cunningham silt loam, 0 to 2 percent slopes	10.59
EtB	Etowah loam, 2 to 6 percent slopes	8.32
HoB	Holston find sandy loam, 2 to 6 percent slopes	11.17
NaC	Nauvoo fine sandy loam, 6 to 10 percent slopes	75.60
NaD	Nauvoo fine sandy loam, 10 to 15 percent slopes	335.15
NeF	Nella fine sandy loam, 25 to 45 percent slopes	204.20
RoA	Rome silt loam, 0 to 2 percent slopes	47.77
TmD	Tidings-Townley complex, 10 to 25 percent slopes	25.29
TmF	Tidings-Townley complex, 25 to 45 percent slopes	418.47
TnC	Townley silt loam, 2 to 10 percent slopes	126.72
TnE	Townley silt loam, 10 to 25 percent slopes	33.79
TuA	Tupelo silt loam, 0 to 2 percent slopes	15.10
UpF	Udorthents-Pits complex, 6 to 45 percent slopes	28.15
WhA	Whitwell loam, 1 to 2 percent slopes	1.86
		1627.01

* Indicates hydric soils.

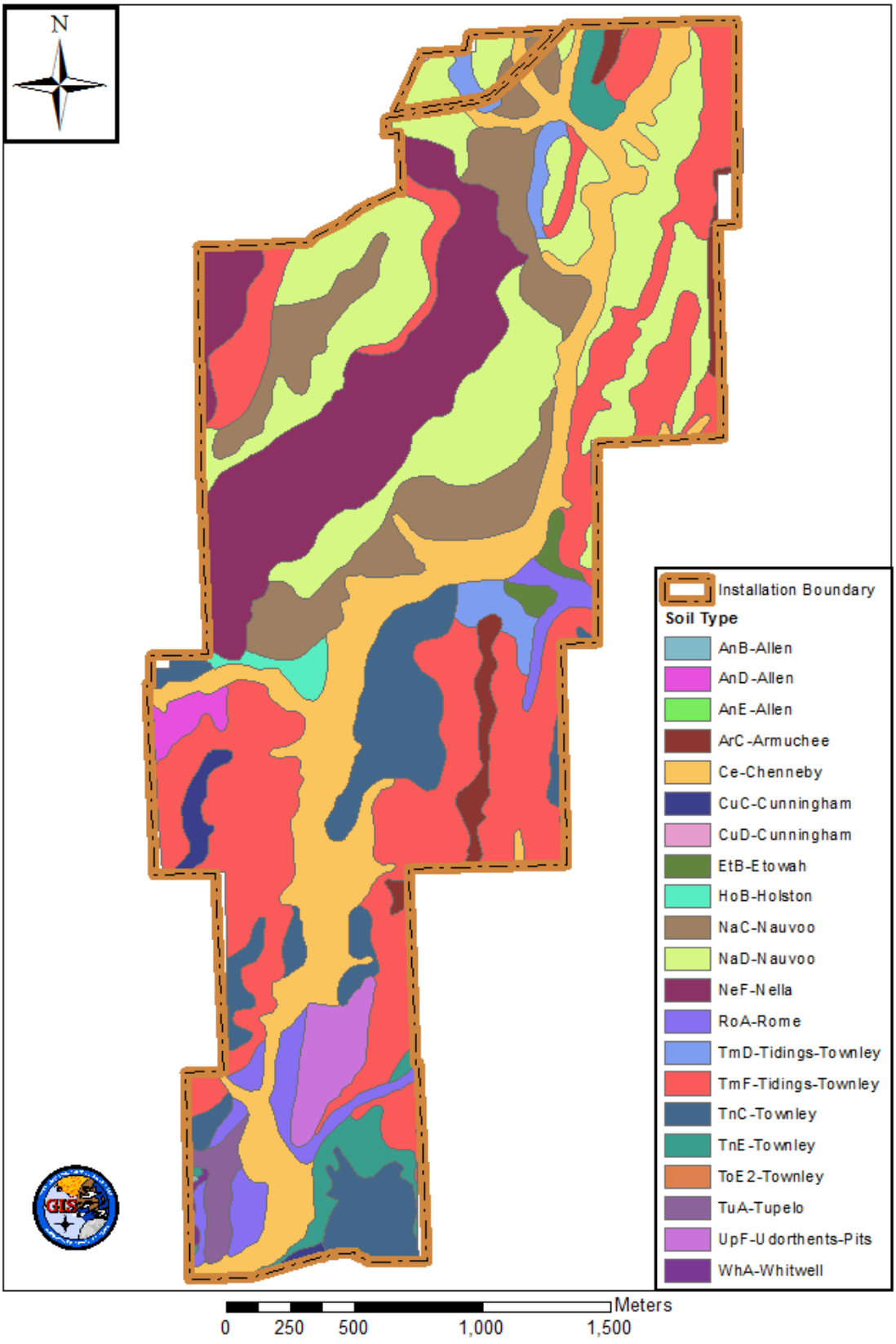


Figure 3.3: Soil Types on VTS-Catoosa.

Chenneby-Rome soils occur on nearly level, very gently sloping ground on floodplains and stream terraces. They are loamy, somewhat poorly drained to well drained soils and are 60+ inches deep over bedrock. The soils at VTS-C which make up this association cover approximately 362 acres (22% of the training site) and include: Chenneby (Ce), Etowah (EtB), Holston (HoB), Rome (RoA), Tupelo (TuA), Udorthents-Pits complex (UpF), and Whitwell (WhA).

Townley-Cunningham-Conasauga is an upland soil association, occurring on gently sloping to moderately steep locations on ridgetops, hillsides, and uplands. They are well-drained or moderately well-drained soils with a loamy surface layer and a clayey subsoil. Depth to bedrock is typically 20 to 60 inches. At VTS-C, this association covers 523 acres (32%) and is made up of the following soil series: Armuchee (ArC), Cunningham (CuC), Nauvoo (NaD), Tidings-Townley (TmD), and Townley (TnC).

Townley-Tidings is another upland association and covers 46% of the training site (741 acres). The soils are strongly sloping to steep and well drained. They either have a loamy surface layer and clayey subsoil or are gravelly and loamy throughout. The bedrock is typically shale 20-60 inches deep. The soil series in this association at VTS-C include: Allen (AnB, AnD, AnE), Nauvoo (NaC), Tidings-Townley (TmF), and Townley (TnE).

NRCS has identified five hydric soil types that occur in Catoosa County. Of these five state-listed hydric soils, the NRCS has mapped one – Chenneby silt loam, Ce – at VTS-C (see Table 3.1, starred soil type "Ce". Hydric soils are defined by the Soil Science Society of America as "Soils that are wet long enough to periodically produce anaerobic conditions, thereby influencing the growth of plants" (Soil Science Society of America 1987).

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 the least damage will be done and where the soil is most capable of recovering from the impact. Soil erosion potential is principally influenced by rainfall (R), slope steepness and length (LS), soil texture or erodibility (K), cover protecting the soil (C), and special practices (P) such as terracing or planting on the contour. Humans can control the C and P factors, while R, LS, and K are a function of the soil's geographic location, topography, and physical properties. The Universal Soil Loss Equation (USLE) (A=R*LS*K*C*P) uses these factors to estimate the average annual soil loss due to sheet and rill erosion for a given soil with specific management. It provides the estimate in tons per acre per year. It does not include other sources of erosion, such as gully or bank erosion.

At VTS-C, the slope steepness and length (LS) of a soil influences the amount of soil erosion more than the other factors because this factor is more variable than others. Interpretation of the data found in the soil survey reveals that soil erosion and compaction are the primary problems affecting the soil resources at the VTS-C site. The erosion index (EI) shows the soils' potential for erosion (Table 3.2) by considering the effects of rainfall, erodibility, and slope, and adjusting for differences in soil erosion tolerance.

On the VTS-C, 78% of the soils meet the criteria of highly erodible lands (marked with red in Table 3.2). Figure 3.4 makes the extent of these soils on the training site very apparent. These soils can tolerate little disturbance. Land management activities as well as training activities which will disturb the soil or eliminate vegetation should be minimized on these highly erodible soils. Where such activities cannot be avoided or relocated, plans for immediate reclamation and revegetation should be developed prior to the activity and implemented promptly after.

An additional problem with soils at VTS-C is excess water. Chenneby soils and the other soil series located along Tiger Creek and Broom Branch floodplains, Rome, Whitwell, and Tupelo, are prone to extreme wetness and flooding. Although these areas are typically very level and so the erosion potential is low, the prevailing wetness can be a problem for training and land management. Large vehicles, including tractors and bushhogs, cannot access non-road areas near the creeks without getting stuck and/or creating large tire ruts. This limits the usefulness of these areas and makes maintenance of open areas such as the tank range difficult. Soil moisture factors must be taken into consideration when scheduling activities.

Table 3.2: Soil Erosion Potential

Symbol	Acreage	Slope (%)	LS Minimum	LS Maximum	T-factor	K-factor	Erosion Index (EI)	HEL Class
AnB	0.36	2 to 6	0.26	0.3	5	0.28	3.6-4.2	PHEL
AnD	8.33	10 to 15	1.31	2.29	5	0.28	18.3-32.1	HEL
AnE	0.39	15 to 25	1.31	2.93	3	0.28	30.6-68.4	HEL
ArC	25.69	6 to 10	0.74	1.08	3	0.28	17.3-25.2	HEL
Ce	250.06	0 to 2	0.05	0.05	5	0.37	0.9	NHEL
CuC	10.59	2 to 6	0.74	0.9	3	0.32	19.7-24.0	HEL
EtB	8.32	2 to 6	0.26	0.31	5	0.37	4.8-5.7	PHEL
HoB	11.17	2 to 6	0.26	0.32	5	0.28	3.6-4.5	PHEL
NaC	75.60	6 to 10	0.74	1.21	3	0.28	17.3-28.2	HEL
NaD	335.15	10 to 15	1.31	2.58	3	0.28	30.6-60.2	HEL
NeF	204.20	25 to 45	4.16	12.26	5	0.15	31.2-92.0	HEL
RoA	47.77	0 to 2	0.05	0.05	4	0.28	0.9	NHEL
TmD	25.29	10 to 25	1.31	1.92	3	0.28	30.6-44.8	HEL
TmF	418.47	25 to 45	4.16	11.65	3	0.28	97.1-271.8	HEL
TnC	126.72	2 to 10	0.26	0.35	2	0.37	12.0-16.2	HEL
TnE	33.79	10 to 25	1.31	2.93	2	0.37	60.6-135.5	HEL
TuA	15.10	0 to 2	0.05	0.05	4	0.37	1.2	NHEL
UpF	28.15	6 to 45	None	None	None	None	None	PHEL
WhA	1.86	1 to 3	0.32	0.05	5	0.32	0.8	NHEL

Note:
LS = Topographic factor (length and steepness of slope)
T = Tolerable soil loss (acres/year)
K = Soil erodibility factor
EI = Erosion Index
HEL Class: HEL= highly erodible land; NHEL= not highly erodible land; PHEL= potentially highly erodible land.

3.4.3 Prime Farmland

A prime farmland designation is given to an area if soils are present that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. According to Lawrence (1993), approximately 16,194 acres in Catoosa County, or about 16 percent of the total county acreage, meet the soil requirements for prime farmland. The acreage in most crops and pasture has been gradually decreasing as more land is used for urban development. Most of the soils on

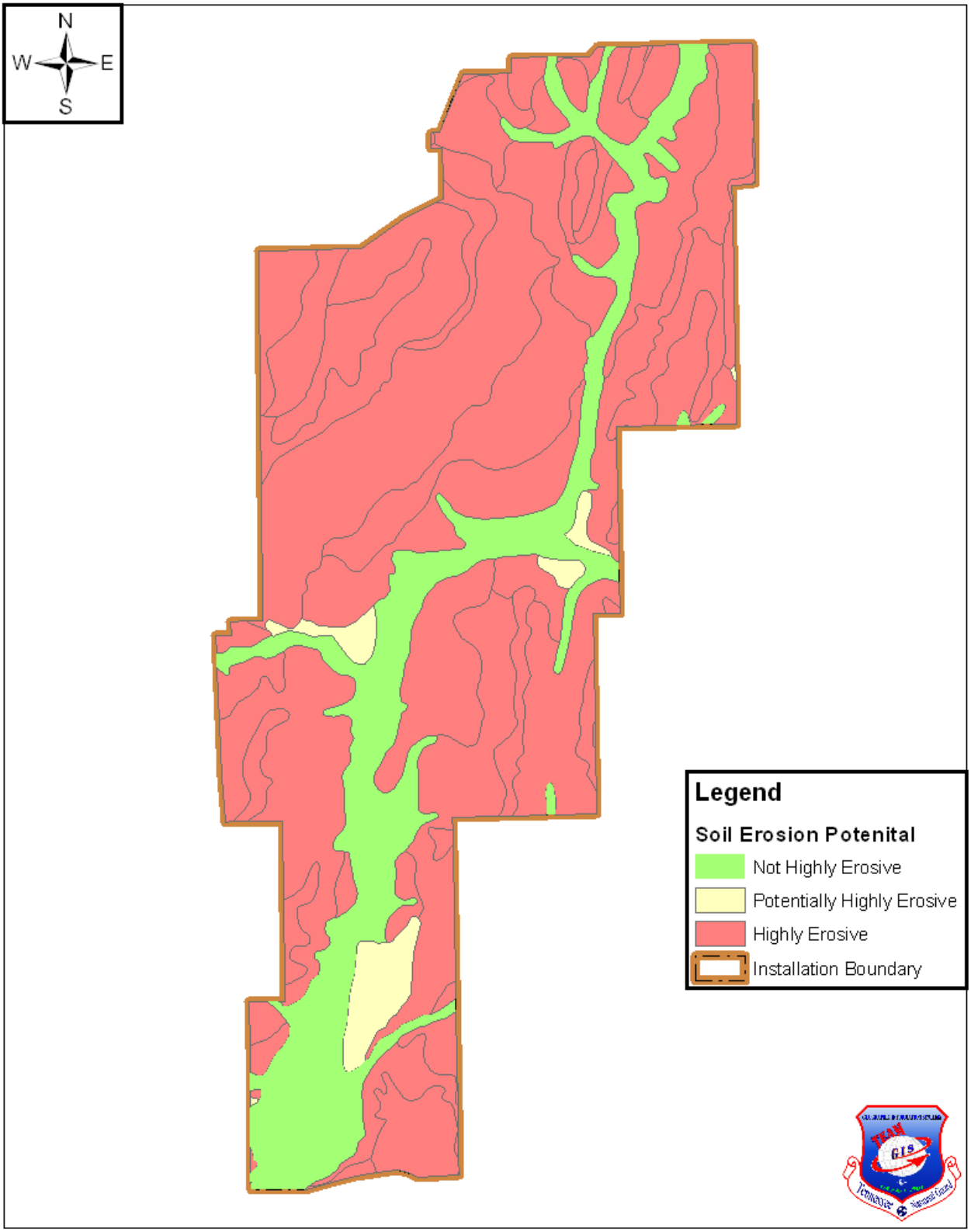


Figure 3.4: Soil erosion potential on VTS-Catoosa.

VTS-C are not suitable for farmland due to soil erosion by wind and water, low soil fertility, and wetness; however, four soil types (AnB, EtB, HoB, and WhA) fall into the prime farmland category, constituting 21.7 acres of the training site. Prime farmland on the VTS-C is not managed to produce crops, nor is it leased for agricultural production.

3.5 WATER RESOURCES

3.5.1 Surface Water

The VTS-C lies within the Chickamauga watershed (USGS Hydrologic Unit #06020001); specifically, the Little Chickamauga Creek – East Chickamauga Creek or the Tiger Creek (HUC #0602000109) watershed. The training site is drained primarily by Tiger Creek and its tributaries, including Catoosa Springs Branch and Broom Branch. A 1998 delineation of regulated waters identified 11.6 miles of intermittent or flowing streams on the site (Minkin et al. 1998).

Tiger Creek originates in Whitfield County, GA, from underground springs. It flows south and southwest through heavily forested terrain into Catoosa County, GA. It proceeds west across Catoosa County, entering the VTS-C on its eastern border, approximately midway between the northern and southern boundaries. Within the training site, the creek turns south, collecting the drainage from the eastern slope of Sand Mountain, and exits the training site midway along the southern border. Tiger Creek ultimately flows into South Chickamauga Creek southeast of Ringgold, GA (Georgia 2006).

Broom Branch enters the VTS-C across the northern border near the northeast corner and flows approximately 7,500 feet south-southwest until its confluence with Tiger Creek. Catoosa Springs Branch enters the training site on the east boundary, approximately 1,100 feet north of the southern boundary. The creek flows in a westerly direction for approximately 900 feet before turning southwest and flowing another 900 feet to its confluence with Tiger Creek.

Tiger Creek and its tributaries are designated as Secondary Trout Streams by the Georgia Department of Natural Resources. A Secondary Trout Stream is one with no evidence of natural trout reproduction but that is capable of supporting trout throughout the year. Tiger Creek is stocked with trout twice per month during the stocking season of March through Labor Day (Georgia 2006). Trout streams are subject to additional controls intended to minimize sedimentation and maintain forest cover for temperature control. Current state regulation requires the maintenance of a 50 foot vegetated buffer on either side of a trout stream with permits required for any modification within that buffer area (DeMeo et al. 2005).

The upper reach of Broom Branch has been heavily impacted by beaver. In 2007, more than 20 maintained dams were counted along Broom Branch and its unnamed tributary north of the upper road, and much of the surrounding area had been flooded, leaving the defined creek channel obscured. Indications of beaver activity are present along Tiger Creek and Catoosa Springs Branch, as well. Beaver control efforts were initiated in FY07: USDA Animal Damage Control trapped three dozen beavers from the training site and broke down the known dams to restore creek flow. By mid-2008 there have been indications of some returning beaver activity.

One small pond on the site is shown on the USGS topographic map (Ringgold, GA, Quadrangle). It is a man-made pond behind a small dam on Catoosa Springs Branch from 1934 and is currently heavily clogged with silt and organic debris.

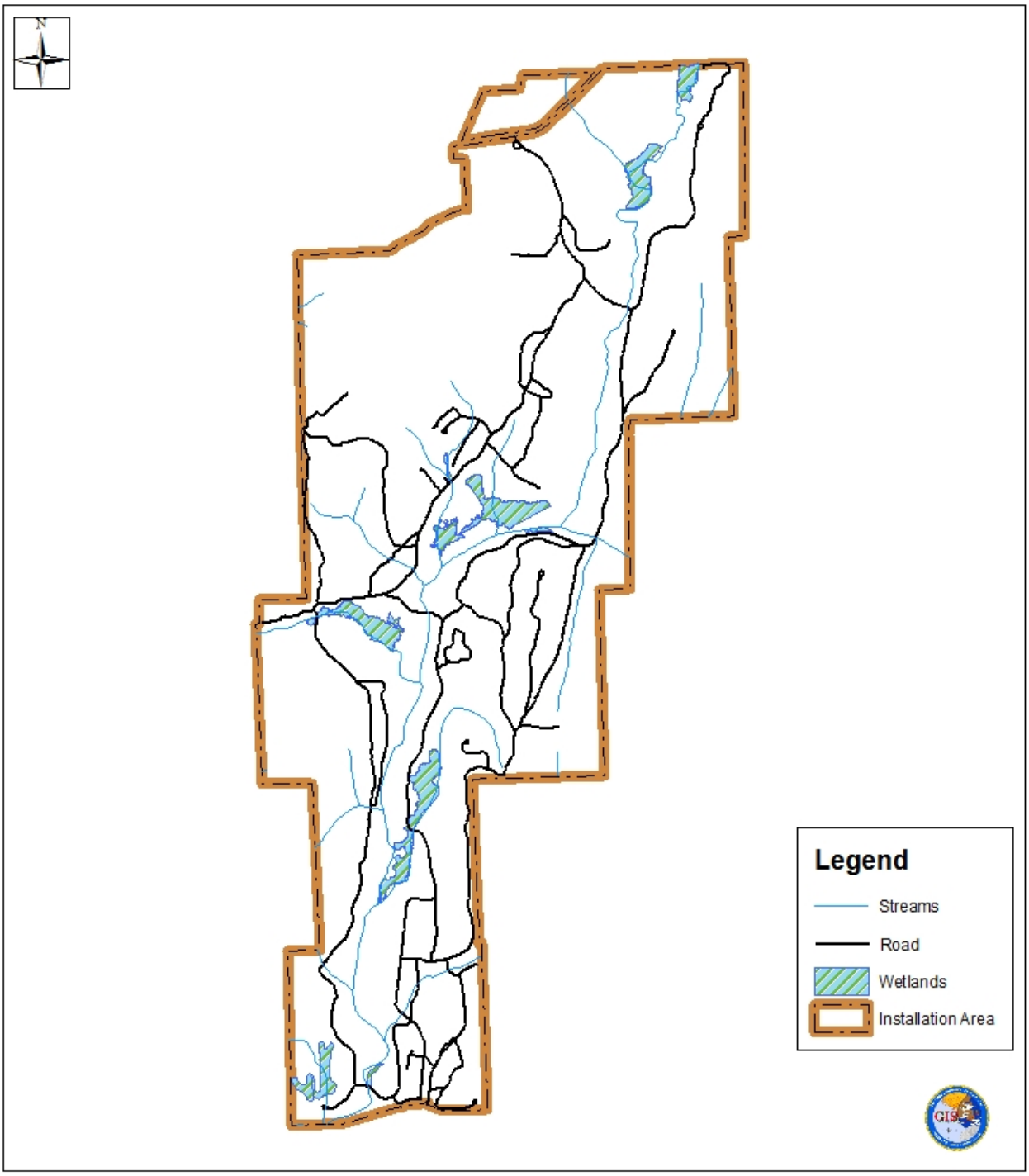


Figure 3.5: Surface Water on VTS-Catoosa.

3.5.2 Ground Water

Groundwater beneath VTS-C occurs in the Paleozoic Rock Aquifers. Soil and residuum form low-yield unconfined aquifers across most of the Valley and Ridge Providence of northwestern Georgia (Donahue 1998). For this reason, surface water is the primary source of water in the county. Chickamauga Creek provides water to the community of Ringgold. Drilled wells are widely scattered, and some areas of the county have no wells. Most drilled wells are less than 100 feet deep, but some reach to nearly 150 feet.

3.5.2.3 *Water Supply*

VTS-C is supplied with water through the Catoosa County Utility District. There are two wells located on the training site. They are not used as a potable water supply, but serve primarily to supply the vehicle wash rack.

3.5.2.4 *Wastewater Discharge*

VTS-C wastewater discharge is to fourteen septic tanks across the facility. The washrack discharges to grade upslope of a wetland located off-site.

3.5.3 Water Quality

An initial water quality assessment was conducted for VTS-C during the fall (dry) and spring (wet) seasons in 1997/98 by Science Applications International Corporation (1998a). The purpose of the water quality analysis was to obtain current information on the existing conditions of the surface waters at the training site. The conclusion from this assessment was that the water quality in the surveyed creeks and ponds was "generally very good."

Two rounds of sampling were performed in the study. The first sampling was performed on November 5-6 and December 11, 1997 (low flow), and the second sampling was conducted on April 28, 1998 (high flow). Ten stations were sampled for water quality throughout the training site including two in Tiger Creek (T-1 and T-5), two in Broom Branch (B-1 and B-3), two in Catoosa Springs Branch (C-1 and C-3), two in unnamed tributaries to Tiger Creek (U-1 and U-2), and two in ponds (P-1 and P-2).

The study found low concentrations of toxic metals, nutrients, anions, and fecal coliform. Calcium, magnesium, total hardness, sulfate, and total dissolved solids were many-fold greater at the Catoosa Springs Branch stations than any other stations during both rounds of sampling, suggesting that there is some off-site source for the elevated concentration. Complete results are available in the study report.

Although the initial assessment results for the training site indicate good water quality, the State of Georgia has developed a Total Maximum Daily Load (TMDL) Implementation Plan for the HUC #0602000109 watershed (Tiger Creek) in accordance with the GADNR Rules and Regulations for Water Quality Control, Chapter 391-3-6, Revised (November 2005). Tiger Creek's designated use is fishing, and the creek is listed as impaired on Georgia's 303(d) list for fecal coliform bacteria. The TMDL Implementation Plan lists the primary source of the bacteria as non-point from wildlife, agricultural livestock, and urban development.

Water quality was again sampled and assessed in fall/winter 2008 and spring/summer 2009 in conjunction with an aquatic fauna survey conducted by URS (2010). Water quality had not changed appreciably form 1997-1998 to 2008-2009, and was still generally considered very good. Measured fecal coliform levels were however much higher in 2008-2009 than in 1997-1998, and still violated the now higher allowable limits of state water quality standards. Only the December 2008 samples did not exceed the allowable limits, likely due to the colder temperatures.

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 macroinvertebrates that use or break down nutrients and contaminants.

A 1998 delineation of wetlands and other regulated waters was performed by Minkin et al. (1998) of the U.S. Army Engineer Waterways Experiment Station. To determine if an area would be considered a jurisdictional wetland under Section 404, this study applied the technical criteria for wetland delineation as described in the Corps of Engineers Wetlands Delineation Manual (U.S. Army Corps of Engineers 1987) and the Code of Federal Regulations (33 CFR 329.11(a)(1)). They found that VTS-C contained approximately 7.88 acres of wetlands and ponds, the majority located in the southwestern corner of the property (Figure 3.5).

A more comprehensive planning level wetland survey was conducted in December 2010 (URS 2012). This survey identified approximately 39.50 ac of wetlands on the training site, but did not thoroughly delineate the wetland perimeters. The results of the two studies were combined with National Wetland Inventory (NWI) data to produce the 46.73 ac of wetlands represented in the GIS database (Figure 3.5). The combined dataset is used to identify potential wetland issues when evaluating proposed projects and planning field activities. The data must be ground truthed or formal delineations conducted when the situation merits data of that accuracy.

This small area (2.9% of the installation's total land) is composed of a variety of wetland communities, with many situated along streams and drainage-ways. Six National Wetland Inventory (NWI) classes are found at VTS-C. Of the VTS-C wetlands designated clearly by type, the majority are forest wetlands (18.7 acres, 43%). In addition, there are approximately 14.3 acres (33%) of shrub-scrub wetland, and 10.4 acres (24%) of emergent wetland dominated by graminoids.

The beaver (*Castor canadensis*) population on the training site has varied greatly over time. A 2005 survey of Broom Branch identified over 25 individual dams in good repair. Another series of dams located on Tiger Creek, in the middle of the tank range, expanded the associated "pond" substantially. The level of beaver activity at that time significantly affected the usability of the area for training, and a control program was initiated to reduce the population and associated flooding to acceptable levels. Beaver activity and dams are currently monitored through incidental observation, with more intensive monitoring and control implemented when they begin to impact infrastructure, work activities, or training.

3.7 VEGETATION

The VTS-C is part of a larger ecosystem that is known as the Gulf Slope Section of the Oak-Pine Forest Region (Braun 1950). 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, and farms. Fire has probably been the principal historical disturbance, previously burning over small areas between natural barriers with moderate frequency and low intensity. Insect

related disturbances have resulted from southern pine beetles (McNab and Avers 1994). Climatic related influences include occasional droughts and ice storms.

3.7.1 Vegetation Community Classification

Climate and land use history influence the types of ecosystems found in Georgia. At the time of European settlement, most of VTS-C was probably covered by oak-hickory-pine forest and southern mixed forest. Approximately 82% of VTS-C is currently forested. The principal cover type is oak-hickory, which includes southern red oak, white oak, post oak, red maple, winged elm, flowering dogwood, pignut hickory, and loblolly pine. In some areas, loblolly and shortleaf pines are dominant.

Ten natural communities were described in the Phase II natural resources survey by Science Applications International Corporations (SAIC 1998b) based on edaphic conditions and dominant species types. These community types were further refined by a 2006 survey (Dynamic Solutions 2007) which classified the vegetation on VTS-C according to the National Vegetation Classification Standard to the level of floristic alliance (Figure 3.6). These community classifications are described below.

3.7.1.1 Vegetated, Tree Dominated, Closed Tree Canopy, Evergreen

Pinus taeda Forest Alliance

Several loblolly pine plantations of varying ages occur in the southern portion of VTS-C. They were established as pure stands, but other species have invaded the understory, including red maple, sweetgum, black gum, black cherry, box elder, and eastern red cedar. If they remain free from major disturbance, these stands will likely succeed to more shade-tolerant hardwood species typical of the region. A number of the loblolly stands, however, have been impacted by southern pine bark beetle, resulting in high mortality of mature pines and leaving the future stand composition yet to be determined by competition among the surviving pines and the mixed hardwood species in the understory.

Pinus (*echinata, virginiana*) Forest Alliance

This alliance is characterized by natural stands of the native southern yellow pines, shortleaf pine and Virginia pine. These two species dominate the overstory, although loblolly pine and eastern redcedar may also occur naturally. These stands have a diverse canopy, including pignut hickory, basswood, black gum, yellow-poplar, black cherry, black oak, white oak, and sweetgum, as appropriate to the edaphic conditions, and an understory which includes dogwood, wild grape, and Christmas fern. This forest alliance on VTS-C is often infested with privet and honeysuckle.

3.7.1.2 Vegetated, Tree Dominated, Closed Tree Canopy, Deciduous

Fraxinus pennsylvanica Forest Alliance

Green ash grows along the bottoms and first terraces of Tiger Creek and Broom Branch throughout the training site. This forest alliance consists of species which are capable of withstanding frequent and, sometimes, prolonged flooding during the December to April wet season. Tree species typical of these stands include black gum, sweetgum, boxelder, black willow, black walnut, hackberry, red maple, pin oak, sycamore, basswood, redbud, and slippery elm. On the southern portion of VTS-C, this alliance has become dominated by privet up to 5-7 m in height.

Quercus (*alba, velutina, prinus*) Forest Alliance

Dominated by white oak, black oak, and chestnut oak, this alliance also contains mockernut hickory, black cherry, sassafras, American beech, post oak, shagbark hickory, dogwood, and sourwood. Several *Vaccinium* species are prevalent in the understory, as are wild grape, greenbriers, and

Christmas fern. These stands typically occupy the upper and mid slope positions along the well-drained east- and west-facing slopes on the ridges throughout the training site.

Quercus (*alba, rubra, velutina*) – *Liriodendron tulipifera* Forest Alliance

Along the lower slopes and rolling hills in the center of the site the oaks of the previous alliance are joined by northern red oak and yellow-poplar. This alliance occupies higher quality sites with a more favorable moisture regime.

Ulmus americana – Carya ovata – Celtis Forest Alliance

There is one isolated stand of this type in the cantonment area. The area is mowed regularly and maintained with these three species over a crabgrass-dominated turf.

3.7.1.3 Vegetated, Tree Dominated, Closed Tree Canopy, Mixed Evergreen-Deciduous

Juniperus virginiana – Quercus (*prinus, velutina*) Forest Alliance

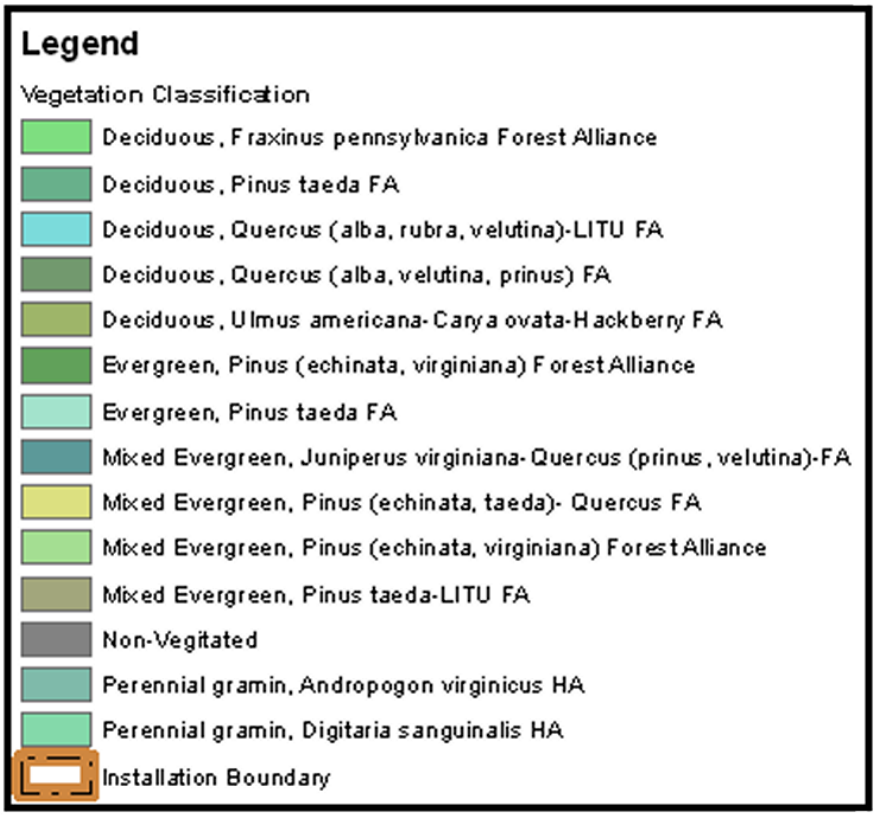
An area along the south slope of Sand Mountain has exposed limestone at the surface. This area is dominated by eastern redcedar, with hickories and dry-site oaks (chestnut oak and black oak) also common in the overstory and a variety of other species present including sourwood, redbud, and farkleberry.

Pinus (*echinata, taeda*) – *Quercus* Forest Alliance

Areas of the training site which experienced disturbance may develop into a mixed stand in which shortleaf and loblolly pines dominate but oaks are also a significant component. Current stands of this type can be found on the northern edge of the property, as well as two areas west of Tiger Creek. The dominant hardwood canopy trees are black oak and chestnut oak. VTS-C is within the native range of loblolly pine, and so mixed stands of this type are a natural response to disturbance on dry sites in this region, not necessarily a result of human planting efforts.

Pinus taeda – Liriodendron tulipifera Forest Alliance

One area to the east of Tiger Creek is likely a response to heavy disturbance of a relatively moist site. Loblolly pine is the dominant overstory species, but it shares the stand with a significant yellow-poplar component.


Legend
Vegetation Classification
Deciduous, Fraxinus pennsylvanica Forest Alliance
Deciduous, Pinus taeda FA
Deciduous, Quercus (alba, rubra, velutina)-LITU FA
Deciduous, Quercus (alba, velutina, prinus) FA
Deciduous, Ulmus americana-Carya ovata-Hackberry FA
Evergreen, Pinus (echinata, virginiana) Forest Alliance
Evergreen, Pinus taeda FA
Mixed Evergreen, Juniperus virginiana-Quercus (prinus, velutina)-FA
Mixed Evergreen, Pinus (echinata, taeda)- Quercus FA
Mixed Evergreen, Pinus (echinata, virginiana) Forest Alliance
Mixed Evergreen, Pinus taeda-LITU FA
Non-Vegitated
Perennial gramin, Andropogon virginicus HA
Perennial gramin, Digitaria sanguinalis HA
Installation Boundary

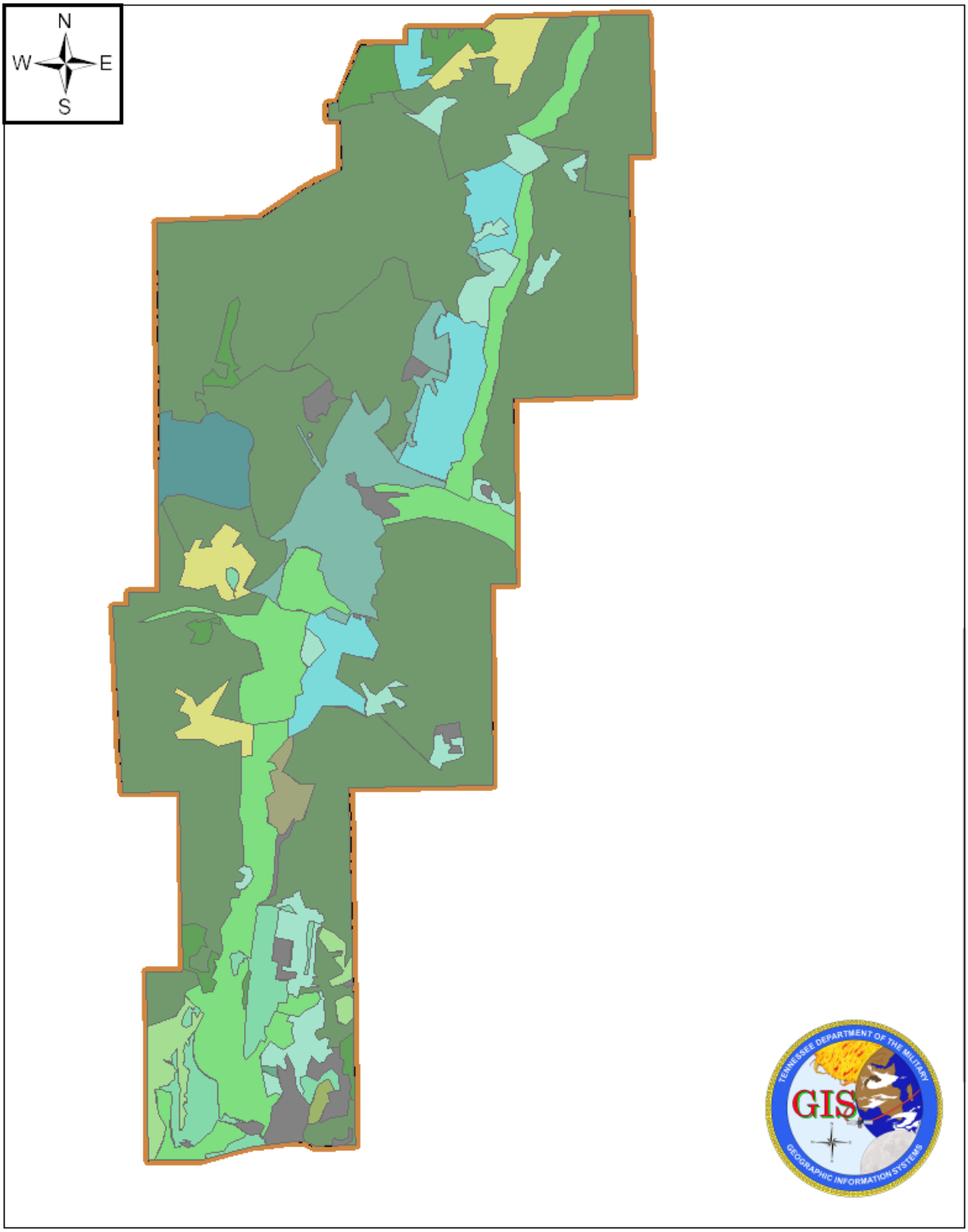


Figure 3.6: Vegetation communities on VTS-Catoosa.

3.7.1.4 Vegetated, Herb Dominated, Herbaceous Vegetation, Perennial Graminoid Vegetation

Andropogon virginicus Herbaceous Alliance

The tank range in the center of the training site represents the primary example of this alliance. The area is regularly mowed to maintain its open condition. The species composition varies across the site, but broomsedge is the dominant species throughout. Other species found in this alliance include common plantain, blackberry, thoroughwort, and honeysuckle. A number of tree species have seeded into the area, but the regularly mowing regime prevents succession to forest alliance from occurring.

Digitaria sanguinalis Herbaceous Alliance

The small arms ranges and the Cantonment areas which are mowed are dominated by crabgrass. Other species common in these areas are tall fescue, foxtail, plantain, white clover, and bermudagrass.

3.7.2 Forest Inventory and Management

3.7.2.1 Past Forestry Operations

A forest inventory for the entire site was conducted in 1986 by the U.S Army Corps of Engineers, South Atlantic Division, Savannah District. At that time, the training site woodlands were composed primarily of a mixture of upland and lowland hardwoods with various species of oak and hickory, as well as yellow-poplar, ash, and maple, among others.

Since the mid to early 1980's, the forestry staff at the US Army Corps of Engineers, Savannah District has provided forestry management support to Catoosa. From 1982 to 1984, timber clearing was conducted in compartments 4 and 5 to create an impact area for tank firing. In addition, during the latter 1960's and the early 1970's, several road rights-of way and tank parking areas were cleared.

An emergency harvest of pine was conducted in 1988 to prevent the further spread of southern pine bark beetles and salvage the trees before they lost all value. Timber made available for harvest was located in the northeastern quadrant of the training site to the east and west of Broom Branch. Total board feet harvested was estimated at 3.5 million.

Since 1990, the Georgia Division of Forestry has provided technical expertise and professional judgment in planning for and applying various management practices related to prescribed burning. No further commercial timber harvests have been made by the TNARNG.

In 2001 another forest inventory was contracted with the U.S. Forest Service (USFS), Chattahoochee – Oconee District; however, this inventory was never completed due to personnel transfers with the USFS.

3.7.2.2 Current Forest Inventory and Management

A forest inventory and a management plan 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. 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-Catoosa Forest Management Plan (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 1,313 acres (81%) of VTS-C were covered in forests in April 2005. The forest stands are typically dominated by red oaks and white oaks, with a substantial amount of pine in some stands. Yellow-poplar is a co-dominant in some stands, as is hickory. Timber volumes are given in Table 3.3. The average DBH for the entire installation was 11.7 inches, and the average basal area was 78.1 square feet per acre. Most stands are 20-40 years old; although some had trees approaching 70 years in age, and a few stands were dominated by young trees. The overall health of the forest stands was classified as good in April 2005, but there was evidence of a past infestation of southern pine beetles. In addition, stands in the impact area of the tank range show a significant amount of timber damage due to frequent hot fires.

Table 3.3. Forest product volume summary for the VTS-Catoosa (from Thompson Engineering et al. 2006).

Timber Product	Per Acre		Installation Total	
	Tons	Board feet	Tons	Board feet
Sawtimber				
Pine	5	640.1	6,837	875,273
Pole	0.1	6.4	137	8,751
CNS	1.9	198.8	2,598	266,370
Cedar	0	4.4	0	6,017
Red Oak	10.7	1485.4	14,631	2,031,136
Hickory	2.9	358.2	3,965	489,803
White Oak	7.2	941.7	9,845	1,287,681
Ash	1.1	148.2	1504	202,649
Poplar	4.8	650.9	6,564	890,041
Walnut	0.2	23.6	273	32,271
Misc. Hardwood	2.6	322.4	3,555	440,850
Pulpwood				
Pine	0.6	0.2	820	273
Hardwood	19.5	7.2	36,664	9,845

The forest inventory data was utilized to develop management prescriptions for each forest stand on VTS-C based on forest health and commercial timber production goals. Military requirements and goals were then incorporated into the final forest management plan for VTS-C presented in Annex 2. Timber harvests will be conducted on VTS-C for the purpose of opening up needed training areas and improving forest health. Forest health harvests will be thinning or small group selection cuts (creating a patchwork of 2-10 acre openings but removing no more than 30% of timber volume. Large areas (greater than 10 acres) will only be clearcut in the event that training needs demand open land.

The forest management plan identifies the priority for stand harvest for up to 17 years. The forest inventory is scheduled to be repeated in 2032 to provide updated information which will be used to revise the management and harvest plan as needed. Thereafter, the plan will be reviewed and revised as needed in conjunction with the INRMP review process and at subsequent forest inventory periods.

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, become 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 invasives 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-C (Figure 3.7). A survey of the training site for invasive exotic species was completed in both FY2006 (Dynamic Solutions 2006) and FY2014 (University of Tennessee at Chattanooga). Survey results overlapped greatly, with UTC 2015 detecting 18 Invasive Pest Plants (IPP). Chief among the problem species are: privet (*Ligustrum* spp.), Japanese honeysuckle (*Lonicera japonica*), Nepal grass (*Microstegium vimineum*), sericea or Chinese lespedeza (*Lespedeza cuneata*), and bicolor Lespedeza (*L. bicolor*). Tree-of-heaven (*Ailanthus altissima*), mimosa (*Albizia julibrissin*), wintercreeper (*Euonymus fortunei*), multiflora rose (*Rosa multiflora*), Johnson grass (*Sorghum halepense*), sessile joyweed (*Alternanthera sessilis*), goatweed (*Hypericum perforatum*), Korean clover (*Kummerowia stipulacea*), Chinese yam (*Dioscorea oppisitifolia*), large periwinkle (*Vinca major*) common periwinkle (*Vinca minor*), bush honeysuckle (*L. maackii*), and bull thistle (*Cirsium vulgare*) were also found on the training site. All of these species are listed as “severe threats” or “significant threats” on the Tennessee Invasive Plant Council list (TNIPC 2017). 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, in particular, can create dense, difficult-to-traverse stands which make an area unsuitable for mounted or dismounted maneuvers.

Complete eradication of these problem species is unlikely to be possible. In the case of small, recently established infestations – tree-of-heaven and wintercreeper at VTS-C – rapid control efforts may eliminate the species from the site. For the more prevalent species, an achievable goal is to reduce their numbers and spatial extent and to limit their impacts on native species. 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 4, Invasive Pest Plant Control.

At VTS-C, the use of chemical herbicides is limited by the presence of a federally listed Threatened plant species, the large-flowered skullcap (*Scutellaria montana*) and federally threatened northern long-eared bat. To minimize the chance of accidental damage to the skullcap, herbicide use within and upslope of skullcap clusters is limited to that described in Annex 4: no herbicides will be used within a skullcap management group during the growing season for the skullcap (March through September), no foliar spray application of herbicides will be conducted within 50 feet of known skullcap locations during the skullcap growing season , and no chemicals which translocate through the soil from root systems will be utilized within 50 feet of known skullcap clusters at any time. To prevent unanticipated impacts to NLEB, any active season application of herbicides in forested areas will first be coordinated with USFWS through the streamlined consultation process defined in the NLEB final 4(d) rule BO (2017).

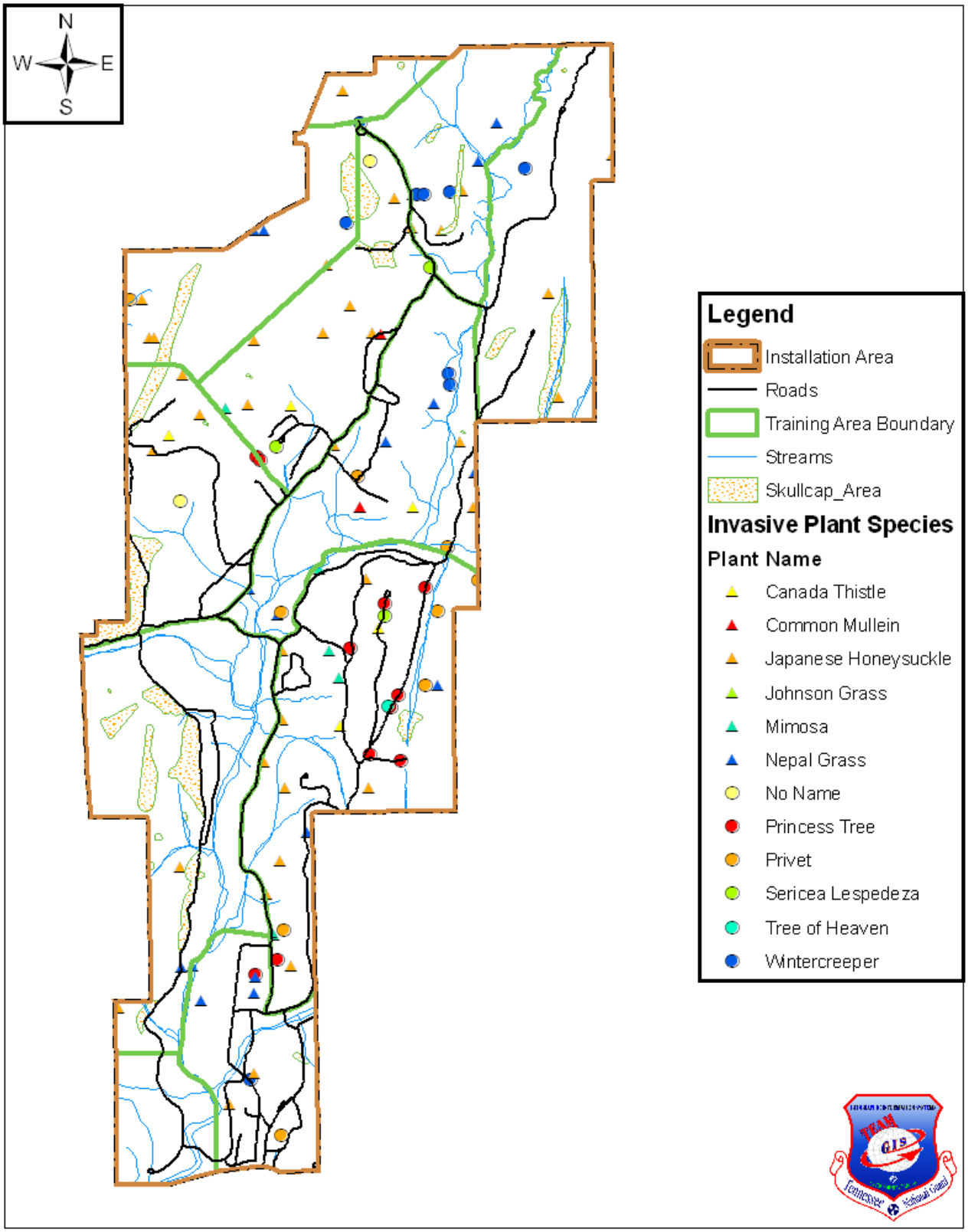


Figure 3.7: Invasive pest plant species identified on VTS-Catoosa.
(Point occurrences – large occurrences are not represented.)

3.8 FISH AND WILDLIFE

Data on the wildlife utilizing the training site have been collected through several surveys. The 1998 Phase II Natural Resources survey identified some species occurring on VTS-C (SAIC 1998b). Bird surveys completed in 2008 and 2013, in conjunction with mammal, reptile, and amphibian surveys completed in 2010 and 2015, contributed a substantial number of new species to the site species lists (see Appendix F for species lists). Bird surveys will be repeated on a five year schedule to maintain up to date information. Other vertebrate surveys will be conducted on a longer schedule (every ten years) unless changing conditions or concerns dictate earlier resurveys. Aquatic surveys have been conducted separately from the terrestrial examinations and are discussed in section 3.2.3.

3.8.1 Migratory Birds

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

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

In Georgia, which falls within the Atlantic flyway for migratory birds, over 90 species of neotropical migrants depend on the forests, thickets, and fields of the state as areas to rest and refuel during their long migrations. Fifty-four migratory species nest and raise their young in habitats around the state (Georgia Natural Heritage Program 1999). At VTS-C, 36 bird species were identified during the 1998 Phase II Natural Resources survey (SAIC 1998b). A baseline survey of birds was initiated in 2006 and identified 134 species (see Appendix F) utilizing this training site for part or all of the year (AMEC 2008). A bird PLS was conducted in 2012 and identified 130 species using the site. The combined results from all three surveys indicate at least 161 species using the installation. Of these, only three are not included on the 10.13 migrant list: wild turkey, northern bobwhite, and European starling. The first two are protected by state and federal gamebird regulations, and the third is a non-native invasive species which is not protected from control efforts.

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-C are identified, the TNARNG will develop a MOU with the USFWS within two years. No measurable negative effects have been identified at this time.

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

3.8.2 Wildlife and Game Species

A comprehensive mammal survey conducted by AMEC Earth and Environmental, Inc. in 2008-10, identified 25 mammal species on the VTS-C. An ESI mammal and herpetile (reptile and amphibian) survey conducted in 2015 documented 22 non-bat mammals on VTS-C. These species combined with one additional mammal documented in the INRMP and 7 bat species documented during bat studies indicate the presence of at least 35 total mammal species on the installation. See the mammal species list in Appendix F for more detail.

A herpetofauna survey was completed by URS in 2010 and identified 24 reptile and amphibian species on the training site. An aquatic RTE species survey focusing on fishes incidentally documented the presence of eight herpetofaunal species in 2013 (URS 2013). A 2015 mammal and herptile survey conducted by Environmental services, Inc. identified a total of 39 herptile species. Two of the species from the 2010 survey and two from the 2013 RTE survey were not encountered during the 2015 mammal and herpetile survey, giving a total of 42 herpetile species (8 salamander, 11 frog, six lizard, 9 snake, and 8 turtle) documented on VTS-C. See herpetile species list in Appendix F for more detail. One reptile species (*Graptemys geographica*, common map turtle) documented in 2015 is considered rare.

Wildlife game species on VTS-C include white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), northern bobwhite quail (*Colinus virginianus*), American woodcock (*Scolopax minor*), dove (*Zenaida macroura*), squirrel (*Sciurius* spp.) and other small game species, and several waterfowl species. There is no hunting on VTS-Catoosa due to its small size, residential neighbors, and the potential for interference with training. For this reason, there are no management actions specific to game species, who are addressed through general wildlife habitat management.

3.8.3 Aquatic Species

An aquatic survey was conducted in 1997-1998 to determine the ichthyofaunal (fish) and benthic macroinvertebrate fauna (insects and other large invertebrates) of the VTS-C (SAIC 1998a). The aquatic survey was repeated in 2008 by URS. A separate mussel survey was conducted in 2007; its results are presented in the macroinvertebrate section below. Aquatic fauna were further sampled during an RTE survey conducted by URS in 2013.

3.8.3.1 Fish

The 1997-1998 survey included Tiger Creek, Broom Branch, Catoosa Springs Branch, two unnamed tributaries of Tiger Creek, and two ponds. A total of 3,387 fish, representing 33 species and three hybrids, were collected (see Appendix F for species list). The 2008 sampling collected fewer individuals due to sampling methodology differences. Fewer species were also collected in 2008 (29 species in the fall sampling), including one new species. The species that had been identified in 1997 but not 2008 were rare in the system, represented by only one or two individuals caught. Index of Biotic Integrity (IBI) metrics in 2008 indicates that VTS-Catoosa streams range from fairly poor to fair biotic quality.
The 2013 RTE survey captured a total of 1,095 fish representing 27 species, four of which are listed as imperiled by the state of Georgia, and three of which are new species on the VTS-C list. No federal or state listed fish species were collected in any of the surveys.

3.8.3.2 Macroinvertebrates

The 1997/1998 aquatic survey included 15 sampling points for aquatic macroinvertebrate fauna, while the 2008 survey sampled benthic macroinvertebrates at 13 stations. The species list is contained in Appendix F. In the fall 1997, 8,798 organisms, representing 154 taxa, were collected; in spring 1998, another 13,105 organisms were collected, representing 172 taxa. The results of this survey and its associated habitat analysis indicate that aquatic habitat quality on VTS-C was generally very good and supported highly diverse benthic and fish communities, especially in Tiger Creek and Broom Branch (SAIC 1998a). The biotic index values calculated from the 2008 survey data indicated relatively unimpaired streams for all sampling stations except Catoosa Springs Branch, which was indicated to be slightly impaired. The lower quality indicators in this stream were consistent across water chemistry, fish, and macroinvertebrate indicators, and are probably a result of higher temperature and dissolved solids from the cattle pond on the creek just upstream of the training site boundary (URS 2010).

Freshwater mussels are one of the most endangered groups of aquatic species. The 1997/1998 survey identified five taxa of native mussels from live specimens and relict shells. Although none of these were federally listed species, it was determined that one – a *Villosa* sp. – might be a previously undescribed species. In addition, Asiatic clams (*Corbicula fluminea*) were common throughout the streams of the training site. In FY2007 a mussel survey was initiated to document the species diversity on the training site and further investigate the unique *Villosa* sp. The more recent survey found a significant change from the earlier conditions: Asiatic clam was found in very high numbers, while native species were extremely rare. Only one live mountain creekshell (*Villosa vanuxemensis*) was found, in addition to several relicts of that species and of the rainbow (*Villosa iris*). There was no sign of the unknown *Villosa* in the 2007 survey. Competition from the Asiatic clam and high sediment loads provide the likely explanations of the loss of native mussels from the VTS-C. The 2008 aquatic survey again found significant numbers of *Corbicula fluminea*. However, larger numbers of a *Sphaerium* species were identified. This genus, the fingernail clams, includes several species native to Tennessee and one non-native European species that has been found in Tennessee. None of them are listed by Natureserve Explorer as found in the state of Georgia (NatureServe 2012). The lack of detail in the sampling report makes it impossible to know whether this result indicates a return of native fauna or an invasion of additional non-native species. A few individuals of a Pisidium species were sampled. This peaclam genus also has native and exotic species, but only native species are documented from Tennessee.

3.8.4 Pest Species

In the past, VTS-C has experienced problems with large numbers of feral hogs. Rooting by these animals is highly destructive of understory plant communities and is a significant threat to the federally listed large-flowered skullcap. Feral hogs were controlled previously by professional removal. If hog sighting or damage increase to unacceptable levels, a project will be initiated to reduce their numbers.

As noted previously, beaver have been active on the VTS-C in large numbers. Control activities initiated in 2006 reduced the population to zero, temporarily, and reclaimed much of the flooded training land. It is anticipated, however, that the population will rebound as young beaver move in from other areas. The beaver population is monitored by observation of dammed waterways by training site and Environmental personnel. Control efforts will be re-initiated if the acreage lost to training becomes significant again.

VTS-C is infested with the imported fire ant (*Solenopsis* spp.). This invasive pest has spread to encompass the whole of the southeastern U.S. and has been found as far west as New Mexico, Arizona, and California. The imported fire ant is a highly aggressive ant, dominating the areas it infests and generally causing a decrease in insect species diversity. It has a fierce sting which it will apply repeatedly to animals it encounters with minimal provocation. These stings are painful and can cause anaphylaxis in sensitive individuals. Humans, domestic livestock, and wildlife are all susceptible to injury by red imported fire ants (Williams et al. 2001). The imported fire ant is the subject of a USDA quarantine which restricts the transport of soil, plants with soil and roots attached, grass sod, and similar materials. Fire ants are most prevalent on the open ranges and Cantonment lawns on VTS-C. A program of broadcast bait application coupled with direct contact insecticide application to immediate threat mounds is used to minimize the impact of the fire ant on training activities.

3.9 RARE, THREATENED, OR ENDANGERED SPECIES

One federally listed plant species has been located on VTS-C: a rather large population of the threatened large-flowered skullcap (*Scutellaria montana*) occurs in clusters over most of the training site (see 3.9.1 and Annex 1). No other federally listed plant species are known from Catoosa County. Several state-listed plant species are documented in Catoosa County but were not found on the site during rare, threatened, and endangered (RTE) species surveys in 1998 or 2012 (SAIC 1998b, URS 2013):

- **Goldenseal** (*Hydrastis canadensis*) – listed as endangered in GA – A perennial, low-growing, rhizomatous herb with a solitary, greenish white flower. Found in rich, mesic hardwood forests with alkaline soils. Commercial exploitation puts this species at risk as it has been over-harvested for medicinal uses. Additionally, goldenseal is sensitive to habitat alterations and encroachment of invasive species.
- **Least glade-cress** (*Leavenworthia exigua var.exigua*) – listed as a threatened by GNHP – A small winter annual with lobed basal leaves and solitary white flowers with yellow centers. Restricted to open areas in limestone cedar glades where soil is shallow and gravelly. Habitat loss is the primary threat for this species.
- **Great Plaines ladies'-tresses** (*Spiranthes magnicamporum*) – listed as endangered by GNHP – A member of the orchid family, this perennial produces white flower spikes in early fall after the leaves have withered. Grows in basic soils and may be found in prairies, glades, and floodplains. Loss of habitat is the greatest threat for this species.
- **Glade meadowparsnip** (*Thaspium pinnatifidum*) – listed as endangered by GNHP – A Perennial herb in the carrot family; has white flowers and finely divided leaves. Occurs in forests and woodlands with rich, calcareous soils. There are no clear explanations for population declines. Forest succession and soil disturbances are potentially threats to this species.

The federally listed endangered gray bat (*Myotis grisescens*) and threatened northern long-eared bat (*Myotis septentrionalis,* NLEB) have been captured over Tiger Creek on VTS-C. No hibernacula for either species have been identified on the training site. No gray bat maternity or roost caves, or NLEB maternity or roost trees are known to be present on the installation. Further information on the gray bat is presented in section 3.9.2 and in Annex 1. Further information on the NLEB is available in section 3.9.3

and Annex 1. Two additional federally listed animal species are documented in Catoosa County, but have not yet been found on the training site:

- **Spotfin chub** (*Erimonax monachus*) – threatened – This species occurs in clear creeks or medium-sized rivers with moderate gradient and rocky substrate. Range restricted to the Tennessee River drainage; presumed extirpated in Georgia. Species threatened by habitat loss and degradation.
- **Snail darter** (*Percina tanasi*) – threatened – The snail darter is found in shoals of creeks and small rivers, sometimes burrowing into sandy substrate. Habitat fragmentation due to stream impoundments is the main threat to this species.

In 2012 the USFWS identified the probable range of the endangered Indiana bat (*Myotis sodalis*) to include northwest Georgia. There are no recent records of this species from Catoosa County, but it must be treated as a possible species for the training site, requiring presence-absence surveys prior to any project involving the cutting of timber that might be habitat. A baseline mist-net and acoustic bat survey conducted by URS in 2007 failed to capture or detect Indiana bats on VTS-C. No Indiana bats were captured by mist-netting efforts during a 2009 gray bat radio tracking study on VTS-C. A bat survey utilizing USFWS Indiana bat monitoring protocols was initiated in 2012 to provide baseline data on whether the species is utilizing the training site. The initial acoustic component of the study indicated the possible detection of an Indiana bat, though not at levels significant enough to confidently place the species at the site. The later mist-netting and acoustic components of the 2012 study didn't capture or acoustically detect the species. A 2017 bat PLS using current USFWS Indiana bat monitoring protocols failed to capture Indiana bats in mist nets. Acoustic monitoring efforts did record numerous possible Indiana bat calls, though not at levels significant enough, or call qualities high enough, to confidently place them at the site and distinguish them from other similar Myotis species.

While not currently listed, the tricolored bat is proposed for listing (petitioned June 2016). The USFWS' 90-day finding (December 20, 2017) was that the petition presented substantial information indicating listing may be warranted. The USFWS is currently conducting a 12 month status review on the species. Current protections for listed forest bats and habitat improvement programs of VTS-C may already be benefiting the species. The tricolored bat was first captured on VTS-C during a 2006 baseline bat PLS. More were captured during a gray bat radio tracking study in 2009. A 2013 bat PLS both captured and acoustically detected more tricolored bats. Two tricolored bats were discovered hibernating in a 60 foot vertical drop cave during a 2016 karst and bat survey. No tricolored bats were captured during the 2017 bat PLS, though they were detected by the acoustic component of the study.

A number of state-listed animal species are found in Catoosa County (given below). They are all aquatic animals. The Chickamauga crayfish (*Cambarus extraneus*) was found on VTS-C during a 2013 RTE survey (URS 2013). None of the other state listed animal species have been found on site, but habitat could be present to support them.

- **Chickamauga crayfish** (*C. extraneus*) – listed as threatened by GNHP– Found in shallows and in leaf litter of high gradient streams. Has a naturally restricted range which is threatened by likelihood of stream impoundments in the area.
- **Eastern hellbender** (*Cryptobranchus alleganiensis alleganiensis*) – listed as threatened by GNHP – This entirely aquatic amphibian may be found in cool, clear streams with large rocks. The former range of these animals has been greatly diminished due primarily to habitat degradation. The species is currently under 12 month review by the USFWS to determine if it will be listed under ESA. To date, no eastern hellbenders have been documented on VTS-Catoosa. The facility will be surveyed for the presence of hellbenders and their habitat. The

species is benefited by existing ecosystem management practices including water quality protection measures, 50 foot SMZs on both sides of all creeks, sediment and erosion control/prevention practices, forest management BMPs, and restricted use of pesticides. The species will be incorporated into the RTE Species Management Plan if detected on or near VTS-Catoosa.

- **Flame chub** (*Hemitremia flammea*) – listed as endangered by GNHP – Found in springs and spring-fed streams in areas with abundant aquatic vegetation. The primary threat to this species is habitat loss and degradation.
- **Popeye shiner** (*Notropis ariommus*) – listed as endangered by GNHP – Found in clear waters of large creeks and small to medium rivers with gravelly substrate. The main threats to these fish are habitat degradation due to siltation and other pollutants as well as stream impoundments.
- **Mountain madtom** (*Noturus eleutherus*) – listed as endangered by GNHP – Habitat consists of small to large rivers with fast-flowing, clear waters with sandy or rocky substrate. The mountain madtom is primarily threatened by habitat loss.
- **Stargazing minnow** (*Phenacobius uranops*) – listed as threatened by GNHP – Occurs in warm waters of creeks and small to medium rivers in rocky runs and riffles. The primary threat to this species is habitat loss and degradation.

Bat surveys and research were conducted in 2007, 2009, 2013, 2016, and 2017: seven species were captured on the training site (see Appendix F); of these, the gray bat and NLEB are the only protected animal species. Bird, mammal, herpetofauna, fish, and RTE surveys have been conducted since 2013. Species known to occur on VTS-C are listed in Appendix 7. The large-flowered skullcap, gray bat, and NLEB are the only federally listed species to have been identified on VTS-C. The tricolored bat (Perimyotis subflavus) that is known to occur on site is currently proposed for listing and undergoing a 12 month status review. The Chickamauga crayfish is the only state listed species known to occur on post. A Rare Species Management Component for all RTE species is located in Annex 1.

3.9.1 Large-Flowered Skullcap (*Scutellaria montana*) – Federal threatened, Georgia Natural Heritage Program threatened

Overview: The U. S. Fish and Wildlife Service listed large-flowered skullcap (*Scutellaria montana*) as an endangered species in 1986. At that time there were seven populations known in Georgia and three in Tennessee. Over 90 % of the 7,000 plants known in 1986 occurred at only two sites (USFWS 1996). The USFWS defined a self-sustaining population as containing more than 100 plants. The species was reclassified (down-listed) to threatened in 2002, at which time 48 populations were known for a total of over 50,000 individual plants. Lacking a definition of what distinguished a population, a 0.5 mile separation between clusters was developed during the down-listing process. The definition of a population at this time involves separations of more than a mile in contiguous habitat, but also involves the geographic factors of overriding drainages, geographic features, and other features that could impede genetic flow between groups.

In 2002, TNARNG contracted SAIC to conduct a full site survey for the large-flowered skullcap. A total of 1,581 individual plants were found in sixty discrete clusters across VTS- C. These clusters were then clumped into 26 management groups based on geographic proximity and habitat similarity (Figure 3.8). All groups on VTS-Catoosa are considered one population, as they are all located in a single drainage basin and lack significant landscape features that would prevent genetic flow among groups. TNARNG has been participating in the Large-flowered Skullcap Working Group in an effort to benefit and eventually delist the species since their discovery on post.

Description of species: Large-flowered skullcap is a member of the Lamiaceae or mint family. Chapman described the species in 1878 based on a location in Floyd County, Georgia. It flowers in mid-May to June. The corolla is blue and white with two-lobed calyx with a "cap" on the upper lobe. It has a solitary, erect, hairy, and square stem. Leaves are lanceolate to ovate, are serrated, and have opposite leaves.

Habitat/ecosystem: Large-flowered skullcap is endemic to northwest Georgia and southeast Tennessee. The habitat for the plant consists of rocky, slightly moist to dry, well drained and slightly acidic soils in slope, ravine, and stream bottom forests. Typically, the plant grows under mid- to late-successional oak-hickory canopies (*Quercus* spp. and *Carya* spp.). Usually, a deciduous shrub layer and moderately dense herb layer are present. Natural pine (usually shortleaf pine, *Pinus echinata*) can be present. The shrub layer often has some *Vaccinium*. This type of habitat is present at VTS-C.

Threats and competing species: Habitat alteration and destruction (as a result of logging, wildfire, grazing and development) are the principle threats to this species across its range. Conversion of oak-pine forests to pine plantations has resulted in known population losses. The large-flowered skullcap can probably tolerate some selective logging; complete canopy removal by clear-cutting likely would increase competition to an undesirable level. The large flowered skullcap is not considered to be a vigorous competitor. It is thought to be susceptible to competition by invasive, exotic, aggressive plants (especially Japanese honeysuckle) that tend to flourish after any type of disturbance. At VTS-C, invasive plant species are present near some of the skullcap management groups. Animal damage can also have an impact on large-flowered skullcap. At VTS-C indications of feral hog rooting have been noted near skullcap groups – as a perennial herb, damage to the rootstock could be a significant threat to the skullcap. Also, deer are believed to be eating the plants; indications of browse, especially removed floral parts, have been observed regularly during the annual monitoring of the plants.

Conservation measures: At VTS-C the large-flowered skullcap management groups are marked by signs (Figure 3.9). During the flowering season (March 1 – June 30), posted areas are closed to all access; the rest of the year posted areas are limited to foot traffic only. Maps produced for training use show the skullcap areas as limited activity sites, and training activities are designed to avoid impact to the plant or its habitat. Annual monitoring was initiated on the training site in 2004. TNARNG participates in the Large-flowered Skullcap Working Group, an informal group of affected land holders, agencies, and interested cooperators that try to work with the species to benefit it enough to eventually merit delisting. TNARNG is currently working on a Conservation Management Agreement (CMA) with USFWS and GDNR to participate in meeting delisting requirements. For further information, see Annex 1.

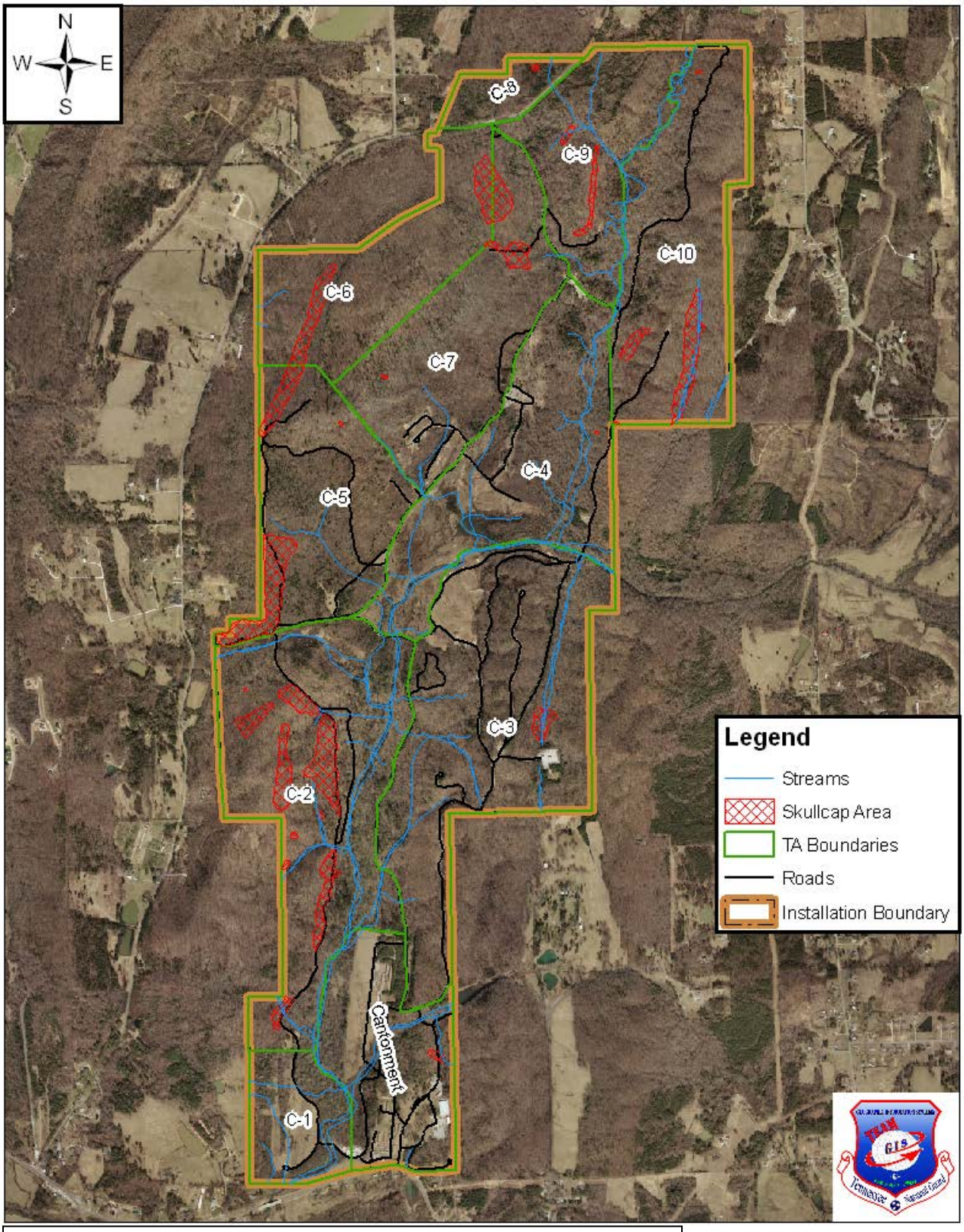


Figure 3.8: Large-flowered skullcap occurrences on VTS-Catoosa.

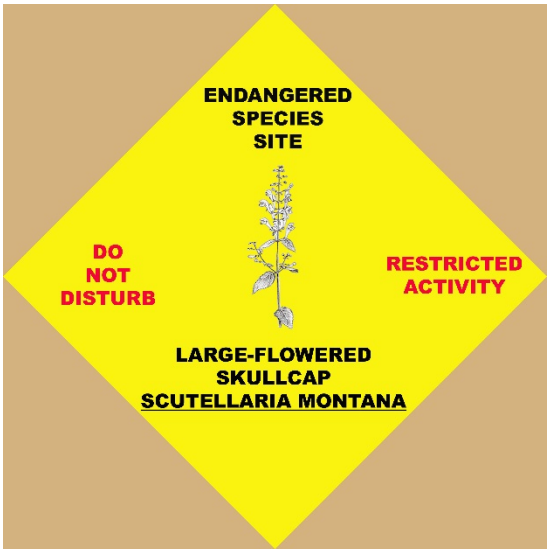


Figure 3.9: Large-flowered skullcap signs.

3.9.2 Gray Bat (*Myotis grisescens*)

Gray bat colonies are usually restricted to caves or cave-like habitats located within a kilometer of a river or reservoir. In winter they utilize only deep, vertical caves having a temperature of 6-11 degrees centigrade. The largest member of its genus in the eastern United States, the gray bat weighs from 7 to 16 grams. Its forearm ranges from 40 to 46 millimeters in length (USFWS 1982). One feature which distinguishes this species from all other eastern bats is its uni-colored dorsal fur. The other bats have bi- or tri-colored fur on their backs. Also, the gray bat's wing membrane connects to the foot at the ankle instead of at the base of the first toe as in other species of *Myotis* (USFWS 1982). Gray bats feed on insects, of which the majority are aquatic species, particularly mayflies.

Gray bats were first documented on VTS-C in the summer of 2006, foraging over Tiger Creek (URS 2007). No gray bat roost, maternity, or hibernation caves have been located on the training site, but gray bats can travel up to 20 km from their roost site while foraging. The nearest known gray bat roost and hibernacula is located near Ringgold, GA, approximately 5.6 km (3.5 miles) from VTS-C. A radio telemetry project was conducted in 2008 to track foraging bats to their roost caves. The study failed to follow the gray bats to their roosts; however, it was determined that they were leaving the training site. The habitat component of a 2013 study found only four low quality caves. None of the caves appeared to be receiving gray bat use when investigated during a 2016 karst and bat survey, though the cave with the largest interior was not entered as the entrance was too small. Gray bat calls were recorded during spring and possibly summer acoustic components of the 2013 study, and 20 were captured during the summer mist-netting component. A 2017 bat planning level survey captured six gray bats and recorded numerous acoustic detections. Further surveys will be conducted as funding becomes available to more completely characterize the gray bat usage of VTS-C.

More information on gray bats and their management on VTS-C is available in this species' portion of the Rare, Threatened, and Endangered Species Management Component in Annex 1. The gray bat portion of the plan will be updated as more information about the population and its needs becomes available. Currently, the primary management strategy for gray bats on VTS-C is to protect riparian habitats, which they are known to use for foraging.

3.9.3 Northern Long-Eared Bat (*Myotis septentrionalis*)

The NLEB was listed as threatened under the Endangered Species Act of 1973 on May 4, 2015. It is a medium sized bat (5-8 g), with females being slightly larger than males. They have medium to dark brown ears, wings, and back hair, and tawny to pale brown hair on their underside. They are distinguished from other *Myotis* species by their longer ears (17mm). They live for up to 18.5 years in the wild. They forage along roads, streams, and in semi-open forest for a diverse diet of moths, flies, leafhoppers, caddis flies, beetles, and arachnids that varies with season and location.

The species hibernates in the cracks and crevices of relatively cool and humid caves and mines. Hibernating individuals can be difficult to see as all that can often be seen is their noses and ear tips protruding from cracks in ceilings and walls. They stage at these hibernacula in spring and then migrate or disperse to summering areas. Summer roosts consist of live trees or snags with sloughing bark, cracks, and hollows. Males and non-breeding females typically form smaller (1-30) summer colonies in roost trees, and occasionally mines and caves, with more flexible conditions (cooler, less solar exposure, etc.). Breeding females tend to form larger (20-100) maternity colonies in trees and snags with warmer conditions.

The NLEB was first recorded on VTS-C during a 2007 bat PLS. The species was recorded by acoustic equipment, and three were captured in mist-nets (URS 2007). None were captured during a 2009 gray bat radio telemetry study (AEC 2009). The habitat component of a 2013 bat PLS found moderate commuting and foraging habitat in forested areas, a large number of marginal roost trees on one hill slope (not known to be active), one high quality roost tree near Catoosa Springs Branch, and four low quality caves (ES 2013a). The spring acoustic component of the study recorded NLEBs (ES 2013b), but there was only a possible detection during the summer acoustic component (ES 2013c). Concurrently with the summer acoustic component, a single NLEB was mist-netted (ES 2013c). No NLEB were found hibernating in the four low quality caves during a karst and bat survey in the winter of 2016, though the largest cave was not entered due to the too small entry hole (approximately 1.5ft.). A 2017 bat PLS failed to capture any NLEB and acoustically recorded five possible NLEB calls. Further surveys will be conducted as funding becomes available to more completely characterize the NLEB usage of the site.

More information on NLEBs and their management on VTS-C is available in this species' portion of the Rare, Threatened, and Endangered Species Management Component in Annex 1. The NLEB portion of the plan will be updated as more information about the population and its needs becomes available. Currently, the primary management strategy for NLEBs involves protecting their habitat by avoiding removal or damage of trees greater than 3in DBH within 150ft. of a known maternity roost tree during the pupping season (May 15 – July 31), or any disturbance to vegetation or the roost tree during the pupping season. There are no maternity roost trees currently known to occur on site, but these protections will be implemented if any are discovered. It further involves avoiding actions that could disturb hibernating individuals, physically alter hibernacula entrances, physically alter the internal conditions of a hibernacula, or removing trees within 0.25miles of a hibernacula. Bat surveys are conducted when funds are available to improve our knowledge of the species, their management needs, and identify any maternity roost trees that occur on or near the installation. Further, any removal of trees that could affect the NLEB or its habitat are coordinated through consultation with the USFWS.

3.9.4 Tricolored Bat (*Perimyotis subflavus*)

The tricolored bat was petitioned for listing in June 2016. The USFWS' 90-day finding indicated that the petition presented substantial information indicating that listing may be warranted. The Service is currently conducting a 12-month status review for the tricolored bat. It is a relatively small bat (4-8 g)

with a yellowish to reddish brown coat. It is distinguished from other Myotis species by its tricolored hairs, with a dark base, yellowish brown middle, and dark tips. They are also distinguished by their pinkish ears, muzzles, and forearms, which contrast with their black wing membranes. Females and males can live up to 10 or 15 years in the wild respectively. They forage along forest edges, in riparian areas of streams, over water, above forest canopies, in open to semi-open forest, and among sparse vegetation of early successional forest. They feed on a diverse assortment of moths, flies, beetles, mosquitoes, wasps, midges, ants, leaf hoppers, and other insects.

Tricolored bats can't withstand freezing temperatures and are among the first bat species to enter hibernation and among the last to emerge. They typically hibernate singly or rarely in small groups deep in caves and mines, in areas of relatively warm stable temperatures and high humidity. They will also hibernate in cave like structures such as tunnels, dams, and box culverts. They show strong hibernation roost fidelity, and may use the exact same spot each year, having several spots among which they move over the winter. They may make short regional migrations between hibernation caves and summering areas. Both individuals and maternity colonies (2-20 individuals) roost in dead or live tree foliage. Females may be faithful to small roost areas within and between years, with juvenile females showing some connection to the same areas. Initial appearance at treetop level may indicate the species roosts high in trees. Maternity colonies may also occur in tree cavities and rarely human structures. Non-reproductive individuals tend to roost in riparian zones within mature forest stands near openings.

The tricolored bat was first recorded on VTS-C during a 2006 baseline bat PLS. Twenty-one individuals were mist netted (URS 2007). Seven were captured during a 2009 gray bat radio telemetry study (AEC 2009). The habitat component of a 2013 bat PLS found moderate commuting and foraging habitat in forested areas, a large number of marginal roost trees on one hill slope (none known to be active), one high quality roost tree near Catoosa Springs Branch, and four low quality caves (ES 2013a). The spring and summer components of the study captured ten tricolor bats in mist nets and detected them acoustically as well (ES 2013b, ES 2013c). Two tricolored bats were found hibernating in one of the four low quality caves during a karst and bat survey in the winter of 2016, though the largest cave was not entered due to the too small entry hole (approximately 1.5ft.). A bat PLS conducted during the summer of 2017 failed to capture any tricolored bats, but did record numerous calls nearby during the same survey. Further surveys will be conducted as funding becomes available to more completely characterize the tricolored bat usage of the site.

More information on tricolored bats and their management on VTS-C is available in this species' portion of the Rare, Threatened, and Endangered Species Management Component in Annex 1. The tricolored bat portion of the plan will be updated as more information about the population and its needs becomes available. The area around the cave that the two tricolored bats were found hibernating in will be fenced off and signed as off limits to restrict access to the cave. The area of the cave entrance will be protected from timber harvest and prescribed fire to prevent impacts to the cave entrance and its internal conditions. While not implemented specifically for tricolored bats, there are a number of additional protections and programs at VTS-C that benefit the species. These include protections for other rare and listed bat species, and habitat protection and enhancement programs for all species through an ecosystem management approach. Requirements under the final 4(d) rule for NLEB prevent trees and snags over three inches DBH from being cut without prior evaluation and approval from TNARNG Natural Resource staff and USFWS. Plans for continued bat PLSs include radio telemetry work with any listed bats, making it possible that tricolored bat hibernacula could be discovered and protected. If a cave or other hibernaculum of a listed bat is found in the future, a protection plan will be developed with the help of USFWS. Any removal of trees that could affect listed bats or their habitat is coordinated through consultation with the USFWS.

3.9.5 Chickamauga Crayfish (*Cambarus extraneus*)

The Chickamauga crayfish is Georgia State listed as threatened, with a federal designation of G2 (imperiled). It is a native stream dwelling crayfish that only occurs in the Chickamauga Creek drainage system. The species is only known to occur in three Georgia and one Tennessee counties. The species' limited distribution makes it particularly susceptible to extirpation by local events, such as impoundment of streams, siltation, and water quality degradation. It is typically found under rocks or in leafy material in slow to moderately fast flowing sections of small streams with gravel substrate. It can be distinguished from other crayfish by the striped pattern on its tail section, with a light stripe running lengthwise down the center, bordered by a dark stripe on either side, and another light stripe along the outsides of those.

The species was documented on VTS-C during an RTE survey conducted by URS in 2013. It was found in Tiger Creek and Broom Branch, but not Catoosa Springs Branch. Species management is currently accomplished by addressing its primary threats, through existing policies and programs that protect riparian areas, prevent erosion and siltation, and protect water quality. Further information can be found in this species' section of the Rare, Threatened, and Endangered Species Management Component in Annex 1.

3.10 CULTURAL RESOURCES

3.10.1 Paleoenvironment

The current climate and vegetation of northern Georgia are the result of a long and complex interaction of natural and human-induced change. Prior to the arrival of humans, conditions during the last full glacial period (ca. 23,000 to 13,000 B.C.) were considerably cooler than at present. At that time, the study area was covered by a northern coniferous forest dominated by pines and spruce (Stanyard et al. 1998). When humans first arrived in what is now the Georgia region (ca. 13,000 to 8000 B.C.), the climate gradually warmed and precipitation increased. These trends occurred in conjunction with northern hardwoods replacing pine and spruce as the dominant overstory species. The Altithermal period from ca. 8000 to 3000 B.C. was a period of continued warming but decreased precipitation, with a dominant overstory vegetation of oak-hickory forest. Since ca. 3000 B.C., the climate has cooled slightly and precipitation has possibly increased, leading to the conditions that exist today. Since prior to settlement by Euro-Americans, oak-hickory stands have been decreasing and the number of pines has been increasing.

Vegetation within the Georgia Ridge and Valley has undergone extensive alteration in the past two centuries, complicating any estimation of the relative quantities of original species and their distribution across the landscape. The earliest Euro-American settlers reported large stands of yellow pine in the oak-hickory forests of the Ridge and Valley province. Whether these were the products of natural forces or the results of aboriginal hunting methods, which used fire to drive and concentrate game, is unknown. Large-scale clearing and cultivation of cotton in the nineteenth century removed large tracts of native forest and caused serious erosion. As a consequence, by the 1930s, much of the land had to be abandoned, with the result that up to 70 percent of the area now lies in secondary forest dominated by pine (Stanyard et al. 1998).

3.10.2 Prehistoric Background

Details on the prehistoric period in the southeastern United States and Georgia in particular are available in the TNARNG Integrated Cultural Resources Management Plan (ICRMP) for the Catoosa Training Center (TRC Garrow and SAIC 2002).

3.10.3 Historic Overview

The Contact Period

The earliest European contact with what is now Catoosa County was the de Soto expedition of 1540, which probably passed to the east of Catoosa County through the Conasauga River valley. The towns that the expedition visited reflected Mississippian Period culture, and were probably heavily impacted by the contact with these and other Spanish explorers. During the following century, European goods were incorporated into the American Indian trade, and disease and power struggles disrupted the old order.

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). At that time, the area around modern-day Chattanooga and northwest Georgia was essentially uninhabited, although a number of important Indian trails passed through what would become Chattanooga. As a result of the American victory in the Revolution, 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.

During the late eighteenth and early nineteenth centuries, the Cherokee adopted many Western ways. Some Cherokee accumulated great wealth, managed large plantations, and owned slaves. Other Cherokee established farms, operated stores and taverns, and practiced trades, such as milling and blacksmithing. They settled in loosely structured towns in the fertile river valleys, where they practiced European-style farming, growing cash crops, such as corn and tobacco. One of the chiefs of the Cherokee, Captain Richard Taylor, lived near Ringgold at the northern end of the ridge that bears his name (located to the northeast of VTS-C).

Despite their acceptance of European culture, the Cherokee's right to their native homeland was never accepted by the American public, who continued to push for further concession by the Cherokee. By 1820, both legitimate and questionable treaties had reduced the Cherokee territory to the northwest corner of Georgia, north of the Chattahoochee River. Determined not to make any further concessions, the Cherokee organized the Cherokee Nation, a sovereign nation with a constitution modeled on that of the United States.

In 1835 after the discovery of gold in northern Georgia, a treaty was obtained from a small group of Cherokee, none of whom were officials in their government, agreeing to remove to lands west of the Mississippi. John Ross, then chief of the Cherokee, refused to recognize the treaty and resisted compliance, appealing to the U.S Supreme Court for support. Although the Supreme Court supported the Cherokee who refused to recognize the bogus treaty, President Andrew Jackson was generally unsympathetic to Native American causes and refused to enforce the court's decision. Despite passive resistance from the Cherokee, by 1838 federal troops had rounded up most of the remaining tribe members and forced them onto the Trail of Tears to Oklahoma. To avoid removal, numerous Cherokee fled to the mountains, while others abandoned the march en route to return to their homeland or take up residence along the trail.

Afro/Euroamerican Settlement

Permanent European settlement in Catoosa County probably began sometime after 1805, when construction was authorized for a Federal Road through the area to connect the southeast coast with the settlements of the upper Mississippi Valley. The road followed Georgia Highway 2 and US 41 in Catoosa County, passing within two miles of the training site. The road was used by settlers in Tennessee to drive their stock to markets in Georgia and South Carolina and to transport crops and products such as wheat, cotton, and whisky.

Catoosa County was created from Walker and Whitfield counties in 1853. In the 1830s the valleys in the area began to fill with pioneer farmers. The railroad soon followed: service from Atlanta to Dalton began in 1847, and the line to Chattanooga opened in 1850. The town of Ringgold was incorporated in December 1847.

One of the area's early attractions was its mineral springs, of which Catoosa Springs was said to be among the finest. Catoosa Springs is supposed to have been used by the Indians prior to the arrival of European settlers, and by 1849 there was an established resort centered on the springs. By 1854, the rail line had a stop, called Catoosa Platform, just southeast of Ringgold and southwest of the training site. By 1860, Ringgold was a thriving trade town in a county of 5,082, where wheat was the chief economic product. The cooler climate of the mountains did not support cotton well, and so there was little development of the plantation system, and slavery was not widely supported.

Military History

The current area of the VTS-C was utilized for military activities as early as the 1850s when the resort at Catoosa Springs was used as a summer camp for cadets attending the Georgia Military Institute. From the fall of 1862 until September 1863, the buildings and grounds at Catoosa Springs were used as a Confederate hospital.

During the Battle of Ringgold, the Union forces pursued the retreating Confederates only as far as Stone Church before returning to Ringgold. The Union occupied the town throughout the winter of 1863-1864. Soldiers from both armies likely visited the springs during that period. At the beginning of the Atlanta Campaign, the Fourth Corps of the Army of the Cumberland marched from Cleveland, Tennessee, to Catoosa Springs. There was some fighting east of the springs during the march. The Corps remained encamped at Catoosa Springs from May 4 until May 7, when they marched on Tunnel Hill.

In 1904, land west of the Catoosa Springs recreational property was leased by the U.S. Army as a target range for soldiers stationed at Fort Oglethorpe. In 1906-07, the Army purchased 1174.5 acres; more land was acquired in 1910 through condemnation. Portions of this land were actively farmed at the time and may have supported several residences. This area was known as the "Target Range" or "Rifle Range" during its years of association with Fort Oglethorpe. A 1,000 yard rifle range was located at the south end of the property. In 1910, at least 12 structures existed, near Catoosa Springs Road and along Tiger Creek at the base of Sand Mountain. The range site was maintained and utilized by the Army through World War II.

In 1946, Fort Oglethorpe was deactivated and offered for sale to the public. The rifle range was originally included in the sale offer. The range site remained in surplus until 1948 when the U.S. Army recommended that it be placed under the jurisdiction of the Corps of Engineers for use by the Tennessee National Guard as a training site for its Ground Force Unit.

3.10.4 American Indian Resources and Tribes

The VTS-C is located on lands traditionally claimed as territory of the Cherokee. Kaskinampo/Coushatta and Yuchi and, marginally, some bands of Creek may have also ranged within the area. All archaeological sites identified during cultural resources surveys are potential American Indian sacred sites. To date, no American Indian sacred plant, animal, or mineral gathering localities are known from the VTS-C.

Currently, three groups of Cherokee are federally recognized. The Cherokee who traveled to Oklahoma are currently represented by the Cherokee Nation of Oklahoma and the United Keetoowah Band of the

Cherokee of Oklahoma. The Eastern Band of Cherokee of North Carolina trace their ancestry to those Cherokee who remained in the mountains to avoid removal in 1838-1839.

Federally recognized groups of the Creek are the Alabama-Quassarte Tribal Town of the Creek Indian Nation of Oklahoma, the Kialegee Tribal Town of the Creek Indian Nation of Oklahoma, the Muskogee (Creek) Nation of Oklahoma, the Thlopthlocco Tribal Town of the Creek Nation of Oklahoma, and the Poarch Band of Creek Indians of Alabama.

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.

Only one group of Yuchi – those who relocated to Oklahoma with the Muskogee Creek – exists as a distinct cultural entity within a federally recognized group. These Yuchi, today represented by the Yuchi Tribal Organization, petitioned the federal government for recognition as a separate group; the government has proposed denying the petition (http:www.doi.gov/bia/bar/yuchidx.html).

In 2003, TNARNG initiated tribal consultation with all federally recognized tribes which have ties to Tennessee and northwest Georgia. In 2011, the TNARNG began participation in annual multi-southern-state Native American Consultations (NAC). TNARNG hosted the annual NAC in 2015. In addition to the annual NAC, TNARNG consults with federally recognized tribes per Section 106 of the National Historic Preservation Act (NHPA) on all projects that may impact tribal resources on a project by project basis, as no MOU/MOA/PAs exist between TNARNG and any Tennessee/NW Georgia affiliated tribes. All interactions between the TNARNG and the tribes that have historic ties to the Catoosa region are conducted in accordance with the DoDI 4710.02 Annotated Policy for the American Indian and Alaska Native Policy (27 Oct 1999).

3.10.5 Cultural Resources Identified on VTS-C

Comprehensive archaeological and architectural inventories at Catoosa were completed in the fall of 1997. These studies encompassed the entire 1,500-acre property (Stanyard et al. 1998). Prior to the 1997 inventories, the only professional cultural resources investigation occurred in 1994 as a reconnaissance-level survey to determine the nature and preservation state of six archaeological sites recorded by Captain Laury K. Weaver, a member of the TNARNG (Baldwin et al. 1994). Three additional sites were discovered during the 1994 investigation. In 1998, The U.S. Army Engineer District, St. Louis, completed a National Guard Cultural Resources Planning Level Survey for the Army and the Air Force (Riordan et al. 1998). This document provides a brief overview of the 1997 cultural resources inventories but offers no new findings on the cultural resources at Catoosa.

In 2005, TRC Garrow Associates conducted a Phase II archaeological study on 12 archaeological sites from the phase I discoveries that needed further evaluation. This resulted in the detection that three sites actually encompass one large site. Two of the sites studied were recommended as eligible for the NRHP, along with one additional site being recommended for preservation measures.

In 2016 MRS Consultants, LLC conducted a phase I cultural resources survey on previously surveyed lands and recorded 7 new archaeological sites of which two of these sites are recommended for further evaluation to determine possible NRHP eligibility.

Aboveground properties at Catoosa were evaluated for the NRHP eligibility status in the 1998 cultural resources inventory (Stanyard et al. 1998), which identified 17 buildings and structures. Three aboveground properties at Catoosa were recommended as eligible for the NRHP and the GA-SHPO concurred with this assessment in 1999. A historical building inventory for the three major training

centers was conducted in 1999, which reaffirmed the standing of those resources. In recent light, through the discovery of unknown documents, consultation with GA-SHPO on April 6, 2016 has yielded the bridge (HS-17), previously denoted as NRHP-eligible, not meeting the qualifications any longer due to its lack of age.

3.10.5.1 Archaeological Resources

Thirteen sites represent prehistoric occupations; two of those are recommended eligible for the National Register of Historic Places (NRHP) under Criterion D, and eleven are recommended ineligible for the NRHP. The prehistoric sites range from ephemeral encampments associated with lithic reduction to extensive, long-term occupations.

The prehistoric sites are primarily concentrated in the southern portion of the base, where a fairly large floodplain has developed between two steep ridges. Extensive archeological remains associated with chipped stone tool manufacture and maintenance occurs on that floodplain. The area has been designated 9CT66, and it was occupied sometime around 500 B.C. The flat, narrow ridge tops that surround the floodplain also contain the remnants of prehistoric occupations associated with lithic reduction.

With the exception of site 9CT28, which may have been a base camp, small village, or some other type of long-term occupation, all of the surrounding sites appear to be related to lithic reduction and stone tool manufacture. It is possible that chert cobbles in Tiger Creek were being gathered as a source of lithic raw material and transported to those locations, where they were fashioned into preforms and/or formal tools.

Based on that evidence, it appears that very little domestic activity occurred at the lithic reduction sites. Therefore, they were either short-term stopovers by people traveling through the area, or specialized activity loci that were associated with a more permanent occupation site, 9CT28, for example.

Ten historic archaeological sites are present within the Catoosa Training Center boundary. They include one late nineteenth to early twentieth century house site, a collection of brick scatter, an historic spring box, early twentieth century camp incinerator, early to mid-twentieth century trash dump, one house site that dates to the latter half of the nineteenth century, a probable Civil War cemetery, a late-nineteenth-century family (Massengill) cemetery, a mid-nineteenth to early twentieth century house site, and a cave visited by members of the Sixth Cavalry stationed at Fort Oglethorpe during the late nineteenth and early twentieth centuries. Three historic sites (civil war cemetery, mid nineteenth to early twentieth century house site, historic spring box) are recommended potentially eligible for the NRHP under Criterion D requiring further evaluation while the remaining 7 are considered NRHP-ineligible.

Two archaeological sites (9CT31, and 9CT135) contains both prehistoric and historic components. 9CT31's historic component is associated with a late-nineteenth/early-twentieth-century house site with the age and cultural association of the prehistoric component unknown. 9CT135's historic component is very minor while the site designation wholly refers to the lithic scatter description. These sites are recommended as ineligible for the NRHP under Criterion D.

3.10.5.2 Architectural Resources

The historic architecture survey identified 17 historic architectural resources located among numerous non-historic resources near the south end of the installation. Of the 17 resources, three were recommended eligible for the NRHP; the rest are recommended ineligible due to loss of integrity. The three resources recommended NRHP-eligible are a 1934 concrete dam (with its associated pond) (HS-14)[TR-23]; a ca. 1907 target range (HS-15)[TR-27]; and a ca. 1940 concrete bridge (HS-17). HS-14 and HS-17 appear eligible under NRHP Criterion A for their roles in the military history of the local area,

state, and region and under Criterion C as an intact site that continues to display its historic appearance and use. The State Historic Preservation Office (SHPO) concurred with these findings on August 5, 1998. In recent light, through the discovery of unknown documents, consultation with GA-SHPO on April 6, 2016 has yielded the bridge (HS-17), previously denoted as NRHP-eligible, not meeting the qualifications any longer due to its lack of age.

The inventoried buildings and structures were evaluated to determine if they comprised a potentially eligible NRHP district. Severe alterations to 14 of the 17 properties, non-historic infill construction, and changes in use had drastically altered the historic core area of the training center. In fact, an approximately equal number of historic and non-historic properties were located in the core area. Thus, it did not appear that a cohesive, eligible NRHP district existed at the facility.

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CHAPTER FOUR
RESOURCE MANAGEMENT GOALS:
GOALS, OBJECTIVES, AND TARGETS FOR NATURAL RESOURCES MANAGEMENT

4.1 MILITARY MISSION GOALS AND OBJECTIVES

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

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

- Additional small cleared areas for bivouac and other training
- Improved visibility along roadways through selective tree cutting
- Meet security directives by clearing 25 ft. buffer along perimeter fencing
- Thin vegetation in the land navigation course to improve accessibility
- Construct additional barracks and classrooms in the Cantonment Area
- Renovate berm and baffle ranges to accommodate new enhanced performance ammunition

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. Appendix J (Table J-1) presents the list of projects given in the sections that follow, projected implementation years, and who will implement them.

4.2.1 Ecosystem Management and Maintenance of Biodiversity

In 1994, the Office of the Under Secretary of Defense for Environmental Security issued a memorandum to all forces in the Department of Defense (DoD) to implement Ecosystem Management on DoD lands. Ecosystem management blends multiple-use needs, provides a consistent framework to manage installations, and ensures that the integrity of the system of DoD lands remains intact. DoD Instruction 4715.3, “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 ensures the continuing ability of that system to meet future needs.

Ecosystem management is not easily planned or measured. Many functions of an ecosystem take place on scales far larger and longer than most human activity, and the boundaries of an ecosystem are not easily defined. For the purposes of this INRMP, the property line of the training site will function as a permeable border around a series of interconnected systems (forest, grassland, riparian) which make up a

whole, which is itself a part of a larger system. Management of the training site must focus on the training site, but must take into account the activities beyond the fenceline, as well.

VTS-C has a variety of community types, including the habitat for a federally listed threatened plant species, creating a high level of ecosystem diversity. The current patchwork of habitats has been created by the conjunction of past land use patterns, current military land use, and environmental gradients, and it may be drastically different from the environment found in the region prior to European settlement. However, it is a healthy, functioning system, as indicated by its high level of species diversity and the presence of rare species. It is the aim of this management plan that native biodiversity will be maintained at all levels within the ecosystems that make up VTS-C and that those systems will continue to function fully.

Goal 1: Provide the ecosystem types needed for training.

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

Targets:

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

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

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

Targets:

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

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

Targets:

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

Goal 3: Protect unique communities.

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

Targets:

- 1n) Identify and prioritize ecotypes of significance at regional and local scales. Create a map and priority list of extant ecosystems.
- 1o) Identify threats and training that could impact significant habitats in an ongoing process.

- 1p) Determine the necessity of significant habitats to training activities, and identify alternate areas for training where feasible. Collect threat and usage details.
- 1q) Develop a protection plan for significant habitats.

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

Targets:

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

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

VTS-C is home to relatively large numbers of the federally threatened large-flowered skullcap (*Scutellaria montana*), and the largest population in Georgia. Initial investigations of the species on VTS-C began in 2002 with a survey to establish the extent of its occurrence on the training site. Annual monitoring for the skullcap has been carried out on the training from 2004 to present. Tennessee Army National Guard natural resource staff actively participate in the skullcap working group, composed of representatives from multiple agencies and non-government organizations (NGO)

The federally listed endangered gray bat (*Myotis grisescens*), threatened Northern Long-Eared Bat (NLEB, *Myotis septentrionalis*), and tricolored bat (proposed for listing, *Perimyotis subflavus*) have also been found on the VTS-C. Mist net survey and acoustic monitoring data indicate gray bats are much more common on the site than NLEB. Lactating and pregnant gray bats captured on post indicate that roost caves may be within five miles of their feeding sites along Tiger Creek. No roosting or hibernation caves have been found on VTS-C. A radio telemetry study of gray bats did identify some foraging areas and two night roosts on or near post, but did not lead to finding any maternity or roosting colonies. A bat habitat survey found moderate commuting and foraging habitat in forested areas, and high quality habitat of both types along streams. Only marginal tree roosting habitat for NLEB was found on post, with many marginal trees along the west slope below the range tower road, and one high quality roost tree near the east bank of Catoosa Springs Branch. Two tricolored bats were discovered hibernating in a 60-foot vertical drop cave on the installation as well.

A variety of other rare, threatened, or endangered species are known to occur within the northwest Georgia region in habitats that can be found on VTS-C (see section 3.9). Annex 1 contains the Rare Species Management Plan. At this time, the plan is focused on monitoring and management activities for the large-flowered skullcap, gray bat, and NLEB. Additional information will be added if other RTE species are identified on the training site and management protocols are developed for them.

Goal 1: Monitor, maintain, and enhance the large-flowered skullcap population on VTS-C.

Objective 2-1: Quantify and monitor groups of large-flowered skullcap on VTS-C.

Targets:

- 2a) Conduct annual monitoring during the flowering season.

- 2b) Utilize results of annual monitoring and other data to track the plant population and report results.
- 2c) Re-evaluate and update the monitoring protocol annually to reflect changing methodology and evaluate needs.

Objective 2-2: Protect the large-flowered skullcap groups on VTS-C.

Targets:

- 2d) Maintain a posted perimeter around the large-flowered skullcap groups.
  - 2e) Evaluate and GPS group perimeters every 5 years.
  - 2f) Adjust sign positions as needed.
- 2g) Update posters and training materials to educate soldiers and site personnel about restrictions and their purpose as needed.
- 2h) Continue regular communication with GADNR and USFWS, including consultation on major actions as needed.
- 2i) Develop other protection protocols as needed.

Objective 2-3: Investigate management alternatives and their impacts.

Targets:

- 2j) Work with universities or other research institutions to further knowledge of large-flowered skullcap as needed.
- 2k) Determine effect of prescribed burning on large-flowered skullcap, and produce a report of study results.
- 2l) Develop a treatment protocol, monitor, and report the effects of herbicide and non-chemical control of invasive plants in the vicinity of large-flowered skullcap.
- 2m) Identify management practices that could improve skullcap habitat and develop experimental protocols in cooperation with FWS.
- 2n) Participate in the large-flowered skullcap working group to help benefit and delist species.
- 2o) Develop a Conservation Management Agreement with USFWS and GDNR to help meet delisting requirements for species.

Goal 2: Monitor, maintain, and enhance federally listed bat species (gray bat and NLEB) and their populations on VTS-C.

Objective 2-4: Monitor and characterize use of federally listed bat species on VTS-C.

Targets:

- 2p) Resurvey bat species on VTS-C every 5 years (see Target 1h).
- 2q) Track bats with radio-telemetry in conjunction with surveys to determine location of roosts/hibernacula when feasible.
- 2r) Perform surveys to quantify populations of federally listed bats and their activities on VTS-C if roosts/hibernacula are located. Conducted as needed.
- 2s) Develop a bat monitoring protocol and incorporate Indiana bat survey protocol requirements into regularly scheduled bat surveys (see target 1h) as needed.
- 2t) Protect known tricolored bat hibernation cave through fencing and signage.
- 2u) Protect known tricolored bat hibernation cave entrance and internal conditions through preventing timber harvest and prescribed fire near entrance.

Objective 2-5: Protect and enhance populations of federally listed bats on VTS-C.

Targets:

- 2v) Develop a management plan for federally listed bat species, their foraging habitat, their maternity colonies, and their hibernacula if located on VTS-C.

Goal 3: Prevent accidental take of federally listed species and ensure ESA compliance.
Objective 2-6: Quantify and monitor populations of state and federal RTE species on VTS-C.

Targets:

- 2w) Perform a comprehensive survey for RTE species every 5 years (see target 1g).
- 2x) Perform eastern hellbender and habitat surveys.
- 2y) Develop management plans and monitoring protocols for any new species identified on VTS-C, as needed.
- 2z) Continue regular communication with GADNR and USFWS, including consultation on actions that could impact listed species.

Goal 4: Maintain or enhance native plant communities that support listed species.
Objective 2-7: Identify and manage native plant communities currently supporting or potentially supporting RTE species.

Targets:

- 2aa) Integrate community information with RTE information and develop community-based habitat management plans and monitoring protocols for significant habitats, as needed.
- 2ab) Control invasive pest plant species where impacting RTE habitats (see Section 4.2.10).
- 2ac) Monitor 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, largely under the ITAM program. Major projects of reclamation and mitigation are included under the more specific environmental topic involved (e.g., erosion control, wildlife habitat, etc.). The principle project addressed in this INRMP is the Tiger Creek streambank restoration effort, which is discussed in detail in section 4.2.4 Erosion Control.

4.2.4 Erosion Control and Soil Conservation

VTS-C has large areas of steep slopes and highly erodible soil (see Section 3.4). Vehicle traffic is kept to the roads where possible in these fragile areas; however, erosion problems do occasionally develop from the limited use of these areas, the heavier use of less sensitive sites, and/or natural forces. Erosion issues need to be identified and repaired as quickly as possible. Documentation of recurring problems will allow adjustments to training use to avoid such problem areas. In addition, one significant reclamation project is planned at this time:

- A section of Tiger Creek which runs through the tank range has experienced significant undercutting and sloughing of the banks. Natural vegetative regeneration has helped to stabilize the soils to some extent, but soil erosion and bank sloughing is still an issue. In addition, the regenerating riparian tree species are growing too tall and beginning to interfere with visibility on the range. The erosion and visibility issues will be resolved through implementation of a restoration plan. The plan involves cutting the tops out of trees high enough to leave them alive, planting native lower growing riparian vegetation (button bush, dogwood, etc.) in the reduced competition environment to stabilize soils, and removing the taller tree species completely after the planted species are well established and stabilizing the soils.

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

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

Objective 4-1: Prevent erosion issues from occurring.

- 4a) Develop training for soldiers, commanders, and planners in best Management Practices and their applicability to TNARNG actions.
- 4b) Develop an "erosion guide" for VTS-C that identifies areas experiencing repeated erosion and gives guidance in appropriate repair and avoidance methodology.

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

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

Goal 2: Identify and rehabilitate existing erosion problems.

Objective 4-3: Repair existing erosion issues.

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

Objective 4-4: Restore sections of Tiger Creek streambank that are badly eroded/slumping.

- 4k) Finish restoration plan development.
- 4l) Revegetate with native, bottomland species which will provide soil-holding capabilities but remain low-growing to comply with range line-of-sight requirements.

4.2.5 Watershed Management

The riparian ecosystem – the land adjacent to the streams and wetlands – is extensive on VTS-C, surrounding Tiger Creek, Broom Branch, Catoosa Springs Branch, and the wetland areas. It consists primarily of mixed bottomland hardwood forests; although a portion of the area surrounding Tiger Creek in the tank range has been converted to managed grassland. Riparian areas serve as the interface between aquatic and terrestrial ecosystems. They serve as valuable wildlife habitat and corridors, promote streambank stabilization, trap sediments and nutrients, filter runoff water, and help to moderate flooding.

Limited military training activities occur within riparian areas at VTS-C. For much of the year, the natural water table level makes the area too wet for vehicle or troop movement. Stream fording by vehicles is only permitted at designated, hardened sites.

All stream systems will be surrounded by functioning riparian zones, continuous throughout a watershed and connected to other watersheds by mixed species corridors. Riparian zones and corridors will be designated as riparian buffer areas [streamside management zones (SMZ)] on maps in the VTS-C training site office.

The TNARNG will maintain riparian habitats along streams by implementing at minimum a 50 foot SMZ on either side of all creeks. Vehicular traffic in the SMZ will be kept to a minimum, and authorization must be obtained before conducting maintenance and construction activities. Foot traffic through riparian areas is not regulated, but vehicles will be kept to established roads and trails within the SMZs. Where wetlands are present, a 50 foot riparian buffer zone will be established and marked with Seibert stakes on all sides of the wetland.

The riparian habitat is variable in size. While the restricted-activity SMZ is 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.

Riparian areas are particularly susceptible to invasion by exotic plant species. The bottomland forests around Tiger Creek and Broom Branch are heavily infested with privet (*Ligustrum* spp.) and Nepalese browntop grass (*Microstegium vimineum*). These species drastically modify the habitat quality of the area and will require intensive efforts to control.

The stretch of Tiger Creek through the tank range was heavily modified in the past. It currently has areas of bank sloughing and erosion and sections with insufficient vegetative cover. Reclamation of this problem is covered in Section 4.2.4 Erosion Control and Soil Conservation.

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

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

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

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

Objective 5-3: Protect shoreline of Tiger Creek and all riparian areas from potential causes of erosion.

- 5i) Restrict all vehicular traffic, especially of large vehicles and machinery, along highly erodible soils at water's edge by maintaining, at minimum, a 50 foot riparian buffer zone (SMZ).
- 5j) Post and maintain signs/Seibert stakes identifying SMZs.
- 5k) Maintain SMZs during all timber harvests and other clearing activities, retaining all trees that exist within the buffer zone.
- 5l) Educate troops, management staff, and others on the importance of SMZs, the limitations to their use, and regulatory and permitting issues involved in riparian area activities.

Goal 3: Improve trout habitat quality throughout VTS-C streams.
Objective 5-4: Improve water quality for trout habitat.

- 5m) Measure water quality in terms of trout habitat requirements through stream system in conjunction with regular water quality assessment.
- 5n) Develop and implement plan for improving stream habitat.

4.2.6 Wetlands Protection

VTS-C has approximately 47 acres of jurisdictional wetlands, mostly associated with the creek system on the training site. This ecotype is of importance for its chemical and sediment filtration functions as well as providing habitat for many species. A 50-foot buffer zone has been established surrounding wetland areas on VTS-C. Limitations for use of the buffer zone will be the same as those for SMZs.

The Georgia Department of Natural Resources Environmental Protection Division, Water Protection Branch, and the Army Corps of Engineers protect wetlands by requiring state permits to alter waters of the state. These permits require that activities be undertaken in such a way that impacts to streams or wetlands are avoided or mitigated. Wetland criteria are provided within the general Water Quality Standards, and Best Management Practices identified for Forestry and Agriculture are applicable to wetland ecosystems.

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

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

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

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

4.2.7 Forest Management

The Forest Ecosystem occurs on approximately 94% (1,522 acres) of the training site. The desired future condition of the forest at VTS-C is a range of forest types and ages, approximating natural habitat conditions and providing needed training opportunities. Timber production is not a primary goal of forest management on VTS-C, but timber harvest may be an appropriate method to achieve training needs, native species restoration, or forest health goals.

The Army forest management program is required to support and enhance the immediate and long-term military mission while meeting environmental stewardship requirements as mandated by Federal laws. Army Regulation 200-1 states that "…it is the Department of Army policy to maintain, restore, and manage its forest lands on an ecosystem basis. The harvesting of forest products is allowed and encouraged when conducted consistent with protecting and maintaining a viable, self-sustaining ecosystem".

Currently, many of the stands on VTS-C are overmature in terms of timber production. Areas of the training site are too dense for effective training use. In other areas, the mature forest should be protected for the threatened large-flowered skullcap. A forest inventory and a timber management plan were completed in 2006. This information and training site plans were used to develop the overall management plan for forest resources in Annex 2.

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

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

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

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

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

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

4.2.8 Fire Management

Catastrophic wildfire is not a common threat to northwest Georgia ecosystems but must be planned for. The Wildland Fire Management Plan (WFMP) for the VTS-C is found in Annex 3. It includes background information on wildland fire and fuels on the training site, fire suppression guidelines, and the prescribed burning plan. The existing road system at VTS-C provides the basis for a functional firebreak system; additional breaks may be needed. The natural ecosystems of VTS-C are not notably fire adapted, and so prescribed fire will be a small component of forest management on the training site. It can be an important tool for maintaining grassland areas, however.

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

- 8a) Identify any additional firebreaks needed.
- 8b) Create firebreaks where needed, with consideration for erosion potential. VTS staff responsibility.

- 8c) Maintain firebreaks as needed. VTS staff responsibility.

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

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

4.2.9 Fish and Wildlife Management

Currently, there are no specific fish or wildlife management activities conducted at VTS-C. Ecosystem management focuses on maintaining or improving the system as a whole; therefore, TNARNG policy is to manage animal species through 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 open hunting or fishing at VTS-C due to concerns for security and for the safety of the public and the soldiers. The white-tail deer population may exceed the site's carrying capacity without control; TNARNG will work with the GADNR to determine if this is a problem and to carry out a solution. Feral pigs and beaver are also an intermittent problem on the training site which will be addressed in cooperation with the Georgia wildlife authorities. Control of pest animals is addressed in Section 4.2.10, Pest Management.

Tiger Creek and its tributaries on VTS-C are classified as trout streams by the state of Georgia. Management of riparian areas will be conducted with maintenance of trout habitat as a primary goal.

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

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

Objective 9-2: Manage habitats for all native species

- 9b) Protect and maintain native species vegetative buffers around water sources, in accordance with SMZ protocols (See Section 4.2.5).
- 9c) Install and maintain nest boxes for appropriate bird species, when feasible.
- 9d) Convert grassland areas to native plant species where feasible. See Section 4.2.1.
- 9e) Monitor vegetation community condition through PLS. See Section 4.2.1.
- 9f) Implement vegetative community/habitat management actions as needed.
- 9g) Educate troops, management staff, and others on protection of wildlife species and habitats.

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

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

4.2.10 Pest Management

Pest Management at VTS-C is directed by the TNARNG Integrated Pest Management Plan (IPMP). Integrated Pest Management (IPM) 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 regulation and TNARNG policy, only DoD or State Certified Pesticide Applicators may apply any (restricted or general use) pesticide or herbicide to VTS-C property. The only exception to this rule is occasional small application of ready-made general use pesticides applied on a "self-help" basis. Examples of appropriate self-help applications include wasp spray in motor pools and around training structures, fire ant baits around buildings and walkways, and ready-to-use roundup around buildings and motor pools. Most chemical pest control on VTS-C is provided by contracted pest control companies. VTS-C has one employee certified in the right-of-way category for in-house weed control. All chemical pesticide applications must be reported to the TNARNG Integrated Pest Management Coordinator (see Appendix H for forms).

VTS-C is infested with the imported red fire ant (*Solenopsis* spp.). This is a highly aggressive ant, dominating the areas it infests and generally causing a decrease in insect species diversity. It has a fierce sting which it will apply repeatedly to animals it encounters with minimal provocation. These stings are painful and can cause anaphylaxis in sensitive individuals. Humans, domestic livestock, and wildlife are all susceptible to injury by red imported fire ants (Williams et al. 2001). The imported fire ant is the subject of a USDA quarantine which restricts the transport of soil, plants with soil and roots attached, grass sod, and similar materials. Fire ants are treated when the mounds pose an immediate threat to soldiers and other site users: around buildings, work stations, bivouac sites, firing points, training shelters, etc.

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-C and impact the usability of the land for Guard purposes. A variety of invasive pest plants are of concern at VTS-C: common privet, Japanese honeysuckle, Nepalese browntop, sericea lespedeza, and Canada thistle are the most prevalent. These plants can out-compete native plant species, change water and nutrient cycling, and drastically change the ecosystem in which they occur. An invasive pest plant management plan is included in Annex 4.

Two significant animal pests occur on the training site: feral pigs and beaver. The pigs dig up the roots of herbaceous plants for food and can have a major impact on rare species including the large-flowered skullcap, as well as disturbing the soil. Beaver are highly active in Tiger Creek and Broom Branch, creating water impoundments which kill timber, destroy bottomland ecosystems, and make the land unsuitable for training. The feral pig population has been reduced in the past by professional hunting. Trapping conducted in 2006 reduced the beaver population to near zero temporarily, but it is anticipated that new individuals will move into the vacated habitat. Hunting and trapping of these pest animals will be continued on an as-needed basis.

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

Objective 10-1: Implement the TNARNG IPMP

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

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

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

- 10d) Repeat survey to identify and map IPP infestations every 5 years.
- 10e) Implement appropriate pest plant controls IAW Annex 4.
- 10f) Monitor change in IPP infestations through long-term vegetation monitoring and repeat surveys (See 4.2.11).

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

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

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

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

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

- 10m) Monitor feral pig impacts on vegetation in conjunction with routine vegetation monitoring (See 4.2.11).
- 10n) Implement controlled hunting in cooperation with GADNR or USDA Animal Control Services to limit population of feral pigs as needed. VTS responsibility.
- 10o) Map and monitor beaver populations and dams, in conjunction with annual stream erosion surveys, see Section 4.2.5.
- 10p) Implement beaver trapping/hunting and dam removal as needed, complying with all state and federal regulations applying to aquatic and riparian habitat alteration. VTS 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. RTLA, under the ITAM program, is one form of monitoring which should be implemented at VTS-C. Additional monitoring is needed to track impacts and changes to the ecosystems on the facility.

The Environmental office initiated a vegetation monitoring protocol in 2002. In the fall of that year, plots were established at three TNARNG training sites (Catoosa, Milan and Tullahoma) following the original Land Condition Trend Analysis (LCTA) line transect-point quadrat methodology (three control plots and five special use plots). On examination of the original LCTA (now RTLA) methodology utilized in 2002, it was determined that the design was not consistent with current scientific methods utilized in the eastern U.S. ecotypes. An initial sampling was made in 2004 on eight rectangular plots at VTS-C located at the

starting end of the original LCTA transects. Further modification of this design is needed to ensure thorough coverage of the site and statistical validity, and a larger sample size is essential to fully characterize the training site.

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

Goal 1: Use analyses of data collected through long-term vegetation plots to monitor effects of training and land management activities on VTS-C.
Objective 11-1: Develop and implement a vegetation monitoring program.

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

4.2.12 Grounds Maintenance

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

Goal 1: Apply environmentally beneficial grounds maintenance techniques to maintain an attractive and functional landscape that meets training and other TNARNG needs.
Objective 12-1: Utilize regionally native plant species for all landscaping and restoration efforts if feasible.

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

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

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

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

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

4.2.13 Recreational Use Management

At VTS-C, outdoor recreation is limited due to the primary mission of the training site and the danger it presents to public safety. Public access is restricted because of hazards related to training activities as well as on-going construction activities: smalls 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 is controlled by secured gates.

Any person entering the training site for any purpose prohibited by law or lawful regulation is trespassing. Criminal trespass is a misdemeanor under Georgia Code 16-7-21 and 38-2-306. It may endanger the life of the person entering the training site and the lives of Tennessee Army National Guardsmen and may interfere with training. Georgia Recreation Use Statutes (Liability of Land Owner to Person Using Land) are found in Section 12-3-116 of the Georgia Code.

For the reasons given above, VTS-C does not allow outdoor recreation in the down-range areas on site. Consequently there are no recreation goals, objectives, or projects.

4.2.14 Cultural Resources Management

TNARNG has an approved Integrated Cultural Resources Management Plan (ICRMP) that covers all of its training sites in both Tennessee and Georgia, 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). Some military training activities, e.g., engineering training and other ground-disturbing activities, are considered “undertakings” that are required to 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.

Goal 1: Conduct all natural resources management actions on VTS-C in compliance with the goals, objectives, and policies of the ICRMP, and applicable laws and regulations.
Objective 14-1: Adhere to guidelines presented in the TNARNG Integrated Cultural Resources Management Plan for VTS-C.

Objective 14-2: Ensure that potential cultural resources sites are identified and are avoided during all natural resources management activities.

Objective 14-3: 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 14-4: Protect cemeteries on the VTS-C in accordance with the license.

4.2.15 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.

Goal 1: Maintain, update, and expand the GIS database to make accurate data available for training and management planning.
Objective 15-1: Maintain a constantly improving GIS.

- 15a) Identify the data layers captured and those still needed.
- 15b) Update older data layers and create new, as needed, or as information becomes available.
- 15c) Make data available for use through interactive web applications.
- 15d) Develop appropriate wording to be included in all Conservation contracts to ensure data is collected and presented in the correct format for the TNARNG GIS database.

4.2.16 Environmental Management Systems

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

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

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

4.2.17 Climate Change

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

All planning for climate change response on VTS-C must begin with consideration of the predicted changes. The 2014 National Climate Assessment predicts the following climate changes in the southeast United States (Carter et. al, 2014). The three major issues expected in

the southeast are increased temperatures, reduced precipitation, and continued ocean rise. The Catoosa Georgia area is expected to see increasing temperatures, with short term fluctuations due to natural variability. Average annual temperatures are expected to increases 4-8^{o}F by the end of the century, depending on the extent to which greenhouse gas emissions are reduced. It is expected that the number of days >95^{o}F will increase 20-30 days per year, the number of nights >75^{o}F will increase as well. The number of nights <32^{o}F are expected to decrease by 12-20 days per year on average. There is expected to be an increase in the frequency of extreme heat events.

Precipitation predictions are less certain than temperature predictions, but in general, there is expected to be a 2.5-5.0% decline in precipitation. The precipitation is expected to come in fewer, more extreme, rain events. There are expected to be fewer hurricanes with an increased percentage of them being of high intensity (category 4 & 5). The reduction in rain events and increased rapid runoff through flood events will likely reduce infiltration and aquifer recharge. While VTS-C is far from the ocean, rising salt water will likely compromise aquifers along the coast, forcing coastal populations to get fresh water from aquifers farther inland.

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

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

Goal 1: Develop and implement a climate change response plan.

Objective 17-1: Conduct necessary research to predict likely local influences of climate change.

- 17a) Review climate change predictions.

Objective 17-2: Develop and implement a climate change response plan

- 17b) Determine which changes TNARNG can practically affect through management actions.
- 17c) Identify functional approaches to manage for each aspect of change.
- 17d) Develop a climate change management plan to protect and manage natural resources.

- 17e) Implement the climate change management plan.

4.2.18 Pollinator Management

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

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

Goal 1: Determine pollinator use and habitat condition on site.
Objective 18-1: Conduct necessary research to identify pollinators using the site, and the condition of their habitat.

- 18a) Conduct a comprehensive survey of terrestrial macroinvertebrates.
- 18b) Survey pollinator habitat conditions on site.

Goal 2: Develop and implement a pollinator management plan.
Objective 18-2: Develop and implement a pollinator management plan.

- 18c) Identify specific issues with pollinator species composition and habitat conditions.
- 18d) Identify appropriate and practicable management approaches to address identified issues.
- 18e) Develop and implement a pollinator management plan.

4.3 SUSTAINABLE RANGE PROGRAM (SRP)

The Sustainable Range Program (SRP) was conceived and implemented to improve the way the Army designs, manages, and uses ranges to ensure that current and future doctrinal requirements are met. As defined in AR 350-19, The Army Sustainable Range Program, the goal of the SRP is to maximize the capability, availability, and accessibility of ranges and training land to support training and testing

requirements. The military mission is supported by the SRP through the integration of facilities management, environmental management, munitions management, and safety management to efficiently manage and maximize the capability, availability, and accessibility of ranges and training land to support training and testing requirements (Department of Army 2005).

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

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

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

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

4.3.1 Range and Training Lands Program

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

4.3.2 Integrated Training Area Management

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

The ITAM program is a management and decision-making process that integrates army training and other mission requirements for land use with sound natural resource management practices. There are four

components of the ITAM program: Range and Training Land Assessment[1] (RTLA); Land Rehabilitation and Maintenance (LRAM); Sustainable Range Awareness (SRA); and Training Resources Integration (TRI). These areas do not fall under the control or responsibility of the Environmental Office. The goals and tasks included here are based on the SRP guidance, but may not be identical to the goals of the TNARNG SRP program.

4.3.2.1 Range and Training Land Assessment

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

Goal 1: Establish and maintain an RTLA monitoring system on VTS-C.
Objective: Conduct monitoring and use the data to warn of changes in ecosystem integrity.

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

4.3.2.2 Land Rehabilitation and Maintenance

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

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

Goals 1: To ensure "no net loss" of usable training lands while maintaining or improving soil, water, and air quality.
Objective: Improve soil, water, and air quality by complying with all applicable laws and regulations, and providing adequate vegetative cover and drainage.

- 2a) Comply with all federal, state, and local laws and regulations pertaining to soil stabilization and water and air quality.
- 2b) Provide adequate protection of natural resources by implementing best management practices.
- 2c) Improve surface water quality by reducing sediment concentrations in streams and drainages on VTS-C.
- 2d) Apply land rehabilitation treatment measures following troop training within the next optimum seeding period (spring or fall).
- 2e) Reseed with native species in areas where they would be effective, productive, and cost-efficient.

4.3.2.3 Sustainable Range Awareness

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

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

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

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

4.3.2.4 Training Requirements Integration

TRI is a decision making process that supports integration of all requirements for land use with natural and cultural resources management processes. TRI integrates the installation training and testing requirements for land use derived from the RTLP; the range operations and training land management processes; and the installation training readiness requirements with the installation's natural resources conditions. Siting military missions (and other land uses) in areas best capable of supporting the activities is the main goal of TRI. TRI relies heavily on GIS and RTLA to determine land capabilities and includes rotation of training lands as well as scheduling lands according to their "carrying capacity" to support specific missions. TRI also includes those restrictions required to maintain quality training land, provide a safe training environment, and protect significant natural resources. When areas cannot be placed "off-limits" or signage cannot be used, the SRA program will serve to educate the training site users about site limitations.

TRI requires the involvement of and coordination between the POTO, Environmental, and Facilities staffs. The ITAM/TRI Committee, formed by the Adjutant General will serve as the mechanism to bring all the key players together. Coordination must take place for management to effectively schedule and properly allocate activities according to the land's ability to support training events with minimum environmental effects.

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

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

4.4 NATURAL RESOURCES PROJECTS

4.4.1 Survey History

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

Table 4.1. Surveys completed at VTS-C.

Survey	Completed	Contractor	Next
Soil Survey for Catoosa County, GA	1993	Soil Conservation Service	NA
Phase I Natural Resources Survey	Mar 1994	Lockwood Greene Technologies	NA
Delineation of Wetlands	Sep 1998 & 2012	US Army Engineers Waterways Experiment Station & URS respectively	2022
Natural Resources Aquatic Survey	Sep 1998 & 2010	Science Applications International Corporation & URS respectively	2020
Phase II Natural Resources Terrestrial Survey	Nov 1998	Science Applications International Corporation	NA
Biological Survey for the Large-flowered Skullcap	Dec 2002	Science Applications International Corporation	Monitored annually
Forest Inventory	Apr 2005	Forest Management Group	2024
Biological Survey for Invasive Plant Species	Jan 2006 & 2015	Dynamic Solutions LLC & UT Chattanooga respectively	2021
Vegetation Community Survey	May 2007	Dynamic Solutions LLC	2022
Biological Survey for Bats	May 2007, 2013, 2016, and 2017	URS Corporation URS RESPEC Apogee	2021
Avian Survey	Sep 2008 & 2013	AMEC Earth & Environmental Inc. & URS Respectively	2018

Aquatic Fauna Survey	Jan 2010	URS Corporation	2020
Mammal Survey	Feb 2010 & 2015	AMEC Earth & Environmental Inc. & ESI respectively	2020
Herpetofauna Survey	Mar 2010 & 2015	URS Corporation & ESI respectively	2020
Planning Level Wetland Survey	Jan 2012	URS Corporation	2022
Rare Species Survey	2011	URS Corporation	2019

4.4.2 Implementation of 2002-2018 INRMPs

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. The initial INRMP's layout made it difficult to identify the objective which a given project supported. In general, the 2002-2006 INRMP was found to be ineffective in guiding actual land management efforts. The format of later INRMPs were updated to be more functional, but still had formatting weaknesses. The format of this INRMP has been updated to make the document more functional for land management purposes. It is hoped that many weaknesses of previous INRMPs have been eliminated in this iteration of the plan.

Despite the flaws in the first and subsequent INRMPs, natural resources management has progressed on VTS-C during the time since their implementation: a great deal of basic information has been gathered through planning level surveys, a working relationship has been developed with USFWS and GADNR with regards to three federal threatened and endangered species, and the groundwork has been laid for a number of management actions which will be carried forward in this new INRMP. As an indicator of the current state of the program, the projects from earlier INRMPs have been incorporated into Table 4.2 with a description of the status of the projects. Some have been fully implemented, and others are in progress. A few were sidelined for budgetary or time reasons. Several ITAM projects are incomplete due to the transfer of monitoring duties from the Environmental Office to the ITAM Office, which lacks the personnel expertise needed to accomplish environmental monitoring. A number of projects have been carried over to this revised INRMP and will be completed or implemented during the next five years (see Table J-1, Appendix J).

Table 4.2: Project Status from the 2002-20018 INRMPs.

Area	Project/Management Action	Status
Environmental		
Training Support	Develop Missionscape statement	Completed
	Develop and implement plan to achieve Missionscape	Completed
	Review and update Missionscape	Completed & On-going
Ecosystem Management	Develop map & priority list of ecosystems	Completed & On-going
	Collect threat and training use details	Completed
Habitat Management	Identify threats to significant habitats	Completed
	Develop/implement protection plans significant habitats	Completed & On-going
	Post streamside management zones (SMZs) to implement 50 ft. buffer along streams	Completed
	Post wetland 50 ft. buffers (SMZs)	Completed
	Update training site SOP with information on SMZs	Completed

Area	Project/Management Action	Status
	Develop BMP training module	Completed
	Develop erosion repair guide	Completed
	Develop native planting guide	Completed
	Monitor for potential erosion issues	On-going
	Develop erosion reporting form for soldiers and staff	Completed
	Post erosion reporting on website	Completed
	Develop erosion report tracking system	Completed but fell out of use
	Develop and implement erosion repair plans as needed	On-going
	Perform water quality monitoring & assessment	Completed 2010
	Vegetation community PLS	Completed 2007
	Conduct periodic wetland survey	Completed 2012
	Riparian habitat assessment	On-going
	Sample Tiger Cr. for contaminants and present to GDNR	Completed
	Conduct forest inventory	Completed 2006
	Develop forest management plan	Completed 2006
	Enter VTS-C into forestry reserve accounting system	Completed
	Rare, Threatened, and Endangered species PLS	Completed 2013, by species prior
	Identify known locations and suitable habitat of rare species on GIS maps	Completed 2002
	Post rare animal and plant locations in Range Control	Completed
	Monitor populations of rare fish on CATC[2]	Completed through RTE Surveys
	Conduct large-flowered skullcap monitoring annually	On-going
	Update skullcap monitoring protocol annually	On-going
	Post and maintain perimeter around skullcap management groups	On-going
	Participate in Skullcap Working Group	On-going
	Develop skullcap Conservation Management Agreement to aid in delisting	In process
	Skullcap transplant experiment	Completed
	Skullcap and fire experiment	Completed
	Skullcap herbivory study	Completed
	Gray bat radio-tracking study to ID roost locations	Completed
	Coordinate tree removal with USFWS for Indiana and northern long-eared bat protection	On-going
	Protect tricolored bat hibernacula with fence	Waiting for funds
	Conduct hellbender habitat surveys	In process
	Conduct hellbender surveys	Not begun yet
	Create rare species identification fact sheets	Completed
Wildlife Management	Conduct breeding and migratory bird survey	Completed 2008, 2013
	Conduct mammal PLS	Completed 2010 & 2015
	Conduct bat surveys	Completed 2006, 2007, 2009, 2013, 2016, & 2017
	Conduct herpetile PLS	Completed 2010 & 2015
	Conduct a nighttime snorkeling biosurvey of Tiger Creek	Deemed unnecessary
	Conduct terrestrial macroinvertebrate PLS	Under Contract 2018
	Conduct snail survey	Deemed unnecessary

[2] CATC is the acronym for Catoosa Area Training Center, an old name for the VTS-C.

Area	Project/Management Action	Status
	Conduct a detailed mussel survey of Tiger Creek	Completed 2008
	Conduct aquatic fauna planning level survey (PLS)	2010
	Install nest boxes	Completed
	Restore grasslands to native species where feasible	No opportunities found yet
	Tiger Creek bank restoration	In process, funding issues.
Pest Management	Develop/implement an Integrated Pest Management Plan	Completed & On-going
	Report pesticide application data annually	On-going
	Conduct an invasive pest plant species inventory and map (GIS) locations throughout the training site	Completed 2006, 2015
	Monitor invasive exotic species of plants and animals on CATC, especially tree of heaven, princess tree, common privet, and multiflora rose	Initial survey and first monitoring PLS (2006 & 2014) completed
	Control or eradicate invasive exotic species of plants and animals	Initiated by ENV office in 2002, and ongoing.
	Implement feral pig, beaver or deer population control as needed	Completed & On-going
	Map active beaver dams	Completed & On-going
Outdoor Rec.	Consult with GDNR on Public Hunting Opportunities	Completed
	Develop hunting and fishing program	Determined impracticable due to potential conflicts with training and safety issues
Wildland Fire Management	Develop a Fire Management Plan for CATC	Completed 2009, 2017
	Develop fire assistance MOA with GAFC	Verbal but no written agreement
	Develop and maintain fire breaks	System in place but none along some fence lines due to terrain
	Implement prescribed fire to meet management needs	Completed & On-going
ITAM		
RTLA (was LCTA in original INRMP)	Conduct floristic survey	Completed, 2007
	Determine locations for RTLA special use plots on CATC	Completed by ENV office, 2002
	Establish 10 special use plots	Not completed – removed from ENV duties
	Establish other special use plots as necessary	Not completed – removed from ENV duties
	RTLA plot monitoring	Initiated by ENV office, 2002, but shifted to an ITAM responsibility
	RTLA analysis	Not completed – removed from ENV duties
	Obtain Global Positioning System (GPS)	Obtained by ENV
TRI	Classify, inventory, and map all roads and trails	Completed
	Determine kind of maintenance roads and trails should receive -- gravel, revegetate, or trim vegetation and perform maintenance	Annual, on-going
	Update CATC SOP -- rewrite environmental section	Completed, 2008
	Meet with the ITAM/TRI committee on a regular basis	Lapsed
	Establish standards for the amount of military training that is environmentally sustainable for CATC training areas	Practiced but not documented

Area	Project/Management Action	Status
	Allocate units to particular Training Areas in Master Training Schedule	Annual, on-going
	Evaluate condition of training areas following each training activity with unit leader	On-going
LRAM	Inspect completed erosion control projects to ensure success	On-going
	Harden all stream crossings used by vehicles on CATC	Completed
	Obtain equipment needed to perform LRAM projects	On-going
	Implement Best Management Practices for LRAM projects	On-going
	Establish priorities and standards for correcting unacceptable erosion	On-going
	Replace culverts in conjunction with wetland hydrology protection and update GIS layer	Completed
	Inventory Catoosa for sites needing rehabilitation (spring/fall)	Annual, on-going
	Document any new problem areas after major storm and training events and prioritize for funding	On-going
	Stabilize existing roads and tracked vehicle trails	Annual, on-going
	Perform continuous maintenance LRAM projects (erosion control and revegetation)	On-going
	Maintain lane areas	On-going
	Erosion control on trails	On-going
	Maintain turning pads	On-going
	Vegetation clearing	On-going
	Maintain hardened staging areas	On-going
	Continue cooperation with NRCS on developing a native reseeding mixture for CATC	Not completed
SRA (was EO in original INRMP)	Develop troop field card	In development
	Conduct environmental briefings for using units	On-going
	Develop or purchase additional Environmental Awareness materials and equipment (laminator, handbook, posters)	Annual, on-going
	Map environmental "points of interest" on Range Control maps and update as necessary	On-going
	Provide updated copies of Range Control maps to units using CATC each year	On-going
	Design and publish a website about the natural resources on CATC	Not completed
	Produce troop awareness video for CATC	Not completed

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CHAPTER 5
RESOURCE PROTECTION GUIDELINES

5.1 LAND MANAGEMENT GUIDELINES

The projects identified in the previous chapter are intended to improve the management and conservation of the natural resources on VTS-C. 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-C 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.

5.1.1 Training Operations

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

Roads and Vehicles

- No new roads, maneuver trails, maneuver corridors, or training area access points may be created without approval of Range Control.
- Tracked vehicles are restricted to existing maneuver trails, hardened crossings, and designated maneuver corridors when moving between training areas.
- Cross-country maneuver of tracked and wheeled vehicles through forested areas without existing maneuver corridors must be pre-approved by Range Control.
- Bivouac sites and other training areas should be rotated to minimize impact on the soils and vegetation when feasible.
- Vehicles brought to VTS-C from off-site should be thoroughly washed upon arrival at the Cantonment of VTS-C before entering the training areas to minimize the spread of invasive species.

Plants and Animals

- Personnel will comply with State Game and Fish Laws.
- Interaction with wildlife should be avoided due to health and safety concerns.
- Do not disturb experimental exclosures, or other wildlife management equipment or facilities.
- Avoid areas identified as containing large-flowered skullcap. All large-flowered skullcap occurrences on VTS-C will be posted with signs in accordance with AR 200-1 (see Figure 3.9 for sign).
    - There will be no off-road vehicular traffic through large-flowered skullcap posted areas.
    - There will be no soil-disturbing activities within posted areas without prior approval of the TNARNG Environmental Office.
- Do not cut vegetation 3 inches in diameter or larger, or any trees with protective coverings or special marks.

Streams and Wetlands

- Streamside Management Zones (SMZs) shall be identified around all water bodies. Perennial streams will have an SMZ extending 50 feet to either side of the stream for a total width of

100 feet, in accordance with Georgia trout stream guidelines. There shall be an SMZ 50 feet wide surrounding all wetland areas.
- Avoid operating vehicles in SMZs.
- Vehicle crossings of riparian zones and streams will only be conducted at designated points.
- Spills will be immediately contained and reported according to the VTS-C 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.
- The use of tracer rounds will be suspended during periods of very high fire danger. The National Fire Rating System can be accessed at http://www.wfas.us/ under "Fire Danger Rating."
- 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-C Range Control and his own immediate superior officer. The next higher headquarters will also be advised, and Range Control will immediately notify the 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 firefighting specialists.
- Georgia has a general prohibition against open burning during the months of May, June, July, August, and September – "smog season." In Catoosa County, the only legal exceptions to this prohibition are agricultural burns, forestry prescribed burning (requiring permitting from the Georgia Forestry Commission), recreational and cooking fires, authorized training of fire-fighters, operation of open flame equipment, and disposal of packaging materials which previously contained explosives (Georgia Rules for Air Quality Control, Chapter 391-3-1-.02(5), Open Burning).

5.1.2 LRAM and Construction

Activities which disturb the vegetation and soil can be particularly damaging to the environment if improper methods lead to erosion and sedimentation problems. Even actions intended to improve conditions, such as LRAM projects, can cause damage if not handled appropriately. LRAM and Construction are the two areas which routinely involve earth moving activities and should both be 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 Manual for Erosion and Sediment Control in Georgia, Fifth Edition (Georgia Soil and Water Conservation Commission 2000) available at http://www.gaepd.org/Documents/esc_manual.html
- Schedule and perform land rehabilitation projects as soon as possible following disturbance, allowing sufficient time for soils to recover. 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.
    - When planting native grasses, include non-persistent grasses that act as a cover crop for the first two or three years to minimize erosion before native species become established, for example: red top, timothy, winter wheat, and grain sorghum.
- Areas that fail to establish vegetative cover will be reseeded as soon as such areas are identified and weather permits.
- Present all construction project plans to the Environmental Office for review as far in advance as possible: special permits are required when disturbing federal jurisdictional wetlands or perennial or intermittent streams and will take time to obtain.

Table 5.1: Erosion Control Best Management Practices (BMPs) for LRAM and Construction Projects. From the TDEC Erosion and Sediment Control Handbook (Price and Karesh 2002)

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 so 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 Georgia General Storm Water Permit is required and a site-specific Erosion, Sedimentation, and Pollution Control Plan must be developed. The Notice of Intent and fees must be submitted to the State at least 14 days prior to any disturbance of the site.

2. Vegetative Controls

a. A buffer strip of vegetation at least as wide as the stream shall be left along any stream bank. For VTS-C streams, the buffer zone will be at least 50 feet back from the water's edge on both sides.
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.

5.1.3 Facilities Management

Maintenance of an attractive, tidy facility is important; however, even activities in a heavily modified cantonment area can impact the environment. Mowing, landscaping, and pesticide use in the managed landscape should be undertaken with consideration for this impact. The presence of the protected large-flowered skullcap, in particular, must be taken into account when performing basic maintenance projects:

Skullcap Protection

- Check with the Environmental Office prior to soil disturbance or vegetation removal activities to ensure there is no large-flowered skullcap conflict.
- Do not apply herbicides to large-flowered skullcap areas.
    - No herbicides will be applied within the boundaries of a large-flowered skullcap occurrence. The only exception is herbicide applied for the purpose of *S. montana* protection according to the Rare Species Management Plan and cleared by the Environmental Office.
    - Use of herbicides within 50 ft. of the boundary of a large-flowered skullcap occurrence will be limited to those products which do not translocate through the soil and to those application methods which minimize the risk of accidental drift to other plants.
- Report any damage or threat to a large-flowered skullcap plant or occurrence to the Environmental Office as soon as it is noted.

General Facilities Maintenance Guidelines

- 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 biological pest control methods wherever feasible and economical. Only apply pesticides when effective biological or mechanical control methods cannot be found or are prohibitively expensive. See TNARNG Integrated Pest Management Plan for more information.
- Pesticides and herbicides can only be applied by certified applicators and must be reported to the Integrated Pest Management Coordinator (see section 5.1.8 for more information).
- Herbicides will be utilized to control weedy vegetation in the most time- and cost-effective manner. The herbicide spray plan presented in Annex 5 will be updated yearly to meet training site needs.

5.1.4 Road Construction and Maintenance

Roads can be a significant source of sediment, as well as an on-going drain on funds, if poorly designed. This is particularly true at VTS-C where slopes over 25% are common. 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-C.

Table 5.2: Forestry Best Management Practices (also apply to Construction and Rehabilitation of Tank Trails). From Georgia's Best Management Practices for Forestry manual (Georgia Forestry Commission 1999).

1. **Access Road Location.** Access roads shall be designed and located to prevent sediment from entering the waters of the State. Methods to prevent sedimentation to streams include, but are not limited to, the following:
   a. Minimize the amount of road to be constructed by using existing roads where practical.
   b. Roads should follow the contour of the land as much as possible with grades ideally kept below 10%.
   c. Locate roads as far from streams and lakes as possible and practical.
   d. Roads should be placed on high ground where possible for proper surface drainage.
   e. Roads should be located on the southern or western aspect of ridges for maximum exposure to sunlight.
   f. Locate roads outside of streamside management zones (SMZs – see Section 5.1.5) except for planned stream crossings.

2. **Access Road Construction.** Access roads shall be constructed to prevent sediment from entering the waters of the State. Methods to prevent sedimentation include, but are not limited to:
   a. To the extent possible, construct and revegetate new roads several weeks or longer in advance of logging/use.

b. Schedule construction for favorable (dry) weather.
c. Avoid excessive soil disturbance during road construction.
d. On permanent access roads with 3% or more grade, broad-based dips should be installed at proper intervals (30° angle across road surfaces), have reverse grades of 3%, and the bottom of the dips should be outsloped about 3%. If necessary, outfall of dips may need sediment barriers such as rock, hay bales or silt fence installed (see Georgia's Best Management Practices for Forestry manual for further information on design of broad-based dips).
e. On crown and ditched roads, install water turnouts at proper intervals. Turnouts should never tie directly into streams or water bodies. If necessary, outfall of turnouts may need sediment barriers such as rock, hay bales, or silt fence installed.
f. Avoid insloping of roads. Where unavoidable, use cross-drain culverts positioned under the road at a 30° angle and appropriate spacing. Place rip-rap at culvert outfall to prevent washing.
g. Keep roads free from obstructions and logging debris.
h. Roadbeds on erosive soils should be stabilized with appropriate measures.
i. Stabilize exposed soil on shoulders of access roads with any one or combination of the following: seed and mulch, silt fence, hay bales, excelsior blankets, or geotextiles.
j. Avoid using ditches on steep roads.

3. Stream Crossings

a. Avoid or minimize stream crossings. If crossings are necessary, roads should cross streams as close to right angles as possible.
b. Avoid crossings at bends in the stream.
c. The road fill shall be bridged, culverted, or otherwise designed to prevent the restriction of expected flood flows.
d. The fill shall be properly stabilized and maintained during and following construction to prevent erosion.
e. Vegetative disturbances shall be kept to a minimum.
f. The design, construction, and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body.
g. Borrow material shall be taken from upland sources wherever feasible.
h. Approaches to all permanent or temporary stream crossings should be made at gentle grades of slope (3% or less) wherever possible.
i. Approaches should have water control structures, such as water turnouts or broad-based dips, on both sides of a crossing to prevent road runoff from entering the stream.
j. Stabilize approaches, if necessary, with rock extending at least 50 feet from both sides of the stream bank during the operation.
k. For temporary access roads, temporary bridges or spans are favored over culverts or fords.
l. Build wetlands fill roads outside the SMZ, except when crossing the channel. Cross-drainage structures (culverts, bridges, portable spans, etc.) may be necessary to allow for surface water movement across the site.
m. Stabilize exposed soil around permanent or temporary stream and wetland crossing with any one or a combination of the following: seed and mulch, hay bales, rock, silt fence, geotextiles, and/or excelsior blankets.
n. Avoid using asphalt materials for low water crossings.
o. Avoid anything that impedes the free or expected flow of water.
p. When bridges are used:
    1. With watersheds of 300 acres or more, use bridges to cross streams if other alternatives are not suitable for containing storm flows.
    2. Remove temporary bridges and stabilize approaches and stream banks when operations are completed.
q. When fords are used:
    1. Locate fords where stream banks are low and the bottoms are relatively hard and level.

2. Where necessary, establish a smooth, hard-surface low water crossing. For a permanent ford use gravel or rock-filled Geoweb or concrete pads. For temporary fords, use dragline mats or logs to armor the stream bottom.
3. Material should not significantly impound stream flow, impede fish passage, or cause erosive currents. Remove temporary crossings from the channel when operations are completed.

r. When culverts are used:
   1. Size permanent culverts so that the cross-sectional area will accommodate expected 25-year, 24-hour storm flows.
   2. Size temporary culverts so that the cross sectional area will accommodate the 2-year, 24-hour storm flows.
   3. Under normal conditions, two alternative methods of culverting are acceptable:
      a. Smaller multiple culverts can be substituted to provide for the same cross-sectional area of pipe.
      b. A combination of a smaller culvert(s) with rock surfaced road dips constructed in the roadbed to handle the runaround flow from larger storm events.
   4. Culverts less than 15 inches in diameter are not recommended.
   5. Multiple culverts should be spaced at a distance of at least one-half the culvert's diameter.
   6. Place the culvert in a straight section of the stream and free of obstructions.
   7. Place the bottom of the culvert at the same elevation as the bottom of the stream.
   8. Stabilize fill at ends of a culvert with either rip-rap, Geoweb, excelsior blankets, gabions, headwalls, grass seed and mulch, hay bales, etc.

4. Road Maintenance and Retirement.

a. Maintain existing roads in accordance with BMPs.
b. Avoid excessive traffic on wet roads.
c. Minimize road grading and reshaping on hilly or mountainous terrain unless required to repair damaged road sections.
d. Keep outfall of broad-based dips, water bars, and water turnouts open at all times. If necessary, install sediment barriers such as rock, hay bales, or silt fence just below outfall.
e. Retire temporary roads by reshaping and/or constructing water bars at recommended intervals. Stabilize as necessary by seeding and mulching or scattering logging debris over the road surface.
f. Periodically inspect retired roads to assure stabilization techniques are still effective and permanent stream crossings are clear and operating properly.

5.1.5 Water Resources

The water resources on VTS-C include several different ecotypes: trout streams, intermittent streams, the riparian areas surrounding the streams, and wetlands. While the 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, and 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).

Streamside management zones are buffer strips adjacent to perennial or intermittent streams or other bodies of water within which activities are limited in order to protect water quality. They shall be designated and managed to buffer water temperatures, prevent sediment and other pollutants from

entering waters of the State, and provide travel corridors and habitat for wildlife. SMZs should be established along any stream (perennial or intermittent) or water body where the potential exists for the movement of sediment or pollutants into the stream or water body. Georgia does not provide a set minimum width for an SMZ. The width of the SMZ should be based upon slope and susceptibility of the soil to erosion.

For VTS-C, a minimum buffer of 25 feet will be established for intermittent streams. This applies to both sides of the stream (total minimum width of 50 feet). All perennial streams on VTS-C – Tiger Creek, Broom Branch, Catoosa Springs Branch, and their primary tributaries – are classified as trout streams by the state of Georgia. Minimum SMZ width for a trout stream is 50 ft on each side. There will be no harvesting of any timber within the first 25 ft closest to the stream, and the remainder of the SMZ will have no more than 50% of the canopy cover removed. In association with wetlands, establish SMZs at least 50 feet in width surrounding the wetland area. BMPs for actions within streamside management zones are given in Table 5.3.

Table 5.3: Perennial and Intermittent Stream SMZs. From Georgia's Best Management Practices for Forestry manual (Georgia Forestry Commission 1999).

1.	Avoid operating any vehicles or other equipment within an SMZ.
2.	Minimize stream crossings.
3.	Except at planned stream crossings, locate new access roads outside the SMZ.
4.	Maintain existing roads within SMZs with adequate water control structures and stabilization measures as needed.
5.	Firebreaks should be installed parallel to streams and outside SMZs.
6.	Minimize prescribed fire intensity within SMZs to maintain forest floor cover and protect the soil surface.
7.	Periodically inspect the SMZ, evaluate the effectiveness of the BMPs, and adjust practices when necessary.
8.	There will be no vegetation harvest in the first 25 feet of the SMZ.
9.	Leave an average of 50 sq ft of basal area per acre evenly distributed throughout the SMZ or at least 50% canopy cover after a harvest to provide shade to the stream.
10.	Do not cut stream bank trees.
11.	Do not fell trees into the streambed or leave logging debris in the stream.
12.	Do not locate servicing or refueling equipment within an SMZ.
13.	Do not handle, mix, or store toxic or hazardous materials within an SMZ.

In addition to the official BMPs for Streamside Management Zones, other actions and/or limitations specific to TNARNG activities are essential to maintain high water quality and habitat quality:

Streams and Riparian areas

- Training is allowed in riparian areas in accordance with guidelines for forestlands. Use extra caution to avoid causing sedimentation or other contamination of the associated waterway.
- There shall be no digging for training purposes, forest management, or construction activities within an SMZ without prior review and permission from the Environmental Office. Certain activities may require a state or federal permit prior to initiation of activity.

- Spills will be immediately contained and reported according to the VTS-C Spill Prevention Control and Countermeasures (SPCC) Plan.
- Dumping of any substance on the training site is not allowed.
- Monitor for erosion problems along stream 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 circumstances.
- Use Erosion Control BMPs during all LRAM projects, road construction and relocation, and maintenance (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 made within the SMZ area 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.

5.1.6 Forestland Use

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

- Tracked and wheeled vehicles are restricted to existing maneuver trails, hardened crossings, and designated maneuver corridors when moving between training areas. Transition from travel on trails to off-road maneuver should only occur at predesignated points. Cross-country maneuver through areas without existing maneuver corridors must be pre-approved by Range Control.

- Cross-country maneuver of tracked and wheeled vehicles through forested areas without existing maneuver corridors must be pre-approved by Range Control.
- Bivouac sites and other forested training areas should be rotated to minimize impact on the soils and vegetation when feasible. Site condition should be monitored semi-annually utilizing the existing long-term vegetation monitoring protocol or the RTLA methodology.
- Clearing or thinning of forest stands to improve or expand training areas will be coordinated through the TNARNG Environmental Office.
- Do not cut vegetation 3 inches in diameter or larger, or any trees with protective coverings or special marks.
- Open burning is not allowed without a permit.
- Accidental fires in training areas will be combated by the unit occupying the area, or the nearest unit to an unassigned area immediately upon discovery. Contact Range Control immediately. See 5.1.1 Training Operations Guidelines for further wildfire information.
- Interaction with wildlife should be avoided due to health and safety concerns.
- Personnel using the area will comply with State Game and Fish Laws.
- Avoid areas identified as containing large-flowered skullcap. All large-flowered skullcap occurrences on VTS-C will be posted with signs in accordance with AR 200-1 (see Figure 3.10 for sign).
    - There will be no off-road vehicular traffic through large-flowered skullcap posted areas.
    - There will be no soil-disturbing activities within posted areas without prior approval of the TNARNG Environmental Office.

5.1.7 Grassland Use

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

- Reseed grassland areas with a native seed mix appropriate to the site and intended use when feasible. Use a non-native seed mix developed in cooperation with the Natural Resources section when necessary for soil retention and resiliency in situations where native seed mixes aren't suited to the need or situation. Discontinue the use of KY 31 tall fescue (*Schedonorus phoenix*) and the non-native lespedezas (Chinese or sericea lespedeza (*Lespedeza cuneata*), shrubby lespedeza (*L. bicolor*), and Korean or kobe lespedeza (*Kummerowia stipulacea*)) when possible.
- Prescribed fire is a useful tool for maintaining grassland ecosystems. TNARNG will develop and implement a burning regime for management and hazard reduction purposes.
- Tracked and wheeled vehicles are restricted to existing maneuver trails, hardened crossings, and designated maneuver corridors when moving between training areas. Transition from travel on trails to off-road maneuver should only occur at predesignated points. Cross-country maneuver through areas without existing maneuver corridors must be pre-approved by Range Control.
- Avoid mowing open grasslands from April to September for the protection of nesting birds. Areas in which taller growth will not impede training should be mowed in late March and then allowed to grow until November. Where grasslands must be maintained low cut, maintain 25-50 foot buffer strips along the forest edges which will only be mown every 3-5 years.
- Protect large, non-fragmented tracts of quality habitat which are required as territory for survival and maintenance of neotropical migratory birds when feasible.

5.1.8 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-C must be by a State- or DOD-certified applicator.
- All applications of herbicide or pesticide must be reported to the TNARNG Integrated Pest Management Coordinator (see Appendix H 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.
- There will be no herbicide application around *Scutellaria montana* except in accordance with the Rare Species Management Plan.
- Follow the Forest Service's Nonnative Invasive Plants of Southern Forests (USDA 2003) guidelines in controlling invasive plant species.
- Only native species will be used in landscaping and in reclamation work.

Contractors who apply pesticides on VTS-C must:

- Show proof of liability insurance.
- Have State commercial certification and licensing in the category or categories of work to be performed.
- Use only EPA registered pesticides or herbicides that are on the "State Pesticide Use List" for use on TNARNG sites (see Appendix H).
- 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 H 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.

5.1.9 Cultural Resources Management

The TNARNG Cultural Resources Management Policy is defined in the Integrated Cultural Resources Management Plan (ICRMP) for VTS-C, Georgia. The following are key points in protection of cultural resources:

- The TNARNG will consult the Georgia Heritage Resources Survey so that known historic, archaeological, and paleontological sites may be avoided.
- Cemeteries will be protected and maintained through fencing.
- For ground disturbing undertakings (ICRMP SOP #5)
  - Prior to any ground disturbance, contact the Cultural Resources office (see "Contacts" at front of this plan) to verify that the site is clear of known cultural resources.

  - The avoidance or mitigation of adverse impacts 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 GA-SHPO has determined an archaeological site to be not eligible or has concurred with a recommendation that an archaeological site is not eligible, any newly discovered sites will be treated as potentially 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 which are newly discovered in the construction of any undertaking shall be evaluated for their NRHP eligibility.
  - Until such time a the GA-SHPO has determined an archaeological site to be not eligible or has concurred with a recommendation that an archaeological site is not eligible, any newly discovered sites will be treated as potentially eligible and will be avoided whenever possible.
  - Nothing in Section 106 or other federal regulations requires TNARNG to stop work on an undertaking. However, if the SHPO indicates that the property is significant, then TNARNG shall make reasonable efforts to minimize harm to the property.
- Treatment of Human Remains and Funerary/Sacred Objects (ICRMP SOP #8)
  - No Native American human remains, funerary objects, or sacred objects from VTS-C 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.

5.2 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 5.4 provides a calendar for essential natural resources activities for VTS-C. This calendar will be revised as new needs are identified and information is gathered.

Table 5.4: Natural Resources Calendar

Issue	January	February	March	April	May	June
RTE					Large-flowered skullcap monitoring	Large-flowered skullcap monitoring
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				April 15 -> Plant native grass seed	Plant native grass seed	
					Plant warm season grasses	Plant warm season grasses
		Plant cool season grasses	Plant cool season grasses	Plant cool season grasses		
			Fertilize	Fertilize		
Erosion control		Erosion survey				
Prescribed Fire	Hardwood Forest RxBurns	Hardwood Forest RxBurns	Grassland RxBurns	Grassland RxBurns		
IPP Control	Cut-stump, Stem injection, or Basal bark treatments	Basal bark treatments	Basal bark treatments	Basal bark treatments	Basal bark treatments; Hand pull	Cut-stump or Stem injection treatments; Foliar Spray; Hand pull

Table 5.3, continued:

Issue	July	August	September	October	November	December
RTE						
Weed Control		Contact herbicide on fencelines and other points of concern				
Revegetation	Plant warm season grasses	Plant cool season grasses	Fertilize P&K	Fertilize P&K		
Erosion control		Erosion survey				
Prescribed Fire						Hardwood Forest RxBurns
IPP Control	Cut-stump or Stem injection treatments; Foliar Spray; Hand pull	Cut-stump or Stem injection treatments; Foliar Spray	Cut-stump or Stem injection treatments; Foliar Spray	Cut-stump or Stem injection treatments; Foliar Spray evergreens	Cut-stump or Stem injection treatments; Foliar Spray evergreens	Cut-stump or Stem injection treatments; Foliar Spray evergreens

REFERENCES

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

Army Regulation 200-1. "Environmental Protection and Enhancement," August 28, 2007.

Bailey, R.G. 1996. Ecosystem geography. Springer. New York, New York.

Braun, E.L. 1950. Deciduous Forests of North America. MacMillan Publishing Company, New York, New York.

Center for Ecological Management of Military Lands. 1999. Ecological Monitoring on Army Lands: ITAM Technical Reference Manual (Coordinating Draft). Department of Forest Sciences, Colorado State University. Fort Collins, Colorado.

Carter, L.M., J.W. Jones, L. Berry, V. Burkett, J.F. Murley, J. Obeysekera, P.J. Schramm, and D. Wear. 2014. Ch. 17: Southeast and the Caribbean. *Climate Change Impacts in the United States: The Third National Climate Assessment*, J.M. Melillo, Terese (T.C.) Richmond, and G.W. Yohe, Eds., U.S. Global Change Research Program, 396-417. Dio:10.7930/JON-P22CB.

Christensen, N.L., and Peet, R.K. 1984. Convergence during secondary forest succession. Journal of Ecology 72:25-36.

DeMeo, T.A., D.R. Christy, and J.E. Kundell. 2005. Georgia's trout stream buffer program assessment. University of Georgia, Athens, GA.

Department of Army. 2005. Army Regulation 350-19: The Army Sustainable Range Program. Washington, D.C.

Department of Defense Instruction 4715.03, "Natural Resources Conservation Program," March 18, 2011.

Donahue, J.C. 1998. Ground-Water Quality In Georgia for 1996-1997. Georgia Department of Natural Resources Environmental Protection Division. Circular 12M. Atlanta, Georgia.

Dynamic Solutions. 2006. Biological Survey Report: Invasive Plant Species for TNARNG Volunteer Training Site – Catoosa, Catoosa County, Georgia. Knoxville, Tennessee.

Dynamic Solutions. 2007. Biological Survey Report for Vegetation Community Survey at TNARNG Volunteer Training Site – Catoosa, Catoosa County, Georgia. 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). 2007. Middle Tennessee-Chickamauga Watershed Profile. http://iaspub.epa.gov/surf/huc.cfm?huc_code=0602001 Accessed February 2007.

Georgia. 2006. Tier 2 TMDL Implementation Plan, Revision 1: Tiger Creek Watershed.

Georgia Department of Natural Resources. 1976. Geologic Map of Georgia. Geologic and Water Resources Division, Georgia Geological Survey. Georgia Department of Natural Resources, Atlanta, Georgia.

Georgia Exotic Pest Plant Council (GA-EPPC). 2006. List of Non-native invasive plants in Georgia. http://www.gaeppc.org/list.cfm Accessed January 2008.

Georgia Forestry Commission. 1999. Georgia's Best Management Practices for Forestry. Georgia Forestry Commission. Macon, Georgia.

Georgia Natural Heritage Program. October 20, 1999. The Georgia Natural Heritage Program Database System Element Occurrences By Quarter 7.5 Minute USGS Quadrangle and County. Georgia Department of Natural Resources, Social Circle.

Georgia Soil and Water Conservation Commission. 2000. Manual for Erosion and Sediment Control in Georgia, Fifth Edition. Athens, Georgia.

Georgia State Climate Center. 1998. Climatology of the Georgia Mountains. http://www.bae.uga.edu/climate/pubs/mtnclimate.pdf Athens, Georgia. Accessed February 2007.

Hodler, T.W. and H. A. Schretter. 1986. The Atlas of Georgia. The Institute of Community and Area Development, the University of Georgia, Athens, Georgia.

Kile, H.M. 2011. Aiding Conservation of the Federally Threatened *Scutellaria montana* (Lamiaceae, Large-Flowered Skullcap) Through Abundance Monitoring and Transplantation Studies [Thesis]. Chattanooga: University of Tennessee at Chattanooga. 70 p.

Lawrence, K.S. 1993. Soil Survey of Catoosa County, Georgia. United States Department of Agriculture, Soil Conservation Service in cooperation with the University of Georgia, College of Agriculture, Agricultural Experiment Stations. Calhoun, Georgia.

McNab, W.H. and P.E. Avers. 1994. Ecological Subregions of the United States. WO-WSA-5. USDA Forest Service, Washington, DC.

Miller, James H. 2003. Nonnative invasive plants of southern forests: A field guide for identification and control. Revised. Gen. Tech. Rep. SRS-62. Asheville, NC: US Department of Agriculture, Forest Service, Southern Research Station. 93 p.

Minkin, Paul, William Packer, Steve Sutton, Dennis A. Gravatt, Michael Bishop, and Amy Bishop. 1998. Delineation of wetlands and other regulated waters – Catoosa Training Site. Report from U.S. Army Engineer Waterways Experiment Station. USACE-WES-ER-W. 30 September 1998.

National Oceanic and Atmospheric Administration (NOAA). 1998. Climatic wind data for the United States. National Climatic Data Center. http://www5.ncdc.noaa.gov/documentllibrary/pdf/wind1996.pdf Accessed February 2007.

National Oceanic and Atmospheric Administration (NOAA). 2005. Comparative climatic data for the United States through 2005. National Climatic Data Center, Asheville, NC.

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://www.naturesere.org/explorer. Accessed July 2012.

Price, J.C., and R. Karesh. 2002. Tennessee Erosion and Sediment Control Handbook. 2nd ed. Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Nashville, Tennessee. http://www.state.tn.us/environment/wpc/sed_ero_controlhandbook/

Science Applications International Corporation (SAIC). 1998a. Natural Resource Aquatic Survey at the Catoosa Training Site, Tunnel Hill, Georgia. Oak Ridge, Tennessee.

Science Applications International Corporation (SAIC). 1998b. Phase II Natural Resource Terrestrial Survey Final Report, Catoosa Training Site, Tunnel Hill, Georgia. Oak Ridge, Tennessee.

Soil Science Society of America. 1987. Glossary of Soil Science Terms. Madison, Wisconsin.

Stanyard, W.F., M.D. Chancellor, and J.L. Holland. 1998. Phase I Cultural Resource Survey of the Catoosa Training Center, Catoosa County, Georgia. Final Report. Prepared by TRC Garrow Associates, Inc., Atlanta, Georgia for Science Applications International Corporation, Oak Ridge, Tennessee.

Tennessee Exotice Pest Plant Council (TN-EPPC). 1997. Tennessee exotic plant management manual. TN-EPPC and Great Smoky Mountains National Park.

TNIPC. 2017. Invasive plants in Tennessee - 2017. Web-Page located at http://www.tnipc.org/invasive-plants/.

Thompson Engineering, Forest Management Group, and Aerostar Environmental Services. 2006. Volunteer Training Site – Catoosa Forest Management Plan. Prepared for the TNARNG.

TRC Garrow and Science Applications International Corporation. 2002. Integrated Cultural Resources Management Plan and Environmental Assessment of the Implementation of the Plan, Catoosa Training Center, TNARNG, 2002-2006. Prepared for the TNARNG.

University of Georgia State Climate Office. Historical data/summaries by station and region: Dalton. http://climate.engr.uga.edu/info.html Accessed February 2007.

URS. 2010. Aquatic Fauna Planning Level Survey, Volunteer Training Site – Catoosa, Tennessee Army National Guard. Prepared for the TNARNG.

URS. 2012. Wetland Survey and Characterization Report for the Volunteer Training Site at Catoosa, GA. Prepared for the TNARNG.

URS. 2013. Rare, Threatened, and Endangered Species Survey at Volunteer Training Site – Catoosa (VTS-C) Tennessee Army National Guard. Prepared for the TNARNG.

U.S. 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.

U.S. Census Bureau. 2012. State and County QuickFacts. http://quickfacts.census.gov/qfd/states/13/13047.html Accessed July 2012.

U.S.D.A. Economic Research Service. 2012. County-Level unemployment and median household income for Georgia. http://www.ers.usda.gov/data-products/county-level-data-sets/unemployment.aspx Accessed July 2012.

U.S.D.A. Forest Service. 2006. Chattahoochee-Oconee National Forests Georgia. http://www.fs.fed.us/conf Accessed June 2006.

U.S. Fish and Wildlife Service (USFWS). 1982. Gray bat recovery plan.

U.S. Sigh and Wildlife Service (USFWS). 1996. Large-flowered skullcap (Scutellaria montana) recovery plan. Asheville, North Carolina. 31 pp.

U.S. Geological Survey. 1983. Ringgold, Ga.-Tenn. Quadrangle, 7.5-minute topographic map.

U.S. National Park Service. 2006. Chickamauga and Chattanooga National Military Park. http://www.nps.gov/chch Accessed June 2006.

Van Lear, D.H., Brose, P.H., and Keyser, P.D. 2000. Using prescribed fire to regenerate oaks. In: Workshop Proceedings of Fire, People, and the Central Hardwoods Landscape.

Williams, David F., Collins, Homer L., and Oi, David H. 2001. The red imported fire ant (Hymenoptera: Formicidae): An historical perspective of treatment programs and the development of chemical baits for control. American Entomologist Fall 2001: 146-159.

APPENDIX A

ENVIRONMENTAL ASSESSMENT

FOR

THE IMPLEMENTATION OF THE REVISED INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

FOR THE VOLUNTEER TRAINING SITE – CATOOSA

TENNESSEE ARMY NATIONAL GUARD
CATOOSA COUNTY, GEORGIA

PREPARED BY
Tennessee Military Department
Environmental Office

February 2012

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ENVIRONMENTAL ASSESSMENT
FOR
IMPLEMENTATION OF THE REVISED INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN, VOLUNTEER TRAINING SITE CATOOSA
TENNESSEE ARMY NATIONAL GUARD

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TABLE OF CONTENTS

Table of Contents A-5
List of Tables A-6
Acronyms and Abbreviations A-6
1.0 Purpose and Need for the Proposed Action A-7
1.1 Introduction A-7
1.2 Purpose and Need A-7
1.3 Scope of the Document A-8
2.0 Description of the Proposed Action (the Preferred Alternative) A-8
3.0 Alternatives Considered A-11
3.1 Alternatives Development A-11
3.2 No Action Alternative A-11
4.0 Affected Environment A-12
4.1 Location Description A-12
4.2 Land Use A-12
4.3 Air Quality A-13
4.4 Noise A-13
4.5 Geology and Soils A-15
4.6 Water Resources A-16
4.7 Biological Resources A-16
4.8 Cultural Resources A-18
4.9 Socioeconomics A-20
4.10 Environmental Justice and Protection of Children A-20
4.11 Infrastructure A-21
4.12 Hazardous and Toxic Materials/Wastes A-21
5.0 Environmental Consequences A-22
5.1 Land Use A-22
5.2 Air Quality A-23
5.3 Noise A-23
5.4 Geology and Soils A-24
5.5 Water Resources A-24
5.6 Biological Resources A-25
5.7 Cultural Resources A-26
5.8 Socioeconomics A-27
5.9 Environmental Justice and Protection of Children A-27
5.10 Infrastructure A-27
5.11 Hazardous and Toxic Materials/Wastes A-28
5.12 Mitigation Measures A-28
5.13 Cumulative Effects A-28
6.0 Comparison of Alternatives and Conclusions A-29
6.1 Comparison of the Environmental Consequences of the Alternatives A-29
6.2 Conclusions A-30
7.0 References A-30
8.0 List of Preparers A-32
9.0 Agencies and Individuals Consulted A-32
10.0 Agency Review A-32
11.0 Public Review A-34

LIST OF TABLES

4-1. Threatened and endangered plant and animal species found in Catoosa County, Georgia. A-19
4-2. Regional income data for Catoosa County, Georgia. A-20
4-3. Regional population by race for Catoosa County, Georgia. A-21

ACRONYMS AND ABBREVIATIONS

AR	Army Regulations
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DA	Department of the Army
DBH	Diameter at Breast Height
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESMC	Endangered Species Management Component
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FNSI	Finding of No Significant Impact
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IPP	Invasive Pest Plants
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
RTE	Rare, Threatened, or Endangered species
SHPO	State Historic Preservation Officer
SMZ	Streamside Management Zone
SPCC	Spill Prevention Control and Countermeasure
TA	Training Area
TMDL	Total Maximum Daily Load
TNARNG	Tennessee Army National Guard
USC	United States Code
USDA	United States Department of Agriculture
USPFO	United State Purchasing Fiscal Office
VTS-C	Volunteer Training Site – Catoosa

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

In 2001, the Tennessee Army National Guard (TNARNG) implemented an Integrated Natural Resources Management Plan (INRMP) for the purpose of guiding land management activities on the Volunteer Training Site – Catoosa (VTS-C) in Catoosa County, Georgia, for the period 2002-2006. It was determined that a full revision of the document would be needed to guide future management due to the discovery of two federally listed species, the development of a forest management plan, and the need for more comprehensive guidance. To that end, the TNARNG, in cooperation with the U.S. Fish and Wildlife Service, Athens Field Office, and the Georgia Department of Natural Resources, Wildlife Resources Division, developed a Revised INRMP for the VTS-C. The revised INRMP includes a newly developed forest management and timber harvest program as well as a rare species management program for the federally listed large-flowered skullcap (*Scutellaria montana*) and gray bat (*Myotis grisescens*), both of which were not covered in the original INMRP or environmental assessment (EA). The purpose of this EA is to evaluate the impacts of implementing this Revised Integrated Natural Resources Management Plan.

This environmental assessment has been prepared in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations as published by the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations (CFR) 1500-1508) as well as 32 CFR 651, *Environmental Analysis of Army Actions*; National Guard Bureau (NGB) "All States" Memoranda on NEPA policy guidance; and the NGB NEPA Handbook, June 2006. Collectively, these regulations and the guidance thereto establish a process by which the Department of the Army (DA) considers and documents the potential environmental and socioeconomic effects of proposed actions and alternatives and then invites comments of interested citizens and organizations prior to deciding on a final course of action. If the analysis presented in this EA indicates implementation of the proposed action would *not* result in significant environmental or socioeconomic impacts, then a Finding of No Significant Impact (FNSI) will be prepared. If a significant impact would result that cannot be mitigated, issuance of a notice to prepare an environmental impact statement (EIS) would be required. CEQ regulations specify that an EA should:

- briefly provide evidence and analysis for determining whether to prepare an EIS or a FNSI
- aid in an agency's compliance with NEPA when an EIS is unnecessary
- facilitate preparation of an EIS when one is necessary

This NEPA review assesses known, potential, and reasonably foreseeable environmental consequences related to strategies presented in this INRMP. However, this NEPA review does not comprehensively assess environmental effects of specific projects presented in this INRMP. Therefore, additional NEPA analysis could be required prior to the implementation of certain actions or projects (e.g., prescribed burning, timber harvests). Furthermore, because the plan will be modified over time, additional environmental analyses pursuant to NEPA may be required if new management measures are developed for the long-term (i.e., beyond five years).

1.2 PURPOSE AND NEED

The Sikes Act, as amended, states "the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation in the United States under the jurisdiction of the Secretary, unless the Secretary determines that the absence of significant natural resources on a particular installation makes preparation of such a plan inappropriate" (16 U.S. Code

(USC) 670a et seq.). The VTS-C consists of approximately 1600 acres and contains significant natural resources, including two federal threatened and endangered species. Therefore, the TNARNG has prepared an INRMP for the VTS-C as a means of ensuring compliance with the Sikes Act.

The purpose of the proposed action is to guide land management on VTS-C to provide for the effective, long-term management of the site's natural resources while allowing the training mission to proceed. Key features of this management program are to provide for the conservation and rehabilitation of natural resources including soil, water, vegetation, and wildlife resources; the protection of rare, threatened, and endangered species; and the maintenance of healthy, functional ecosystems to support military training.

The proposed action is needed in order to ensure natural resources are managed effectively on the VTS-C while allowing the training mission to be accomplished and to maintain compliance with the Sikes Act, as amended, Department of Defense (DoD) Instruction 4715.3 (Environmental Conservation Program), and Army Regulation (AR) 200-1 (Environmental Protection and Enhancement), and applicable NGB and DoD guidance.

1.3 SCOPE OF THE DOCUMENT

Two courses of action are considered under this EA: The Proposed Action and the No Action Alternative. The Proposed Action evaluated in this EA would be for TNARNG to implement the Revised Integrated Natural Resources Management Plan for VTS-Catoosa. Management would include actions for the protection of the federal threatened and endangered species found on the site, management of timber resources for forest health and training needs, protection of soil and water resources through erosion prevention and repair, and maintenance of other environmental values. The No Action Alternative considered under this EA would result in no new management plan implementation but a continuation of management according to the 2002-2006 INRMP for VTS-C.

2.0 DESCRIPTION OF THE PROPOSED ACTION (THE PREFERRED ALTERNATIVE)

The Proposed Action is to implement the Revised INRMP for the VTS-C to guide natural resources on that facility. This action is designed to support the military mission by protecting and enhancing training lands (vegetation, soils, water quality, and wildlife) while providing quality conditions for training. This action would comply with the requirements of the Sikes Act and AR 200-1.

The Revised INRMP has been updated with recent survey data and streamlined to provide easy-to-understand guidance for training site managers, personnel, and users. The Revised INRMP also contains four recently developed specific management components: the Endangered Species Management Plan for large-flowered skullcap and gray bat, the forest management plan, the prescribed fire plan, and the invasive pest plant control plan.

The Revised INRMP identifies multiple natural resources management goals and the objectives and tasks that are necessary to accomplish those goals for integrated, sustainable land management at the VTS-C. It also outlines training and equipment needed to support natural resources goals. These goals, objectives, and tasks are identified in Chapter 4 of the Revised INRMP for the key resource areas defined by the Sikes Act:

- Ecosystem Management
- Rare, Threatened, and Endangered (RTE) Species

- Erosion Control and Soil Conservation
- Watershed Management
- Wetlands Protection
- Forest Management
- Fire Management
- Fish and Wildlife Management
- Pest Management
- Grounds Maintenance
- Recreational Use Management
- Cultural Resources Management
- Geographic Information Systems:

The objectives and the tasks, or projects, associated with each of the objectives are presented in Table 4.3 of the Revised INRMP (p. 81 *et seq*.). Most of the actions proposed by the INRMP have low impact on the environment (e.g., surveys, monitoring, and environmental education for staff) or are distinctly beneficial to the environment (e.g., erosion control and rehabilitation, RTE protection). Activities which involve more complex interactions with the environment include forest management, prescribed fire, invasive species control, and experiments with one of the RTE species on site (large-flowered skullcap).

Forestry

The forest management plan (see Annex 2 of the INRMP) presents a prioritized schedule of timber harvests for the improvement of forest health and quality and for the development of additional training situations. Harvests fall into two types: thinning all trees below the dominant/co-dominant level to lessen competition and create room for dominant individuals to grow more quickly and small group selection harvests in which areas of 2-10 acres will be cleared to encourage regeneration of desirable oak species and create uneven-aged mosaic conditions.

Approximately 610 acres are scheduled for harvest according to this plan which covers 17 years of management activity. Other stands will be reconsidered following the next forest inventory in 2015 and may be added to the harvest plan. No more than 60 acres will be harvested in any one year. Stands cut in successive years will be distributed across multiple training areas to minimize impact to wildlife habitat in any one portion of the installation at a given time.

A buffer of at least 50 feet on each side of the creeks will be protected for maintenance of riparian qualities; several of the narrow stands of bottomland hardwoods will therefore not be subject to any timber harvest. In all harvests, the large-flowered skullcap management groups plus a 50 foot buffer will be withheld – there will be no cutting of any trees within these areas. These two buffer protections will result in actual timber management on less than 610 acres in total.

Wildland Fire

Prescribed fire (see Annex 3 of the INRMP) will be utilized on VTS-C for the purposes of reducing fuel load and wildfire threat, creating and maintaining training conditions, controlling invasive species, and to encourage oak regeneration. Riparian areas (50 foot buffer on either side of the waterway) and large-flowered skullcap management groups (50 foot buffer surrounding) will be protected from fire (with the exception of experimental groups (see below)).

For the most part, fire will be used on the managed grasslands of the training site, e.g., the ranges. These areas will be burned on a 1-2 year rotation. Forested areas may be burned on a longer rotation (typically 6 years for hardwood stands, 3 years for mixed pine/hardwood stands) as needed for fuel control or

training area maintenance. Areas with substantial rare species value (e.g., training area 2) will not be subject to prescribed fire.

Invasive Species Control

This revision of the INRMP provides more detailed instructions for the control of invasive pest plants (IPP) (see Annex 4 of the INRMP) than the original plan. A number of non-native plants have invaded the ecosystems of VTS-C and altered conditions and biodiversity. Control of these problem species will involve the application of herbicides.

The principle species to be controlled on VTS-C are tree-of-heaven, mimosa, princess tree, wintercreeper, wooly mullein, privet, Japanese honeysuckle, and Nepal grass. The chemicals to be used include glyphosate, Garlon 3A, Garlon 4, and Arsenal. The most controlled methods of application will be used when feasible: cut stump treatment and stem injection. For small diameter trees or saplings, basal bark spray is the method of choice. Foliar spray will be used for species (e.g., honeysuckle, Nepal grass, and wintercreeper) which are not easily subject to the other methods and for resprouts of previously treated individuals. Methods will follow recommendations by Miller (2003).

All appropriate precautions will be taken to minimize the danger of drift of herbicide onto nontarget plants. For the protection of the large-flowered skullcap, no soil active herbicides will be used at any time within 50 feet of a skullcap management group. In addition, herbicide use during this plant's March-September growing season will be limited to stem treatments (basal bark, stem-injection, or cut stump) within 50 feet of the management groups. Foliar applications within the 50 foot buffer area will only be made during the fall and winter and thus only on evergreen or semi-evergreen pest plants, to minimize the risk of spray drift affecting a protected plant.

The extensive creek system of VTS-C will also be protected from herbicide contamination: within 25 feet of water, only stem treatments will be used, and foliar treatments will be avoided in any situation where spray would be carried toward water. To minimize the risk of erosion issues from elimination of IPP near streams, dead vegetation will be left standing on creek banks wherever possible, and there will be no stump removal on creek banks or within the 50 foot streamside management zone (SMZ).

Large-flowered skullcap experimentation

VTS-C has a large population of the federally listed threatened plant large-flowered skullcap. In cooperation with the USFWS, the TNARNG hopes to initiate several research projects described in Annex 1 of the INRMP.

To test the potential for transplanting threatened skullcap groups, a number of individuals will be transplanted from locations scheduled for development on the training site to similar locations within that region of the training site. To minimize the loss of plants from the training site, individuals will be propagated in the nursery and outplanted to the training site to replace those plants lost to construction and development. The transplanted individuals will not represent a loss of plants if survival is poor.

To investigate the impact of fire on large-flowered skullcap, several small management groups will not be protected from the prescribed burns scheduled in accordance with Annex 3 of the INRMP. Cool, dormant season burns will be allowed to burn through the chosen skullcap areas on either a 7-year or 4-year rotation, and response of the skullcap will be monitored.

Skullcap management groups which are threatened by invasive pest plants will be subject to experimental control of the IPP with herbicide treatments. The skullcap will be monitored for detrimental effects from herbicide treatments on a small portion of the management group. If the focused treatments are

successful in controlling IPP and there are no damaging effects on the protected species, herbicide treatments will be expanded to include the entire management group as needed.

3.0 ALTERNATIVES CONSIDERED

3.1 ALTERNATIVES DEVELOPMENT

Alternatives were considered based on budget constraints, regulatory requirements, and the functionality of the action. A partial implementation alternative was examined but was discarded as incompatible with DoD and Sikes Act guidance: the INRMP is an integrated document incorporating a specified selection of topics which interact to ensure effective ecosystem management of the site. Elimination of any of those topics would result in a document that does not meet regulatory requirements and a program which is incomplete and ineffective. Therefore, only two alternatives are considered in this NEPA analysis: the Proposed Action and the No Action Alternative.

3.2 NO ACTION ALTERNATIVE

In accordance with regulations promulgated by the Council on Environmental Quality, 43 CFR, Part 1500, Section 1502.14(d), a "No-Action" Alternative must be considered despite the fact that such an alternative would not currently comply with the *Sikes Act* or Army Regulation 200-1.

Under the No-Action Alternative, the VTS-C Revised INRMP would not be implemented, and current natural resources management practices would continue in accordance with the 2002-2006 INRMP with no change in management direction or intensity. The VTS-C would continue to operate using existing programs and management practices; however, new programs for endangered species management and forest management would not be implemented, and most of the projects identified in the revised INRMP, Chapter 4, would not be implemented. The installation would not be in compliance with the Sikes Act and associated guidance due to expiration of the original INRMP period without a completed review/revision. Non-compliance with AR 200-1 would occur due to the lack of an Endangered Species Management Component (ESMC) for two federally listed species now known to occur on the training site.

Under the No Action alternative the following natural resource management practices would persist as directed by the original INRMP:

- Implementation of Best Management Practices (BMPs)
- Protection of wetlands and riparian areas
- Use of temporary erosion control methods during heavy troop training periods
- Implementation of erosion control projects, as funding becomes available
- Protection of Federally listed species by avoidance
- Control of non-native invasive plant species and use of native species for revegetation where feasible
- Intermittent use of prescribed fire to maintain training conditions

Management actions that would not be implemented under the No-Action Alternative include:

- The endangered species management plan for large-flowered skullcap and gray bat
- Forest management actions (timber stand improvement, thinning, harvest, etc.)
- Prescribed fire management coordinated with timber management activities for ecosystem management

- An updated invasive pest plant control plan guided by a recent IPP survey and up-to-date control recommendations.
- Additional biological surveys to support or augment those completed in accordance with the original INRMP

4.0 AFFECTED ENVIRONMENT

4.1 LOCATION DESCRIPTION

The Volunteer Training Site – Catoosa is a 1,628 acre Tennessee Army National Guard training site located in east-central Catoosa County in northwestern Georgia, approximately two miles east of Ringgold, the county seat, and 20 miles southeast of Chattanooga, Tennessee (see **Figures 2.1**, p.12, and **2.2**, p.13, of the INRMP main body). The site is approximately 16,000 feet at its maximum length by approximately 6,625 feet at its maximum width. Georgia State Highway 2 borders the site on the south, and Salem Valley Road accesses the northern boundary.

The climate of Catoosa County is characterized by hot summers and cool winters, with precipitation averaging nearly 58" per year, spread relatively evenly through all seasons. The long growing season and plentiful rainfall combine to create a rich vegetative system dominated by broadleaf forest. The topographic relief of the training site contributes to a high diversity of ecotypes and species. Forests cover approximately 82% of the training site. Another 15% is managed grasslands on ranges and training areas. The remainder is the developed land of the cantonment area. Surrounding lands are a patchwork of forested ridges and valleys that have been cleared for pasturage, small-scale farming, and residences.

4.2 LAND USE

VTS-Catoosa supports the TNARNG State and Federal missions. It provides military field training exercises for both armored and artillery units. This facility provides high quality, realistic training areas, and is used to conduct small arms weapons qualification, command post exercises, field training exercises, and other training activities such as classroom work, familiarization or qualification with tank armaments, and simulated maneuvers.

4.2.1 Current VTS-C Land Use

VTS-Catoosa covers approximately 1,628 acres on Federally-owned property licensed to the Tennessee Army National Guard from the Mobile District of the U.S. Army Corps of Engineers. The training site consists of 10 training areas (TAs) and a Cantonment Area (see **Figure 2.3**, p.16, of the INRMP). The 55 acre Cantonment Area is located at the southern end of the training site. It consists of administrative buildings, supply buildings, two mess halls, classrooms, and barracks and latrine facilities to accommodate 400 soldiers. The small arms range area is also considered a part of the cantonment.

The small arms range facilities include:

- 25-meter pistol range
- 25-meter rifle range
- 10-meter M-60 machine gun range
- 1200-meter machine gun transition
- Known Distance rifle range (100-600 yards)

An additional M203 practice grenade launcher range is located just west of the cantonment in TA1. A tank gunnery range (1:60 scale) and tank table VII range (1:2 scale) occupy portions of TA3, TA4, TA5, and TA7 in the central portion of the training site. Additional facilities include a demolition range, gas chamber, and hand grenade qualification course. Army aviation facilities include one lighted, non-controlled helipad. The nearest fuel point is the Chattanooga Metropolitan Airport.

4.2.2 Off-Site Land Use

The property surrounding VTS-C is primarily privately owned rural residential and agricultural land. The helicopter landing pad is approximately 100 feet north of the closest residence. Land to the north of the maneuver area and rifle range and west of VTS-C is composed of cultivated land, cattle pasture, and hardwood forest. Tiger Creek Elementary School is located approximately 0.5 mile west of the training site on Highway 2.

4.3 AIR QUALITY

The ambient air quality in an area can be characterized in terms of whether it complies with the primary and secondary National Ambient Air Quality Standards (NAAQS). The Clean Air Act requires the federal government to set NAAQS for pollutants considered harmful to public health and the environment. NAAQS are provided for seven criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter with an aerodynamic size less than or equal to 10 micrometers (PM-10), particulate matter with an aerodynamic size less than or equal to 2.5 micrometers (PM-2.5), and sulfur dioxide (SO_2). Areas are designated as “attainment”, “nonattainment”, “maintenance”, or “unclassified” with respect to the NAAQS. General air quality monitoring is conducted in areas of high population density and near major sources of air pollutant emissions. Rural areas are typically not considered in such monitoring.

Catoosa County experiences air quality problems because of its proximity to Chattanooga, TN. The EPA has designated the area surrounding Chattanooga, including Catoosa County, as a nonattainment area for specific air quality parameters. The air quality problems relate to elevated ground-level ozone and particulate matter levels. At the time of this assessment, Catoosa County was in nonattainment status for the 8-hour ozone standard and the PM-2.5 standard (US EPA 2007a).

This nonattainment status has led the Georgia EPD to issue an annual ban on open burning between May 1 and September 30, a timeframe corresponding to the traditional smog season (Georgia Rules for Air Quality Control 391-3-1). This open burning ban does not apply to prescribed burning.

4.4 NOISE

Noise refers to sounds generated by on-site activities that could affect members of the TNARNG and the public. The EPA provides information on negative effects of noise, identifying indoor and outdoor noise limits that protect public health and welfare (e.g., hearing damage, sleep disturbance, and communications disruption). Noise levels below 65 decibels are generally considered to be acceptable in suitable living environments. The following information is taken primarily from the Statewide Operational Noise Management Plan completed for the TNARNG in 2006 (USACHPPM 2006).

4.4.1 Noise Environment

Most of the surrounding lands near VTS-C are rural residential properties and small farms. There are no concentrated residential developments within the range of the noise contours described in the 2006

TNARNG Operational Noise Plan. Noise sensitive receiver sites in the area are primarily individual residences and Tiger Creek Elementary School, located 0.5 mile from the training site along Highway 2.

The topography of the region in which VTS-Catoosa is located is significant to noise considerations. The alternating steep, narrow ridges and valleys serve as natural barriers to sound travel.

Overall, there are currently few problems concerning the noise environment at VTS-C. Noise complaints are minimal, and encroachment pressures are negligible.

4.4.2 Noise Sources

The purpose of VTS-C is primarily to provide the TNARNG with a place for basic military training including small arms, maneuver, field bivouac, and tracked and wheeled vehicle operations. Training at the installation occurs year round, but the vast majority takes place in the months from June to October. The noise produced by the training at the installation is generally limited to that which is made from the small arms firing (i.e., weapons smaller than 20mm). However, there are some operations at the demolition range and the M203 range that are considered large arms.

Small Arms – VTS-C currently utilizes the following ranges:

- (1) KD rifle range (100-600 yards)
- (1) 25-m pistol range
- (1) 25-m rifle range
- (1) shotgun range
- (1) .50 caliber / tank range
- (1) hand grenade practice range

According to the Small Arms noise contour determinations in the Operational Noise Plan, the Zone III contour (incompatible with residential land use) is either contained within the installation boundary or it travels off into uninhabited woodland. The Zone II contour travels well off the facility but does not encompass any noise-sensitive areas of relevant density.

Large Explosions and Other Impulsive Sounds – VTS-C has the following large arms/demolition ranges:

- (1) M203 Grenade launcher practice range
- (1) Demolition range

The operations on these ranges are limited, but calculations in the Noise Plan indicate that both the Zone III and the Zone II contours from the M203 range extend beyond the installation boundary a significant degree in the southern portion of the training site. There are currently no high density noise sensitive uses in this area, but in the future additional development along the highway may become a source of noise complaints. The Zone III contour does encompass the Tiger Creek Elementary School.

Noise contours in the northern portion of the training site are dictated by the Demolition range. Both Zone II and Zone III contours extend past the installation boundary, especially along Route 379. There are some residences in this area, and although the density is not high at this time, future development or increased operations may result in noise complaints.

Aircraft – Aircraft operations at the VTS-C are minimal. There is one lighted, non-controlled helipad on site. Total aircraft on-site averages 15-20 in a 12 month period. Most traffic is during the daytime and includes some transportation use as well as training operations.

Transportation and Other Noise – The noise generated by the current amount of wheeled and/or tracked vehicle maneuver training is small and does not travel beyond the installation boundary.

4.4.3 Current Noise Issues

Currently, VTS-C has few issues concerning noise; noise complaints are minimal and, at this time, encroachment pressures are negligible. Operational noise is contained fairly well within the installation boundary, and in those places where the noise does travel beyond the border, the existing land use is of very low density with few residences. Nevertheless, it is a possibility that future residential development around the installation, particularly to the northeast and to the south, could become a source of noise complaints.

4.5 GEOLOGY AND SOILS

4.5.1 Physiography and Topography

The VTS-C lies within the Southern Appalachian Ridge and Valley physiographic province. The area is characterized by a series of ridges and valleys that lie in a southwest to northeast direction (see **Figure 3.2**, p.27, of the INRMP) (Hodler and Schretter 1986). Tiger Creek and Broom Branch lie within the valley portion of the training site, surrounded by several unnamed ridges, as well as Sand Mountain to the northwest. Elevations range from approximately 755 feet above mean sea level (msl) along the creek channels to more than 1,200 feet above msl on Sand Mountain and other ridges. Slopes are generally moderately steep to steep on the ridges and range from nearly level to strongly sloping in the valleys (USGS 1983). Slope is a significant contributor to a high erosion index on over 75% of the training site.

4.5.2 Geologic Structure

Bedrock in the region of VTS-C is primarily Paleozoic sedimentary rock. Compressional forces deformed existing flat sedimentary formations to create folds which then eroded to the ridge and valley structure seen today. In the region east of Sand Mountain, older rocks were thrust over and now overlie younger rocks. The formations underlying the VTS-C area consist mostly of sandstone, siltstone, and shale. Depth to bedrock is typically more than 20 inches. No known mineral or petroleum resources are located on or under VTS-C (Lawrence 1993).

4.5.3 Soils

Thirteen soil series within three major soil associations are found on VTS-C (see **Figure 3.3**, p.29, and **Table 3.1**, p.28, of the INRMP), as described by the 1993 Catoosa County soil survey (Lawrence 1993). The Chenneby-Rome soils on the nearly level ground of floodplains and stream terraces range from poorly drained to well drained and typically are not considered highly erodible. These silt loam soils are deep (>60 inches to bedrock) and prone to seasonal flooding and wetness. The upland soils on the training site fall within either the Townley-Cunningham-Conasauga or Townley-Tidings soil associations. These upland soils are generally well-drained and often moderately to strongly sloping and are highly erodible. They are loam or silt-loam soils 20-40 inches deep over shale bedrock.

Soil erosion potential is a significant limiting factor on the VTS-C (see **Figure 3.4**, p.32, of the INRMP). Over 75% of the soil types at VTS-C meet the criteria for highly erodible land. Slope steepness and length is the key factor in erosivity: ridge soils are much more prone to erosion than the lowland soils. Wetness and flooding are commonly limiting factors in the valleys on the training site.

4.6 WATER RESOURCES

The VTS-C lies within the Chickamauga watershed. The training site is drained by three named blue line streams (see **Figure 3.5**, p.34, of the INRMP): Tiger Creek and its tributaries Broom Branch and Catoosa Springs Branch. There are also nine unnamed tributaries to Tiger Creek that are shown as blue line streams. In total there are approximately 11.6 miles of intermittent or flowing stream on the site (Minkin et al. 1998).

A water quality survey conducted at VTS-C in 1998 reported the water quality in the surveyed creeks and ponds as "generally very good" (SAIC 1998a). However, the State of Georgia has developed a Total Maximum Daily Load (TMDL) Implementation Plan for the Tiger Creek watershed. Tiger Creek's designated use is fishing, and the creek is listed as impaired on Georgia's 303(d) list for fecal coliform bacteria. The TMDL Implementation Plan lists the primary source of the bacteria as non-point from wildlife, agricultural livestock, and urban development (Joss 2006).

Tiger Creek and its tributaries are designated as Secondary Trout Streams by GADNR. A Secondary Trout Stream is one that has no evidence of natural trout reproduction but that is capable of supporting trout throughout the year (Joss 2006). This designation results in additional controls intended to minimize sedimentation and maintain forest cover for temperature control. Current state regulation requires the maintenance of a 50 foot vegetated buffer on either side of a trout stream with permits required for any modification within that buffer area.

A 1998 delineation of wetlands and other regulated waters was performed by Minkin et al. (1998). They found that VTS-C contained approximately 7.88 acres of wetlands and ponds, the majority located in the southwestern corner of the property (see **Figure 3.5**, p. 34, of the INRMP). This small area (0.5% of the installation's total land area) constitutes a variety of wetland communities, with many situated along streams and drainages. Six National Wetland Inventory (NWI) classes were found at VTS-C. The majority of the wetlands on VTS-C (4.55 acres) are emergent systems dominated by grasses. In addition, there are approximately 2.36 acres of forested wetlands dominated by hardwood species and 0.97 acre of shrub dominated wetland

One small pond exists on the site; it is a man-made pond behind a small dam from 1934 and is heavily clogged with silt and organic debris.

4.7 BIOLOGICAL RESOURCES

4.7.1 Vegetation

Vegetation Communities

The VTS-C is part of a larger ecosystem that is known as the Gulf Slope Section of the Oak-Pine Forest Region (Braun 1950). 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, and farms. Ten natural communities were described in the Phase II natural resources survey by Science Applications International Corporations based on edaphic conditions and dominant species types (SAIC 1998b). These community types were further refined into 11 floristic alliances according to the National Vegetation Classification Standard (see **Figure 3.6**, p.38, of the INRMP) (Dynamic Solutions 2007). During this most recent vegetation survey 171 plant species were identified on the training site (see Appendix F of the INRMP). The forests on the training site are second growth, mostly under 60 years old, regenerated after past logging or clearing for agriculture. The grasslands are human-created and maintained.

Mixed oak and oak-hickory forests predominate, occupying approximately 82% of the training site. Species composition of the overstory varies and is dependent on slope, slope aspect, and soil moisture regimes. White oak (*Q. alba*), black oak (*Q. velutina*), chestnut oak (*Q. montana*), and eastern red cedar (*Juniperus virginiana*) dominate the diverse overstory on the xeric to mesic sites along upper and mid slopes, while on lower slopes, oaks share dominance with yellow poplar (*Liriodendron tulipifera*). The much wetter bottomland hardwoods are dominated by green ash (*Fraxinus pennsylvanica*) with other species that tolerate some inundation and higher soil moisture throughout the year. The training site also contains natural stands of loblolly and shortleaf pines (*Pinus taeda* and *P. echinata*) as well as pine plantations dominated by loblolly pine.

While open fields at VTS-C are dominated by broomsedge (*Andropogon virginicus*) and crabgrass (*Digitaria sanguinalis*), the composition is somewhat dynamic and also contains shrubby and herbaceous species such as plantain (*Plantago* spp.), blackberry (*Rubus allegheniensis*), thoroughwort (*Eupatorium* spp.), and honeysuckle (*Lonicera* spp.). These areas are periodically bushogged throughout the growing season to maintain them in an open condition for training. A mixture of crabgrass, Bermudagrass (*Cynodon dactylon*), white clover (*Trifolium repens*) and other lawn grasses and weeds occupy the lawns of the installation's cantonment area. These areas are mowed frequently throughout the growing season and are generally well-maintained.

Forest Inventory and Management

A forest inventory and a management plan for VTS-Catoosa were completed in 2006. The forest inventory determined that a total of 1,313 acres of VTS-C were covered in forests in April 2005. The forest stands are typically dominated by red oaks and white oaks, with a substantial amount of pine in some stands. Yellow-poplar is a co-dominant in some stands, as is hickory. The average DBH for the entire installation was calculated as 11.7 inches, and the average basal area was 78.1 square feet per acre. Most stands are 20-40 years old; although some had trees approaching 70 years in age, and a few stands were dominated by young trees. The overall health of the forest stands was classified as good in April 2005, but there was evidence of a past infestation of southern pine beetles. In addition, stands in the impact area of the tank range show a significant amount of timber damage due to frequent hot fires (Thompson Engineering et al. 2006).

4.7.2 Wildlife

A total of 218 animal species, representing four groups of land vertebrates (17 amphibians, 134 birds, 23 mammals, and 8 reptiles) and 36 fish species have been documented at VTS-Catoosa during numerous natural resources surveys (SAIC 1998a; SAIC 1998b; URS and EcoTech 2007; AMEC unpublished). The federally listed endangered gray bat (*Myotis grisescens*) has been captured over Tiger Creek on VTS-C, but no hibernacula have been identified on the training site. Further information on the gray bat is presented in section 4.7.3.

Although the installation does not allow hunting at this time, numerous game species have been identified at VTS-C including white-tailed deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridanus*), northern bobwhite quail (*Colinus virginianus*), raccoon (*Procyon lotor*), grey squirrel (*Sciurus carolinensis*), mink (*Marmota monax*), and wild turkey (*Meleagris gallopavo*).

Feral pigs (*Sus* sp.) have been a problem on the training site in the past and may require removal through contracted hunting and trapping. They threaten ground nesting birds and disturb large areas of soil with rooting and wallowing. They may be a particular threat to the large-flowered skullcap as they will dig up and eat the perennial root-stock of this threatened plant. Beaver (*Castor canadensis*) are another problem wildlife species on the VTS-C. They have built extensive dams in Tiger Creek and Broom Branch, and the resultant flooding kills timber and makes land unusable for training. A trapping program initiated in

2006 has the population under control at this time, but they will require on-going surveillance and management.

4.7.3 Rare, Threatened, or Endangered Species

One federally listed plant species has been located on VTS-C: a rather large population of the threatened large-flowered skullcap (*Scutellaria montana*) occurs in clusters over most of the training site (see **Figure 3.8**, p.48, of the INRMP). Occurrences of large-flowered skullcap undergo annual monitoring, and areas in which they are located are marked off-limits to all training activities during the growing season for the plant and are off-limits to vehicular traffic year-round.

The federally listed endangered gray bat (*Myotis grisescens*) was captured while foraging over Tiger Creek on the VTS-C during a bat survey conducted in 2006-2007 (URS and EcoTech 2007). No hibernacula were identified on the training site during this survey, but further research is needed to fully characterize the gray bat presence on the training site.

In addition to the large-flowered skullcap and the gray bat, a number of federal and state-listed species have been documented within Catoosa County (Table 4-1). None of the other species have been found on the VTS-C to date. The blueside darter (*Etheostoma jessiae*), redline darter (*E. rufilineatum*), and banded darter (*E. zonale*) are Georgia "special concern species." These fish were found at VTS-C during an aquatic resources survey in 1998 (SAIC 1998a). No further investigation has been made of their use of the training site.

4.8 CULTURAL RESOURCES

No cultural resources located at the VTS-C are currently listed on the National Register of Historic Places (NRHP). There are, however, resources that have been identified as eligible. A Phase I cultural resources survey of the VTS-C was conducted in 1997 (Stanyard et al. 1998). Twenty archaeological sites and one isolated find were identified on the training site. Nine prehistoric sites and three historic sites are recommended eligible for the NRHP under Criterion D. The other sites are recommended ineligible.

In addition, 17 historic architectural resources were identified. Most were recommended ineligible due to loss of integrity. Three were recommended eligible for the NRHP: a 1934 concrete dam (with associated pond), a ca. 1907 target range, and a ca. 1940 concrete bridge. The State Historic Preservation Office (SHPO) concurred with these findings on 15 August 1998.

Twenty federally recognized American Indian tribes have a current or historic interest in TNARNG lands. All interactions between the TNARNG and these tribes are conducted in accordance with the DoD Annotated American Indian and Alaska Native Policy (27 Oct 1999).

Protection of these historic and prehistoric sites is directed by the TNARNG Integrated Cultural Resources Management Plan (ICRMP) for VTS-Catoosa. This document also guides interactions and consultation with the American Indian tribes that have a current or historic interest in TNARNG lands.

Table 4-1. Threatened and endangered plant and animal species found in Catoosa County, Georgia. (Data obtained from Georgia Wildlife Resources Division 2012a, 2012b; Natureserve 2012; US Fish and Wildlife Service 2012.)

Organism Type	Scientific Name	Common Name	Habitat	Federal Status[1]	State Status[2]
Documented at VTS-C					
Plant	*Scutellaria montana*	Large-flowered skullcap	Mature oak forests on dry, rocky slopes	LT	T
Mammal	*Myotis grisescens*	Gray bat	Cave roosts, riparian foraging areas	LE	E
Not documented at VTS-C					
Plant	*Hydrastis canadensis*	Goldenseal	Mesic hardwood forests with alkaline soils	None	E
Plant	*Leavenworthia exigua var. exigua*	Tennessee gladecress	Limestone cedar glades	None	T
Plant	*Spiranthes magnicamporum*	Great Plains ladies' tresses	Prairies and glades with alkaline soils	None	E
Plant	*Thaspium pinnatifidum*	Glade meadowparsnip	Forests with calcareous soils	None	E
Plant	*Xyris tennesseeensis*	Tennessee yellow-eyed grass	Seepy margins of limestone spring runs	LE	E
Crustacean	*Cambarus extraneus*	Chickamauga crayfish	Shallows of high gradient streams	None	T
Amphibian	*Cryptobranchus alleganiensis*	Eastern hellbender	Cool, clear streams with large rocks	None	T
Fish	*Erimonax monachus*	Spotfin chub	Large creeks to medium rivers; moderate to swift current over gravel to bedrock	LT	T
Fish	*Etheostoma duryi*	Black darter	Springs & small-medium, clear, gravel bottom streams	None	R
Fish	*Hemitremia flammea*	Flame chub	Springs & spring-fed streams with aquatic vegetation	None	E
Fish	*Ichthyomyzon bdellium*	Ohio lamprey	Adults: medium to large rivers; larvae: mud bottoms of quiet pools in creeks	None	R
Fish	*Notropis ariommus*	Popeye shiner	Large creeks to medium rivers with gravelly substrate	None	E
Fish	*Noturus eleutherus*	Mountain madtom	Small to large rivers with fast-flowing waters and sandy or rocky substrate	None	E
Fish	*Percina sciera*	Dusky darter	Low gradient creeks and small rivers with gravel substrate and plentiful vegetation	None	R
Fish	*Percina tanasi*	Snail darter	Shoals of creeks and small rivers with sandy substrate	LT	E
Fish	*Phenacobius uranops*	Stargazing minnow	Creeks to medium rivers in rocky runs and riffles	None	T
Insect	*Gomphus consanguis*	Cherokee clubtail	Mountain streams and adjacent terrestrial areas	None	T

[1] Federal status codes: LE (Listed Endangered) - Taxon is threatened by extinction throughout all or a significant portion of its range
LT (Listed Threatened) - Any species or subspecies of wildlife that is likely to become endangered within the foreseeable future

[2] State status codes: E (Endangered) - Any species or subspecies of wildlife whose prospects of survival or recruitment within the state are in jeopardy or are likely to become so in the foreseeable furture
T (Threatened) - species likely to become endangered in the immediately foreseeable future as a result of rapid habitat destruction or commercial exploitation
R (Rare) – species not endangered or threatened, but which should be protected because of its scarcity

4.9 SOCIOECONOMICS

Socioeconomics identifies and describes the basic attributes and resources associated with the human environment surrounding the VTS-C. This data is presented in order to provide an understanding of the socioeconomic forces that have shaped, and continue to shape, the area. Data have been collected from the U.S. Census Bureau (2007) and the U.S.D.A. Economic Research Service (2007).

Table 4-2: Regional income data for Catoosa County, Georgia.

	Total Resident Population, 2011 *	Median Household Income, 2006-10 *	% Persons Below the Poverty Line, 2006-10 *	Unemployment Rate (%), 2010 **
Catoosa County	64,530	$46,544	11.2 %	8.1 %
Georgia	9,815,210	$49,347	15.7 %	10.2 %
U.S.	311,591,917	$51,914	13.8 %	9.6 %

* U.S. Census Bureau (2012) ** U.S.D.A. Economic Research Service (2012)

Socioeconomic areas of discussion for the affected environment precluded from this discussion due to overall inapplicability include local housing, schools, medical facilities, service facilities, recreational facilities, and associated issues of health and safety. Implementation of the subject INRMP would not affect any of these areas outside the boundaries of the VTS-C.

4.10 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

Because children may suffer disproportionately from environmental health risks and safety risks, Executive Order (EO) 13045, Protection of Children from Environmental Health Risks and Safety Risks, was introduced on April 21, 1997. EO 13045 was intended to prioritize the identification and assessment of these risks that may affect children and to ensure that Federal agency policies, programs, activities, and standards address these risks. Currently, there are seldom children present at the VTS-C as visitors, no children reside at the installation, and no child care centers, schools, parks, or other concentrations of children exist on the installation. However, there is a potential for children to be present in areas proximal to the training site, as Tiger Creek Elementary School is located approximately 0.5 mile west of the main gate on Highway 2.

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, dated 11 February 1994, was issued to focus attention of federal agencies on human health and environmental conditions in minority and low-income communities, and to ensure that potential disproportionately high and adverse human health or environmental effects on these communities are identified and addressed. Catoosa County, as shown in Table 4-2, has a very low percentage of minorities and has a higher median income than the state average. The area immediately surrounding the training site has a range of income levels, but no concentration of low income citizens.

Table 4-3: 2011 Regional population by race for Catoosa County, Georgia. Data from US Census Bureau (2012).

Area	All Individuals	White (%)	African-American (%)	American Indian & Alaska Native (%)	Asian or Pacific Islander (%)	Two or More Races (%)	Hispanic or Latino+ (%)
Catoosa County	64,530	93.8	2.8	0.4	1.4	1.5	2.5
Georgia	9,815,210	63.2	31.0	0.5	3.5	1.8	9.1
U.S.	311,591,917	78.1	13.1	1.2	5.2	2.3	16.7

+ Persons of Hispanic or Latino origin may be of any race.

4.11 INFRASTRUCTURE

Infrastructure resources include potable water supply, wastewater treatment, solid waste disposal, energy sources, and transportation systems (i.e., roads, railways, airports).

The VTS-C is accessible via Georgia State Highway 2 on the south (the main gate) and Salem Valley Road on the north. Interstate 75 is located approximately 2 miles southwest of the installation. Approximately 30 miles of roads, predominantly maintained gravel, are within the training site. One lighted, non-controlled helipad serves the minimal aircraft operations on the site. The nearest fuel point is the Chattanooga Metropolitan Airport. There are no rail facilities on or near the VTS-C.

Electricity is supplied to the training site by Georgia Power. Telecommunications services are provided by Ringgold Telephone Service. The water supply is through the Catoosa County Utility District. There is one well located on the training site; it is not used as a potable water source but supplies the vehicle wash rack. Wastewater discharge on the VTS-C is to thirteen septic tanks across the facility. The washrack discharges to grade.

4.12 HAZARDOUS AND TOXIC MATERIALS/WASTES

TheVTS-C does not currently generate hazardous waste. A solvent rag laundry service is used by the training site. Any excess, expired, or unknown products are disposed of in accordance with the TNARNG Hazardous Waste Management Plan. Waste disposal would be coordinated through the Facilities Engineers Office, the United States Purchasing Fiscal Office (USPFO), and the Chattanooga FMS should any waste be generated at the VTS-C.

Based on the record search conducted in September 1994, no underground storage tanks are present in the VTS-C area. There are four active aboveground storage tanks on the training site. These tanks are located in the motor pool area. The 3,000-gallon JP8 tank is double-walled steel, pad-mounted, and has secondary containment. The three 1,000-gallon capacity tanks are used to store diesel and unleaded gasoline and are single-walled and situated on a concrete pad. All of the military vehicles used at this training site operate using diesel fuel. The Training Site has a current, active Spill Prevention Control and Countermeasures (SPCC) Plan that specifically includes actions to be taken in the event of a diesel or fuel spill.

Most pesticide use on site is done by contract with licensed pest control operators. The training site currently has one certified pesticide applicator on staff who makes weed control applications. Minimal amounts of herbicides are maintained on site for weed control and are stored and handled in accordance

with the Federal Insecticide, Fungicides, and Rodenticide Act (FIFRA), state and DoD regulations, and the product label.

5.0 ENVIRONMENTAL CONSEQUENCES

This section identifies the potential positive and negative environmental, cultural, and socioeconomic effects, or impacts, of the identified alternatives on each of the technical issue areas presented in Section 4.0. In addition, this section identifies any mitigation measures that may be associated with each resource area that when implemented, would reduce the level of identified impacts.

Impacts are characterized as direct or indirect. A direct impact is caused by a proposed action and occurs at the same time and place, while an indirect impact is caused by a proposed action but occurs later in time or farther removed in distance but is still reasonably foreseeable.

In addition to indicating whether impacts are direct or indirect, the impact analyses included in this section distinguish between short- and long-term impacts. In this context, short- and long-term do not refer to any rigid time period but are determined on a case by case basis in terms of the environmentally significant consequences of the proposed action.

Generally, implementation of an updated and improved plan for integrated natural resources management is expected to result in a significant, positive, long-term environmental impact to the natural, cultural, and socioeconomic environments at the VTS-C by allowing for use of a holistic management approach.

5.1 LAND USE

5.1.1 Effects of the Proposed Action

The implementation and integration of the proposed Revised INRMP into the VTS-C overall approach to environmental and training site management would directly supplement and facilitate land management and use for nearly all installation activities. It would allow for the successful completion of military operations while providing for the conservation of natural resources.

The proposed VTS-C INRMP includes strategies that, when implemented, would ensure long-term sustainability of the natural resources on which the TNARNG depends for training. Implementation of land management practices, as described in the INRMP, would improve the quality of existing lands and enhance land use potential. The management goals, objectives, and projects contained within the INRMP would allow for continuance and even improvements of the military training mission, foster increased cooperation with regulatory agencies, and would improve habitat and water quality throughout the site via implementation of BMPs and other measures outlined in the INRMP. Therefore, this action would have *major, long-term positive impacts* to VTS-C land use and management.

5.1.2 Effects of the No Action Alternative

Under the No Action alternative, current management policies and activities would continue with no further guidance from an up-to-date INRMP. Land management would be carried out as it was in the past; however, such efforts might not be conducted in the most appropriate or effective manner. Failure in these efforts could result in degradation of the natural resources of VTS-C over time and a decline in the ability of the land to support military training. As such, the No Action alternative could result in *long-term negative impacts* to VTS-C land use.

5.2 AIR QUALITY

5.2.1 Effects of the Proposed Action

The only action in the natural resources management program that could impact air quality is prescribed burning. Prescribed burning has been identified in the INRMP as a management practice for the improvement of training conditions, control of wildfire, and for experimentation in the regeneration of hardwood forest stands. The major effects of smoke on air quality are visibility reduction and respiratory impairment near the fire due to particulates. Smoke can impair general air quality in populated areas downwind from extensive burning.

Catoosa County is in a nonattainment area for air quality. Open burning restrictions do not apply to prescribed burning of forests and grasslands; however, care should be taken to minimize the influence of VTS-C burning on regional air quality. All prescribed burning would be conducted in accordance with the TNARNG prescribed burn plan and would utilize the smoke management guidelines contained therein. Appropriate smoke management and careful timing of burns to avoid the worst nonattainment periods will mitigate impacts by reducing smoke emissions, ensuring burning occurs during atmospheric conditions that favor smoke dispersion, and minimizing emissions during high-pollution seasons.

Prescribed burning in accordance with the VTS-C INRMP may have short-term, minor effects on air, but mitigation should ensure there are *no significant impacts* on air quality.

5.2.2 Effects of the No Action Alternative

Prescribed burning has been taking place for the maintenance of training area conditions under the minimal guidance of the 2001 INRMP. Burns are conducted with the assistance of the Georgia Division of Forestry. Under the No Action alternative, this practice will continue and there will be *no changes* in the impacts on air quality.

5.3 NOISE

5.3.1 Effects of the Proposed Action

No noticeable effects to area noise environments would be expected from implementation of the Proposed Action. The primary concern regarding noise impacts relates to increases in sound levels that exceed acceptable land use compatibility guidelines and public tolerance. The principle sources of problem noise on the VTS-C are military training activities. As the Proposed Action does not change these military activities, it would have little impact on noise levels on the training site.

Certain actions (e.g., timber harvest) would result in temporary increases in noise levels, but those increases would be well below the typical existing noise levels from military training. Therefore, implementing the Proposed Action should have *no significant impact* on the noise environment.

5.3.2 Effects of the No Action Alternative

Under the No Action Alternative there would be *no effects* to the noise environment. Noise from military activities would remain at present levels.

5.4 GEOLOGY AND SOILS

5.4.1 Effects of the Proposed Action

Implementation of the Proposed Action will have no effects on the geology of the area, as no major changes or management programs regarding geological resources are proposed.

As a part of the natural resources management proposed, the TNARNG would take a proactive approach to prevent soil erosion and to repair existing erosion in an appropriate and timely manner. Actions which would benefit soil resources on the training site include cultivating a thorough understanding of and the appropriate use of BMPs for all soil-disturbing activities; implementing regular surveys and the development of a reporting and planning system for identifying erosion problems and their appropriate restoration; enforcing streamside management zones for protection of riparian areas; and stabilizing creek banks, especially along Tiger Creek, to minimize undercutting, soil loss, and sedimentation.

Certain actions proposed within the INRMP have the potential to cause detrimental effects on training site soils (e.g., timber harvest skid trails, development of fire breaks, and increased runoff due to vegetation thinning through timber harvest or invasive pest plant control). However, the adverse effects of such actions would be mitigated by the appropriate use of BMPs as detailed in the INRMP.

Overall, the implementation of the proposed action would have a *long-term beneficial impact* on the soils of the training site, as implementing an effective soil conservation and erosion control program would reduce soil loss through the erosion process.

5.4.2 Effects of the No Action Alternative

Continuation of current management under the No Action alternative would have no effects on the geology of the site.

Under the No Action alternative, soil protection and rehabilitation measures to minimize soil erosion would still occur. Soil damage during training missions could be expected to continue at its present level, and soil damaged areas created during training missions would continue to be repaired as needed. However, current management strategies include reacting to erosion problems after they occur, rather than preemptively managing the soil resources to prevent impacts or minimize the extent of unavoidable impacts. Without the guidance and training provided for in the revised INRMP, erosion control and repair actions would follow old guidelines and utilize traditional methods which may not be the most appropriate for all circumstances. This would result in continuing soil loss through the erosion process and *minor, long-term negative impacts* to soils from the No Action alternative.

5.5 WATER RESOURCES

5.5.1 Effects of the Proposed Action

There could be some minor, temporary negative impacts to water resources from implementation of the Proposed Action: logging activities, streambank restoration, and beaver dam removal may release some sediment at time of action, although they will be managed with BMPs. In particular, removal of beaver dams should be done incrementally to minimize the sediment load increase and allow a more gradual return of open flow regimes.

However, the overall effects on water resources and water quality would be positive. The enforcement and protection of streamside management zones will intercept sediment, fertilizer, pest control chemical residue, and other pollutants transported overland toward the creek system. Maintenance of the forest cover within these streamside management zones will also preserve a natural temperature regime in the surface waters. Stabilization of creek banks, especially along Tiger Creek, will eliminate sediment loads from bank undercutting and slumping. The variety of erosion control actions, discussed above, will lessen the danger of sedimentation.

Implementation of the proposed action should have a *long-term, beneficial impact* on water resources.

5.5.2 Effects of the No Action Alternative

Under the No Action Alternative, wetlands and riparian areas would continue to be protected by the current standards of avoidance. This prevents significant damage to soils or water quality from current training activities, but does nothing to repair past damages or problems from non-training related causes. There would be no actions taken to repair the banks of Tiger Creek, a regular source of sediment. Under the guidance of the original INRMP, streamside management zones are little noted and training and other activities may occur too close to the streams' banks. While there would be no timber management actions, standard training and land management activities under the old guidance would potentially contribute significant sediment and other pollutants to the creeks over the long-term.

Implementation of the No action alternative would have a *long-term detrimental impact* on water resources.

5.6 BIOLOGICAL RESOURCES

5.6.1 Effects of the Proposed Action

Overall, implementation of the Proposed Action would result in a wide variety of actions that will improve the health and stability of the natural ecosystems on VTS-C. Biological resources including vegetation, wildlife, and rare, threatened, and endangered species would benefit from these activities.

Vegetation
The forest management portion of the proposed plan would result in a short-term decrease in forest biomass but an improvement in overall forest health. The biomass would be replaced readily as residual trees expanded into the newly created space. Control of invasive pest plants would also lead to an improvement in ecosystem health and a probable increase in biodiversity. Control of wild pig populations generally has a strong positive impact on herbaceous biodiversity.

Wildlife
The positive impacts of the Proposed Action on wildlife species are numerous. Examples include habitat improvement through the removal of non-native plant species, maintenance of habitat corridors along creeks within the SMZs, increased mast production typically following forest thinning, protection of ground nesting species via control of wild pig populations, and protection and improvement of aquatic habitat quality through maintenance of SMZs and creek bank stabilization efforts.

There could be some short term detrimental impacts resulting from certain actions proposed within the INRMP. There may be loss of individual animals to fire during prescribed burns. To minimize this threat, burns should not be conducted during breeding season for ground-nesting species and unburned patches of similar habitat should be left contiguous to burned areas to provide "escape zones" and short-term replacement habitat. There could be loss of habitat or habitat fragmentation resulting from timber

harvests. However, since the harvested areas will be less than 60 acres and distributed around the training site, existing habitat will be retained in close proximity to all harvests and the impact on wildlife will be minimal.

Beaver and wild pig will experience a negative impact through population control efforts. However, both species are considered pests in the region, and their loss is not considered detrimental to the environment as a whole.

Rare, Threatened, or Endangered Species

The federally listed large-flowered skullcap and gray bat will experience significant positive effects from the Proposed Action. Their habitats will be protected, and their populations will be monitored and further studied. Monitoring and study results may benefit not only those individuals present on VTS-C but the species across their entire ranges.

Overall, implementation of the Proposed Action would have *significant, long-term positive effects* on the biological resources of VTS-C.

5.6.2 Effects of the No Action Alternative

Under the No Action Alternative, existing processes would continue for managing biological resources. There would be no timber harvests; existing stands would age and lose value. In addition, in the absence of openings created by thinning, prescribed fire, or natural phenomenon, there is a strong tendency for eastern mixed oak forests to experience a change in species composition to more shade tolerant species such as red maple. This change has substantial impacts on the wildlife of the forest, as maple does not provide the food source that the oaks and hickories provide.

Prescribed fire use under the No Action Alternative would continue to be directed solely by training needs and may not be effective in controlling fuel loads. This may make the forests of the training site more subject to a serious wildfire which could cause substantial damage to vegetation, wildlife, and man-made structures and equipment.

Under the No Action Alternative, the original INRMP will be followed. This document has no plan for the management of threatened and endangered species. Regulatory requirements would be met by avoidance of the listed species and their habitats. However, there would be no projects to improve habitat for protected species or to further study their susceptibility to certain disturbances. In addition, there would be only patchy control of IPP and pest animals, and there would be no aquatic habitat improvement.

Overall, the No Action Alternative would have *long-term negative effects* on the biological resources of the VTS-C.

5.7 CULTURAL RESOURCES

5.7.1 Effects of the Proposed Action

Cultural resources would not be affected by the implementation of the Proposed Action. The VTS-C has been surveyed for historical and cultural resources. Identified cultural sites will be avoided by activities related to the implementation of the revised INRMP. Inadvertent discoveries would be handled in accordance with the TNARNG ICRMP for VTS-Catoosa.

There is concern over earth disturbance during timber harvest affecting unknown sites. However, all of the VTS-C has been subjected to a Phase I archaeological survey. Those few areas which are suspected of containing significant cultural resources will not be subject to timber management activities.

There should be *no significant impacts* on cultural resources as a result of the implementation of the Proposed Action.

5.7.2 Effects of the No Action Alternative

All cultural resources will continue to be protected. There will be *no effects* from the No Action Alternative.

5.8 SOCIOECONOMICS

5.8.1 Effects of the Proposed Action

Implementation of the Proposed Action should have minimal influence on the socioeconomic environment. Trends in population, housing, and income in the region would be expected to continue in their current patterns. There will, however, be a *minor positive effect* from timber sales proposed in the INRMP: 50% of the net proceeds of all DoD timber sales are returned to the county in which the site is located to support local schools and road funds.

5.8.2 Effects of the No Action Alternative

The No Action Alternative should have *no effect* on socioeconomics.

5.9 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

5.9.1 Effects of the Proposed Action

Implementation of the Proposed Action should not cause disproportionately high or adverse health effects that would impact minority or low-income populations in the communities surrounding the VTS-C. The Proposed Action should have *no effect* on environmental justice.

5.9.2 Effects of the No Action Alternative

Implementation of the No Action Alternative should have *no effect* on environmental justice.

5.10 INFRASTRUCTURE

5.10.1 Effects of the Proposed Action

Logging and other land management activities proposed in the revised INRMP will result in small occasional, temporary increases in road use. This will be extremely minor relative to the typical military usage. There will be *no significant impacts* on infrastructure from implementation of the Proposed Action.

5.10.2 Effects of the No Action Alternative

Under the No Action Alternative, there will be no change to current land management. There should be *no effect* on infrastructure of the VTS-C.

5.11 HAZARDOUS AND TOXIC MATERIALS/WASTES

5.11.1 Effects of the Proposed Action

Implementation of the Proposed Action would result in *no significant effects* on hazardous and toxic materials/wastes. There may be a small increase in the use of herbicides on the site when the IPP control plan is implemented. These herbicides will be stored, handled, and disposed of in accordance with Federal and State law and the product label. No other hazardous or toxic materials will be involved in the implementation of the revised INRMP.

5.11.2 Effects of the No Action Alternative

The No Action Alternative will result in no changes to current pesticide handling and so there will be *no impact* on hazardous and toxic materials/wastes.

5.12 MITIGATION MEASURES

Mitigation typically involves elimination, minimization, or compensation for impacts if unavoidable. Implementation of an INRMP to manage the natural resources of the VTS-C is a positive action that has few adverse effects. The INRMP itself provides the guidance necessary to conduct a variety of activities with the minimum of impact; implementing the actions as they are prescribed in the INRMP will include all necessary mitigation measures. Below, these measures are reiterated for those actions which have some potential for detrimental impact.

Follow appropriate protocols and precautions for smoke management during prescribed burns to minimize impacts to air quality. Do not burn during the summer when pollutant levels from nearby Chattanooga are at their highest.

Use appropriate BMPs to minimize soil loss due to timber harvest, prescribed fire/fire break construction and maintenance, and other ground-disturbing activities. Schedule timber harvests, and any other ground-disturbing activity, when feasible, to avoid wet soils in order to minimize erosion and compaction effects from equipment access and moving logs.

Use appropriate BMPs to minimize stream sedimentation due to timber harvest, prescribed fire/fire break construction and maintenance, stream bank restoration, beaver dam removal, or other ground disturbing activities. Remove beaver dams incrementally to minimize increases in sediment load at any given time.

Provide wildlife “escape zones” of unburned or unharvested habitat contiguous to prescribed fire areas or timber harvests.

Avoid archaeological sites with all actions and follow ICRMP standard operating procedures in case of any inadvertent find.

5.13 CUMULATIVE EFFECTS

Cumulative impacts are those which “result from the incremental impact of the proposed actions when added to other past, present, and reasonably foreseeable future actions, without regard to the agency (federal or non-federal) or individual who undertakes such other actions” (40 CFR 1508.7).

5.13.1 Effects of the Proposed Action

Implementation of the Proposed Action would provide *long-term positive cumulative effects*. Protection and management of natural resources within the training site would counter the habitat fragmentation and loss to be expected as a region currently on the outskirts of a metropolitan area is engulfed by sprawl. Appropriate ecosystem management in accordance with the INRMP will provide a "safe haven" for wildlife and rare species.

The restoration and rehabilitation efforts proposed in the Plan would repair the residual effects of past military training and earlier land use. The guidance provided in the INRMP will help to mitigate potential effects of future military training activities and training facility development.

Management under the INRMP would dovetail well with other regional environmental management plans such as the Tier 2 TMDL Implementation Plan for improving water quality in Tiger Creek in Catoosa and Whitfield Counties; the State of Georgia Comprehensive Wildlife Conservation Strategy; trout stream improvement efforts by GADNR and conservation partners North Georgia Trout Online and Georgia Trout Unlimited; and large-flowered skullcap protection by the US Fish and Wildlife Service, the Tennessee Valley Authority, and several non-governmental organizations including the North Chickamauga Creek Conservancy and The Nature Conservancy to protect and improve regional environmental conditions.

5.13.2 Effects of the No Action Alternative

Under the No Action Alternative, the original 2002 INRMP would continue to guide natural resources management on the VTS-C. This alternative would have *no significant cumulative effects*. The guidance provided in the old INRMP would minimize negative impacts from future training activities and facility development, and the natural environment of the training site would be protected from commercial development. However, there would be no new management actions to contribute to regional environmental improvement efforts.

6.0 COMPARISON OF ALTERNATIVES AND CONCLUSIONS

6.1 COMPARISON OF THE ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

Resource Area	Proposed Action	No Action
Land Use	Long-term positive	Long-term negative
Air Quality	Temporary, minor, negative	No effect
Noise	No effect	No effect
Geology and Soils	Long-term positive	Minor, long-term negative
Water Resources	Long-term positive	Long-term negative
Biological Resources	Long-term positive	Long-term negative
Cultural Resources	No effect	No effect
Socioeconomics	Minor positive	No effect
Environmental Justice	No effect	No effect
Infrastructure	No effect	No effect
Hazardous and Toxic Materials	No effect	No effect

6.2 CONCLUSIONS

Based on this analysis, the Proposed Action of implementing the revised INRMP for VTS-C is identified as the preferred alternative that would provide the greatest benefit to both the environment and the TNARNG training mission. Implementation of this preferred alternative is the most effective method to comply with the Sikes Act, Army Regulation 200-1, and DoD Instruction 4715.3. It also best enables the TNARNG to meet mission and training requirements at the VTS-C while enhancing the environment through integrated natural resources management.

Implementation of the Proposed Action would result in a comprehensive natural resources management strategy for the VTS-C. Implementation could result in some minor, temporary negative impacts; however, the overall effects would be of long-term benefit to the physical, cultural, and natural environment of the VTS-C. The projects and guidance from the revised INRMP, if implemented, would improve the overall training integration with natural resources management and would minimize potential negative environmental impacts from other TNARNG activities at VTS-C.

Upon completion of public review, a determination will be made about whether to prepare an EIS. If agency and/or public review does not reveal any significant impacts, a Final Environmental Assessment and a Finding of No Significant Impact will be prepared. Any public or agency comment received during the review period will be incorporated into the final document in an appropriate manner. If an EIS is required, this document would become the basis for scoping.

7.0 REFERENCES

AMEC Earth and Environmental, Inc. 2008. Biological Survey for Birds on the TNARNG Volunteer Training Sites. Nashville, TN.

Braun, E.L. 1950. Deciduous Forests of North America. MacMillan Publishing Company, New York, New York.

Dynamic Solutions, LLC. 2007. Final Biological Survey Report for Vegetation Community Survey at Tennessee Army National Guard Volunteer Training Site – Catoosa, Catoosa County, Georgia. Knoxville, TN.

Georgia Wildlife Resources Division. 2012a. Rare Elements of Catoosa County. Georgia Department of Natural Resources, Wildlife Resources Division. Available at: http://georgiawildlife.com/sites/default/files/uploads/wildlife/nongame/text/html/cnty_eos/catoosa.html. Accessed August 2012.

Georgia Wildlife Resources Divison. 2012b. Special Concern Animal Species in Georgia. Georgia Department of Natural Resources, Wildlife Resources Divison. Available at: http://georgiawildlife.com/sites/default/files/uploads/wildlife/nongame/text/html/et_lists/span.html. Accessed August 2012.

Hodler, T.W. and H. A. Schretter. 1986. The Atlas of Georgia. The Institute of Community and Area Development, the University of Georgia, Athens, Georgia.

Joss, J. 2006. Tier 2 TMDL Implementation Plan: Tiger Creek Watershed, Revision 1. Coosa Valley Regional Development Center.

Lawrence, K.S. 1993. Soil Survey of Catoosa County, Georgia. United States Department of Agriculture, Soil Conservation Service in cooperation with the University of Georgia, College of Agriculture, Agricultural Experiment Stations. Calhoun, Georgia.

McNab, W.H. and P.E. Avers. 1994. Ecological Subregions of the United States. WO-WSA-5. USDA Forest Service, Washington, DC.

Miller, J.H. 2003. Nonnative invasive plants of southern forests: a field guide for identification and control. USDA Forest Service Southern Research Station, General Technical Report SRS-62.

Minkin, Paul, William Packer, Steve Sutton, Dennis A. Gravatt, Michael Bishop, and Amy Bishop. 1998. Delineation of wetlands and other regulated waters – Catoosa Training Site. Report from U.S. Army Engineer Waterways Experiment Station. USACE-WES-ER-W. 30 September 1998.

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at: http://www.natureserve.org/explorer. Accessed August 2012.

Science Applications International Corporation (SAIC). 1998a. Natural Resource Aquatic Survey at the Catoosa Training Site, Tunnel Hill, Georgia. Oak Ridge, Tennessee.

Science Applications International Corporation (SAIC). 1998b. Phase II Natual Resource Terrestrial Survey Final Report, Catoosa Training Site, Tunnel Hill, Georgia. Oak Ridge, Tennessee.

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

URS and Ecotech. 2007. Biological survey for bats at Volunteer Training Site- Catoosa Tennessee Army National Guard. Franklin, Tennessee.

USACHPPM. 2006. Tennessee Army National Guard Statewide Operational Noise Management Plan. Operational Noise Program, Directorate of Environmental Health Engineering, U.S. Army Center for Health Promotion and Preventive Medicine, Aberdeen Proving Ground, Maryland.

U.S. Census Bureau. 2012. State and County QuickFacts. http://quickfacts.census.gov/qfd/states/13/13047.html. Accessed July 2012.

U.S.D.A. Economic Research Service. 2012. County-Level unemployment and median household income for Georgia. http://www.ers.usda.gov/data-products/county-level-data-sets/unemployment.aspx. Accessed July 2012.

USDA, NRCS. 2007. The PLANTS Database (http://plants.usda.gov, 10 July 2007). National Plant Data Center, Baton Rouge, Louisiana 70874-4490 USA.

USDA, SCS. 1993. Soil survey of Catoosa County, Georgia. 159 pp. Soil Conservation Service and The University of Georgia, College of Agriculture, Agricultural Experiment Station.

US Environmental Protection Agency (US EPA). 2007a. The Green Book, Nonattainment Areas for Criteria Pollutants. Available at: http://www.epa.gov/air/oaqps/greenbk/index.html. Accessed September 2007.

US EPA. 2007b. Middle Tennessee-Chickamauga Watershed Profile. http://iaspub.epa.gov/surf/huc.cfm?huc_code=0602001. Accessed February 2007.

US Fish and Wildlife Service. 2012. Species by County Report for Catoosa County, GA. http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=13047. Accessed August 2012.

U.S. Geological Survey (USGS). 1983. Ringgold, Ga.-Tenn. Quadrangle, 7.5-minute topographic map.

8.0 LIST OF PREPARERS

This EA has been prepared by the staff of the TNARNG Environmental Office. The individuals who contributed to the preparation of this document include:

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9.0 AGENCIES AND INDIVIDUALS CONSULTED

The agencies listed below were contacted during the development of the proposed INRMP and EA:

U.S. Fish and Wildlife Service
Athens Field Office
James Rickard, Biologist

Georgia Department of Natural Resources
Wildlife Resources Division
Nongame Conservation Section
Tom Patrick, Biologist

10.0 AGENCY REVIEW

In addition to extensive communication with the agencies listed in Section 9.0 during the development of the revised INRMP, the following agencies and organizations were notified directly of the availability of

the revised INRMP and EA for the initial public review and the FNSI review. Copies of the form letters sent out for this purpose can be found in Agency Correspondence, Appendix C of the INRMP. There were no comments received.

Organization	**POC**	**Address**
US Army Corps of Engineers, Mobile District		PO Box 2288 Mobile, AL 36628-0001
US Army Corps of Engineers, Savannah District		PO Box 889 Savannah, Georgia 31402
US Environmental Protection Agency, Region 4		Sam Nunn Atlanta Federal Center 61 Forsyth Street, SW Atlanta, Georgia 30303
US Fish and Wildlife Service, Athens Field Office	James Rickard, Biologist	West Park Center 105 West Park Drive, Suite D Athens, Georgia 30606
US Forest Service, Southern Region		1720 Peachtree Road, NW Atlanta, Georgia 30309
Natural Resources Conservation Service	James E. Tillman, State Conservationist	355 East Hancock Ave. Stop Number 200 Athens, Georgia 30601
Georgia Department of Natural Resources, Environmental Protection Division		2 Martin Luther King Jr. Drive Suite 1152, East Tower Atlanta, Georgia 30334
Georgia Department of Natural Resources, Historic Preservation Division	Ray Luce, SHPO	34 Peachtreee Street, NW Suite 1600 Atlanta, Georgia 30303
Georgia Department of Natural Resources, Wildlife Resources Division	Trina Morris, Wildlife Biologist	2117 US Highway 278 SE Social Circle, Georgia 30025
Georgia Forestry Commission		3086 Martha Berry Highway NE Rome, Georgia 30165
Absentee Shawnee Tribe of Oklahoma	Scott Miller, Governor	2025 S. Gordon Cooper Shawnee, OK 74801
Alabama-Coushatta Tribe of Texas	Ronnie Thomas, Chairman	571 State Park Road 56 Livingston, Texas 77351
Alabama-Quassarte Tribal Town	Tarpie Yargee, Chief	PO Box 187 Wetumka, Oklahoma 74883
Cherokee Nation	Chad Smith, Principal Chief	PO Box 948 Tahlequah, Oklahoma 74465
Chickasaw Nation	Bill Anoatubby, Governor	PO Box 1548 Ada, Oklahoma 74820
Choctaw Nation of Oklahoma	Gregory E. Pyle, Chief	PO Drawer 1210 Durant, Oklahoma 74702
Coushatta Tribe of Louisiana	Kevin Sickey, Chairman	PO Box 818 Elton, Louisiana 70532
Eastern Band of Cherokee Indians	Michelle Hicks, Principal Chief	PO Box 455 Cherokee, North Carolina 28719
Eastern Shawnee Tribe of	Glenna J. Wallace, Chief	PO Box 350

Organization	POC	Address
Oklahoma		Seneca, Missouri 64865
Jena Band of Choctaw	Christine Norris, Chief	PO Box 14 Jena, Louisiana 71342
Kialegee Tribal Town	Evelyn Bucktrot, Mekko	PO Box 332 Wetumka, Oklahoma 74883
Mississippi Band of Choctaw Indians	Phillip Martin, Chief	PO Box 6010, Choctaw Branch Choctaw, Mississippi 39350
Muscogee (Creek) Nation	A.D. Ellis, Principal Chief	PO Box 580 Okmulgee, Oklahoma 74447
Poarch Band of Creek Indians	Buford Rolon, Chairman	5811 Jack Springs Road Atmore, Alabama 36502
Quapaw Tribe of Oklahoma	John Berrey, Chairman	PO Box 765 Quapaw, Oklahoma 74363
Seminole Nation of Oklahoma	Kelly Haney, Chief	PO Box 1498 Wewoka, Oklahoma 74884
Seminole Tribe of Florida	Mitchell Cypress, Chairman	6300 Stirling Road Hollywood, Florida 33024
Thophthlocco Tribal Town	Vernon Yarholar, Mekko	PO Box 188 Okemah, OK 74859
Tunica-Biloxi Tribe of Louisiana	Earl Barbry, Sr., Chairman	PO Box 1589 Marksville, LA 71351
United Keetoowah Band of Cherokee Indians in Oklahoma	George Wickliffe, Chief	PO Box 746 Tahlequah, OK 74465

11.0 PUBLIC REVIEW

This Environmental Assessment was submitted for a public review period from 29 January 2010 to 2 March 2010 with notification in the Catoosa County News. Although the document was present at the library in early December 2009, complications with the publication of the notice resulted in a delay of the review period to February. No public comments were received.

The Environmental Assessment and Finding of No Significant Impact were submitted for a public review period from 27 April to 27 May 2012 with notification in the Catoosa County News. The document was available at the Catoosa County Library as well as on the Tennessee Military Department's webpage. No public comments were received.

APPENDIX B

Finding of No Significant Impact (FNSI)
Revised Integrated Natural Resources Management Plan (INRMP)
and Environmental Assessment (EA) for
Volunteer Training Site – Catoosa
in Catoosa County, Georgia

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DRAFT FINDING OF NO SIGNIFICANT IMPACT (FNSI) FOR IMPLEMENTATION OF THE REVISED INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN AT VOLUNTEER TRAINING SITE - CATOOSA

Introduction

The Tennessee Army National Guard (TNARNG) has prepared an Environmental Assessment (EA) that evaluates and analyzes the potential environmental effects of implementing the revised Integrated Natural Resources Management Plan (INRMP) for the Volunteer Training Site – Catoosa (VTS-C) in Catoosa County, Georgia. The revised INRMP is the result of a review for operation and effect of the original VTS-C INRMP conducted jointly by the TNARNG, the US Fish and Wildlife Service, and the Georgia Division of Natural Resources. The EA was prepared in accordance with the National Environmental Policy Act (NEPA) (42 USC § 4321 to 4370e), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (CEQ Regulations, 40 CFR Parts 1500-1508), and *Environmental Analysis of Army Actions* (32 CFR 651).

1. Description of Proposed Action and Alternatives

Proposed Action.

The TNARNG proposes to implement the revised INRMP. The purpose of the Proposed Action is to ensure no general loss in the capability of the VTS-C to support the military training mission of the TNARNG by providing for long-term management of the site's natural resources. Implementation of the INRMP will provide for the conservation, rehabilitation, and sustainable use of natural resources on the installation, in accordance with the Sikes Act (as amended) and Army Regulations (AR) 200-1.

The Revised INRMP differs significantly from the initial INRMP (implemented in 2001) by including a detailed forest management program, a wildland fire management plan, and a rare species management plan to ensure the protection of two federally listed species found on the VTS-C, the large-flowered skullcap and the gray bat. The Proposed Action will enable mission accomplishment while maintaining compliance with applicable laws and regulation.

Alternatives Considered.

Under the No Action Alternative, the 2001 INRMP would continue to provide guidance for natural resources management on VTS-C. However, there would be no provision for timber management and harvest activities, and guidance on wildland fire control would be minimal. Protection of the endangered species would be piecemeal, and the lack of coordinated management and mitigation for these species could lead to limitations on the military training mission.

The overall goal is to provide for effective natural resources management on the VTS-C. The revised INRMP is an integrated document designed to meet regulatory requirements and provide an effective management program. Any partial implementation option would be ineffectual and other alternatives would not be beneficial to the VTS-C. Therefore, no other Alternative Actions were considered.

2. Environmental Analysis

The EA assesses potential effects on land use, air quality, noise, water resources, geology and soils, biological resources, cultural resources, hazardous materials and hazardous wastes, and socioeconomics (including environmental justice and protection of children). Based upon the analysis contained in the EA, TNARNG has determined that implementation of the revised INRMP would not have an impact on noise, cultural resources, environmental justice, infrastructure, or hazardous materials and wastes. The implementation of the revised INRMP could have a minor, temporary adverse impact on air quality through the increased use of prescribed burning for fuel control and vegetation management. The Proposed Action would have a minor positive effect on socioeconomics and long-term beneficial effects on land use, geology and soils, water resources, and biological resources at VTS-C.

Based upon the analysis contained in the EA, it has been determined that the known and potential impacts of the Proposed Action on the physical, cultural, and natural environment will be of a positive nature. Implementation of the TNARNG's revised INRMP for the VTS-C will result in the effective management of natural resources at the training site. No mitigation measures will be required for implementation of the INRMP at VTS-C.

Mitigation. No mitigation measures will be necessary to reduce any adverse environmental effects to below significant levels.

3. Regulations

The Proposed Action will not violate NEPA, the CEQ Regulations, 32 CFR 651, or any other Federal, State, or local environmental regulations.

4. Commitment to Implementation

The National Guard Bureau (NGB) and TNARNG affirm their commitment to implement this EA in accordance with NEPA. Implementation of the Proposed Action is dependent on funding. The TNARNG and the NGB's Environmental Programs, Training, and Installations Divisions will ensure that adequate funds are requested in future years' budgets to achieve the goals and objectives set forth in this EA.

5. Public Review and Comment

The draft INRMP and EA were made available for public review and comment from 29 January 2010 to 2 March 2010. No comments were received.

The final INRMP and EA and the draft FNSI will be available for public review and comment for 30 days. Copies may be reviewed at the Catoosa County Library, Ringgold, Georgia, or on-line at http://www.tnmilitary.org/Environmental.html. Copies may also be obtained by mail, and written comments may be submitted to:

Laura Lecher
Tennessee Army National Guard
JFHQ-TN-ENV
3041 Sidco Drive
Nashville, Tenessee 37204

For further information, please contact Ms. Lecher at 731-222-5321 or Laura.Lecher@tn.gov .

6. Draft Finding of No Significant Impact (FNSI)

After careful review of the EA, I have concluded that implementation of the Proposed Action would not generate significant controversy or have a significant impact on the quality of the human or natural environment. Per 32 CFR Part 651, the Revised INRMP, Final EA and draft FNSI will be made available for a 15-day public review and comment period. Once any public comments have been addressed and if a determination is made that the proposed action will have no significant impacts, the FNSI will be signed and the Proposed Action will be implemented. This analysis fulfills the requirements of NEPA and the CEQ Regulations. An Environmental Impact Statement will not be prepared, and the National Guard Bureau will issue this Finding of No Significant Impact.

Date

COL MICHAEL C. AHN
Chief, Environmental Programs Division
Army National Guard

APPENDIX C

Agency Correspondence

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

October 9, 2017

Donald W. Imm
State Supervisor/Project Leader
U.S. Fish and Wildlife Service
Georgia Ecological Services
105 West Park Drive STE D
Athens, GA 30606

Mr. Imm,

The Tennessee Army National Guard (TNARNG) is in the process of revising and updating the Integrated Natural Resource Management Plan (INRMP) for Volunteer Training Site - Catoosa (VTS-C), located in Catoosa County, Georgia. The Sikes Act and Army Regulation 200-1 require TNARNG to develop an INRMP for each of its Training sites. The INRMP must be revised every five years to ensure it remains current and relevant to managing the site under planed and existing uses and conditions. The original VTS-C INRMP covered the period 2002-2006. This third revision of the INRMP will cover the years 2018-2022. We hope to have the INRMP completed by December 31, 2017.

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

The VTS-C is located at the center of the Ringgold quadrangle. The 1,627 acre facility is approximately two miles east of Ringgold, Georgia, and 20 miles south of Chattanooga, Tennessee. The attached INRMP includes maps showing the geographic location, boundaries, and topography of the facility. The property is licensed from the Army Corps of Engineers. Tiger Creek runs through the southern half of the facility, and Broom Branch bisects the northern portion. There are known populations of the federally threatened large-flowered skullcap (*Scutellaria montana*), federally endangered gray bat (*Myotis grisescens*), federally threatened northern long-eared bat (*M. septentrionalis*), and state threatened Chickamauga crayfish (*Cambarus extraneus*). Protections for the large-flowered skullcap and gray bat were incorporated into the previous iteration of the INRMP.

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

The primary functional changes to the INRMP include the addition of the Northern Long-Eared Bat and Chickamauga Crayfish to the Rare, Threatened, and Endangered Species Management Plan (Annex 1). These additions do not however represent significant changes to management of the site, as the necessary actions to protect and enhance their populations are already being implemented through protections in place for other resources and species, and ongoing compliance with the NLEB Final 4(d) rule. We have included information on allowing light dormant season underburns to go through large-flowered skullcap management areas in situations other than strictly specific experiments, already included in the existing INRMP, as we discussed in our meeting on 10/12/2016. We have added sections in Chapter 4 (Resource Management) addressing adaptation to climate change and pollinators.

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

We hope to receive your comments by November 4th, 2017. Please contact me with any questions or comments at (615) 313-0945 or brian.e.knapp.nfg@mail.mil. Your participation, insights, and comments in the development of the VTS-C INRMP are greatly appreciated.

Sincerely,

Brian E Knapp

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

Enclosure

MILITARY DEPARTMENT OF TENNESSEE
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October 9, 2017

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Environmental Review Coordinator
&
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Program Manager

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Social Circle, GA 30025

Ms. Yellin & Mr. Albanese,

The Tennessee Army National Guard (TNARNG) is in the process of revising and updating the Integrated Natural Resource Management Plan (INRMP) for Volunteer Training Site - Catoosa (VTS-C), located in Catoosa County, Georgia. The Sikes Act and Army Regulation 200-1 require TNARNG to develop an INRMP for each of its Training sites. The INRMP must be revised every five years to ensure it remains current and relevant to managing the site under planed and existing uses and conditions. The original VTS-C INRMP covered the period 2002-2006. This third revision of the INRMP will cover the years 2018-2022. We hope to have the INRMP completed by December 31, 2017.

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

The VTS-C is located at the center of the Ringgold quadrangle. The 1,627 acre facility is approximately two miles east of Ringgold, Georgia, and 20 miles south of Chattanooga, Tennessee. The attached INRMP includes maps showing the geographic location, boundaries, and topography of the facility. The property is licensed from the Army Corps of Engineers. Tiger Creek runs through the southern half of the facility, and Broom Branch bisects the northern portion. There are known populations of the federally threatened large-flowered skullcap (*Scutellaria montana*), federally endangered gray bat (*Myotis grisescens*), federally threatened northern long-eared bat (*M. septentrionalis*), and state threatened Chickamauga crayfish (*Cambarus extraneus*). Protections for the large-flowered skullcap and gray bat were incorporated into the previous iteration of the INRMP.

There have not been any significant changes in the intended use of VTS-C or in existing conditions. The plan has been updated to incorporate information from resource area, species group, and individual species surveys

conducted since the previous INRMP revision. The draft also updates information on existing facilities. Further, there have been some formatting changes to make the document more user-friendly and functional. There have been a few minor functional changes to the document.

The primary functional changes to the INRMP include the addition of the Northern Long-Eared Bat and Chickamauga Crayfish to the Rare, Threatened, and Endangered Species Management Plan (Annex 1). These additions do not however represent significant changes to management of the site, as the necessary actions to protect and enhance their populations are already being implemented through protections in place for other resources and species, and ongoing compliance with the NLEB Final 4(d) rule. We have included information on allowing light dormant season underburns to go through large-flowered skullcap management areas in situations other than strictly specific experiments, already included in the existing INRMP. Permission for allowing light dormant season underburns was received from USFWS in a 10/12/2016 meeting. We have added sections in Chapter 4 (Resource Management) addressing adaptation to climate change and pollinators.

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

We hope to receive your comments by November 4th, 2017. Please contact me with any questions or comments at (615) 313-0945 or brian.e.knapp.nfg@mail.mil. Your participation, insights, and comments in the development of the VTS-C INRMP are greatly appreciated.

Sincerely,

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

Attachment

United States Department of the Interior

Fish and Wildlife Service

105 West Park Drive, Suite D
Athens, Georgia 30606
706-613-9493 Fax: 706-613-6059

West Georgia Sub Office
P.O. Box 52560
Ft. Benning, Georgia 31995-2560
706-544-6428 Fax: 706-544-6419

Coastal Sub Office
4980 Wildlife Drive
Townsend, Georgia 31331
912-832-8739 Fax: 912-832-8744

January 12, 2018

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

Re: FWS Log NG-18-27-CATO

Dear Mr. Knapp:

Thank you for your October 9, 2017, letter regarding the Tennessee Army National Guard's revision of the Integrated Natural Resource Management Plan (INRMP) for Volunteer Training Site-Catoosa (VTS-C). This third revision, which will cover the years 2018-2022, contains no significant changes in VTS-C's intended use or existing conditions. Primary functional changes are:

- Addition of the Northern long-eared bat (*Myotis septentrionalis*), including all measures in the species' 4(d) rule and Fish and Wildlife Service (Service) guidance, to the Rare, Threatened, and Endangered Species Management Plan (RTE).
- Addition of the petitioned Chickamauga crayfish (*Cambarus extraneus*) to the RTE.
- Including use of light dormant season underburns in management areas for large-flowered skullcap (*Scutellaria montana*), an action that was coordinated with me in October 2016 .
- Addition of new INRMP sections on pollinators and climate change.

The Service strongly supports these revisions. In addition, we recommend that you consider including the tricolored bat (*Perimyotis subflavus*) in this INRMP revision. The Service was petitioned to list this species in June 2016 and published notice in the Federal Register December 20, 2017, that the petition presented substantial information indicating the petitioned actions may be warranted. This 90-day finding does not constitute a status review for the tricolored bat, nor does it mean that the Service, when it completes the ongoing 12-month finding will determine listing the tricolored bat as endangered or threatened is appropriate. We recommend the bat's inclusion since measures that would conserve this species already are being implemented for other rare bat species.

We appreciate the opportunity to comment on the revision. Please contact staff biologist Robin Goodloe at 706-613-9493 X221 if you have questions or require additional information.

Sincerely,

Donald W. Imm, Ph.D.
Field Supervisor

From: Yellin, Anna
To: Knapp, Brian E NFG NG TNARNG (US)
Subject: [Non-DoD Source] Signed Document page
Date: Tuesday, January 23, 2018 1:59:59 PM
Attachments: Complete Draft Catoosa INRMP 2017.pdf
20180123131515.pdf

Hi Brian-

I'm forwarding the signature page of the Catoosa INRMP 2017 as well as the document that we reviewed. John Ambrose, Nongame Chief, signed it. It was reviewed by a few other biologists, who focused on specific areas. These biologists were Tom Patrick (plants), Jason Wisniewski (mussels/ fish), and Trina Morris (bats). We all are very happy with the management activities and surveys that you are conducting.

Please let me know if I can be of additional assistance-

Thank you for your patience!
Anna

Anna Yellin
Environmental Review Coordinator, Nongame Conservation

Wildlife Resources Division < Caution-http://georgiawildlife.com/ >
(706) 557-3283 | M: (678) 459-8393

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GEORGIA DEPARTMENT OF NATURAL RESOURCES

APPENDIX D

Public Comment

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First Public Review Period:

The Revised Integrated Natural Resources Management Plan for the Volunteer Training Site – Catoosa of the Tennessee Army National Guard and its associated Environmental Assessment were made available via electronic access and a bound copy at the Catoosa County Public Library from 14 December 2009 until 2 March 2010. Interested agencies and American Indian Tribes were notified of the availability of the document via letter (see Appendix C, Agency Correspondence) or e-mail.

One comment was received from the representative of an American Indian Tribe; the comment and TNARNG's response are given below. The official public review period, as announced in the Catoosa County News, ran from 29 January 2010 to 2 March 2010. No public comments were received.

NOTIFICATION:

> ----- Original Message -----
> From: "Stokes, Mike CIV CTR" <william.m.stokes@us.army.mil>
> To: <kkaniatobe@astribe.com>; <Actribe.doc@actribe.org>; <aqttcultural@yahoo.com>; <rallen@cherokee.org>; <gingy.nail@chickasaw.net>; <tcole@choctawnation.com>; <lovelin@coushattatribela.org>; <lthompson@coushatatribela.org>; <russtown@nc-cherokee.com>; <estochief@hotmail.com>; <radushane@gmail.com>; <chief@jenachoctaw.org>; <Evelyn_bucktrot@yahoo.com>; <kialegeetribal@yahoo.com>; <kcarleton@choctaw.org>; <preservation@muscogeenation-nsn.gov>; <cultural@ocevnet.org>; <rothrower@hotmail.com>; <dheghia@earthlink.net>; <Executive1@seminolenation.com>; <lupchurch@seminolenation.com>; <wsteele@samtribe.com>; <chascoleman@prodigy.net>; <pfoster@tunica.org>; <earlii@tunica.org>; <clocust@unitedkeetowahband.org>; <lstopp@ukb.org>
> Cc: "Laura Lecher" <Laura.Lecher@tn.gov>; <michelle.volkema@dnr.state.ga.us>
> Sent: Tuesday, December 22, 2009 11:13 AM
> Subject: TN Army National Guard - INFORMAL Section 106 Consultation
>
> Dear Honored Tribes ~
>
> The TNARNG has completed the Final Draft of the Integrated Natural Resources Management Plan (INRMP) for the Volunteer Training Site-Catoosa (VTS-C) in Catoosa County, Georgia. This is a full revision of the original INRMP, dated 2001, for this training site, with additional significant information on endangered species management, forest management activities, wild land fire management, and invasive species control.
>
> In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended in 1980 and l992, the TNARNG requests your review of the Final Draft of the 2010-2014 INRMP. This document is available for review through January 24, 2010 on our new document review link at www.tnmilitary.org.

Go to www.tnmilitary.org
Click on the Green Environmental link at left side of screen
Click on the Natural Resources link to view the INRMP

If you have questions or feedback concerning the INRMP document, please contact Ms. Laura Lecher, Natural Resources Manager at 731-783-3975 or Laura.Lecher@tn.gov.

Please contact me should you have any questions and concerns with our new format.

Best wishes for a holiday season filled with good health, happiness, and the love of family & friends.

Sincerely,

Mike Stokes, CTR, BWM, Inc.
Cultural Resources Manager
TN Army National Guard (TNARNG)
3041 Sidco Drive, POB 41502
Nashville TN 37204-1502
615-313-0794 (office)
615-313-0766 (fax)

COMMENT:

From: "charles coleman" <chascoleman@prodigy.net>
To: "Stokes, Mike CIV CTR" <william.m.stokes@us.army.mil>, <kkaniatobe@astri...
Date: 12/28/2009 9:14 AM
Subject: Re: TN Army National Guard - INFORMAL Section 106 Consultation

CC: "Laura Lecher" <Laura.Lecher@tn.gov>, <michelle.volkema@dnr.state.ga.us>
Seasons Greetings to All!

Well since I was snowed in I had time to review the Executive Summary and scan the other 300 plus pages.
I am OK with the format.
Thlopthlocco does not need a list of plants but some tribes have requested a list in the past.
I would like a copy of other tribes coments.

Charles Coleman
Thlopthlocco Tribal Town

TNARNG RESPONSE:

From: Laura Lecher

To: charles coleman
Date: 1/5/2010 9:06 AM
Subject: Re: TN Army National Guard - INFORMAL Section 106 Consultation

CC: Mike CIV CTR Stokes

Mr. Coleman,

Sorry for my slow response. The list of plants found on site is in Appendix F of the draft document. All public comments will become a part of the final document which will be available electronically (download or cd). I'll be happy to compile all tribe comments and send them out after the review period, as well, if you would like.

Thank you for your comments, and please let me know if you have any further suggestions or concerns.

Hope the snow wasn't too deep,
Laura

Laura P.Lecher
Natural Resources Manager, TNARNG
731-783-3975 / fax 731-783-3901
laura.lecher@tn.gov

Final Public Review and FNSI Review:

The final version of the Integrated Natural Resources Management Plan for the Volunteer Training Site – Catoosa of the Tennessee Army National Guard and its associated Environmental Assessment and Finding of No Significant Impact were made available for the final public review period (FNSI review) from 27 April 2012 until 27 May 2012. Notice was published in the Catoosa County News. The document was accessible via the TNARNG public webpage and a bound copy was located at the Catoosa County Public Library.

Interested agencies and American Indian Tribes were also notified of the availability of the final document via letter (see Appendix C, Agency Correspondence) or e-mail.

No public comments were received.

APPENDIX E

Annotated Summary of Key Legislation Related to Natural Resources Management

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United States Code

Sikes Act, as amended; *16 U.S.C. 670(a) et seq.*	Authorizes military installations to carry out programs for the conservation and rehabilitation of natural resources. Requires preparation and implementation of Integrated Natural Resources Management Plans for all military installations in U.S. except those lacking significant natural resources.
National Environmental Policy Act of 1969 (NEPA), as amended; *P.L.91-190, 42 U.S.C. 4321 et seq.*	Requires Federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts to the environment.
Leases: Non-excess Property of Military Departments, 10 U.S.C. 2667, as amended	Authorizes DoD to lease to commercial enterprises Federal land that is not currently needed for Public use. Covers agricultural outleasing programs.
Federal Land Use Policy and Management Act, *43 U.S.C. 1701-1782*	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values; as well as to preserve and protect certain lands in their natural condition for fish and wildlife habitat. This act also requires consideration of commodity production such as timbering.
Clean Air Act, *42 U.S.C. 7401-7671q,* *July 14, 1955, as amended*	This Act, as amended, is known as the Clean Air Act of 1990. The amendments made in 1990 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country which do not meet Federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Federal Water Pollution Control Act (Clean Water Act), *33 U.S.C. 1251-1387*	The Clean Water Act is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Primary authority for the implementation and enforcement rests with the U.S. Environmental Protection Agency (USEPA).
Migratory Bird Treaty Act *16 U.S.C. 703-712*	The Migratory Bird Treaty Act implements various treaties and for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful.
Endangered Species Act of 1973, as amended; *P.L. 93-205, 16 U.S.C.1531 et seq.*	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no Federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The Endangered Species Act also requires consultation with the USFWS and the National Marine Fisheries Service and the preparation of a biological assessment when such species are present in an area that is affected by government activities.
National Historic Preservation Act; 16 U.S.C. 470 et seq.	Requires Federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the National Register), and protection of historical and cultural properties of significance.
Federal Noxious Weed Act of 1974; 7 U.S.C. 2801-2814	The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.
Sale of certain interests in land; logs; 10 U.S.C. 2665	Authorizes sale of forest products and reimbursement of the costs of management of forest resources.

Federal Insecticide, Fungicide, and Rodenticide Act, as amended (FIFRA);	Controls pesticide distribution, sale, and use. Requires licensing/certification for commercial applications and for sales of pesticides.
Archaeological and Historical Preservation Act of 1974; 16 U.S.C. 469 et seq.	Provides for the preservation of historical and archaeological data which might otherwise be lost or destroyed as a result of alteration of the terrain caused by any Federal construction project or federally licensed activity or program.
Archaeological Resources Protection Act of 1979; (16 U.S.C. 470 et seq.) 32 CFR 22 and 229	Protects archeological resources and sites on public lands and Indian lands.

Federal Public Laws and Executive Orders

National Defense Authorization Act of 1989, *Public Law (P.L.) 101-189;* *Volunteer Partnership Cost-Share Program*	Amends two acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, P.L. 101-511; *Legacy Resource Management Program*	Establishes a program for the stewardship of biological, geophysical, cultural, and historic resources on DoD lands.
Executive Order (EO) 11988, Floodplain Management	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state and Federal review agencies for any construction within a 100-year floodplain.
EO 11514, Protection and Enhancement of Environmental Quality	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	Requires any federal agency taking actions that have or are likely to have a measurable negative effect on migratory bird populations to develop and implement an MOU with the USFWS to promote conservation of migratory bird populations.
EO 11593, Protection and Enhancement of the Cultural Environment	All Federal agencies are required to locate, identify, and record all cultural and natural resources. Cultural resources include sites of archaeological, historical, or architectural significance. Natural resources include the presence of endangered species, critical habitat, and areas of special biological significance.
EO 11990, Protection of Wetlands	Each Agency shall take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.
EO 11987, Exotic Organisms	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters that they administer.
EO 12088, Federal Compliance With Pollution Control Standards.	This EO delegates responsibility to the head of each executive agency for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the Environmental Protection Agency authority to conduct reviews and inspections to monitor Federal facility compliance with pollution control standards.
EO 12898, Environmental Justice	This EO requires certain Federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.

EO 13112, Exotic and Invasive Species	This EO strives to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13045, Protection of Children from Environmental Health and Safety Risks	This EO makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. It also directs agencies to ensure that policies, programs, activities, and standards address such risks if identified.
EO 13007, Indian Sacred Sites	Directs protection of Indian sacred sites Federal lands and guarantees access to and ceremonial use of Indian sacred sites on Federal lands by Indian religious practioners.
EO 13175, Consultation and Coordination with Indian Tribal Governments	Establishes requirement of and process for Nation-to-Nation consultation with Indian tribal governments with regards to the development of Federal policies that have tribal implications.

DoD Policy, Directives and Instructions

DoD Directive 4700.4, Natural Resources Management Program	Requires that the ARNG implement and maintain a balanced and integrated program for the management of natural resources.
DoD Directive 4715.1, Environmental Security	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This directive also ensures that environmental factors are integrated into DoD decision-making processes that may impact the environment, and are given appropriate consideration along with other relevant factors.
DoD Annotated Policy on Indian Tribes and Alaska Natives	Establishes DoD American Indian and Alaska Native Policy for interacting and working with federally recognized American Indian and Alaska Native governments (hereinafter referred to as "tribes"). It defines: protected tribal resources, tribal rights, and Indian lands.
DoDI 4715.03, Environmental Conservation Program	Implements policy, assigns responsibility, and prescribes procedures under *DoD Directive* 4715.1 for the integrated management of natural and cultural resources on property under DoD control.

Army Instructions and Directives

AR 200-1, Environmental Protection and Enhancement	As of 28 August 2007, this document supersedes all previous iterations of AR 200-1, AR 200-3, AR 200-4, and AR 200-5. Provides policies, standards and procedures for the following resource areas: NEPA, Natural Resources Management, Cultural Resources Management, Natural Resource Damage Assessment (NRDA), Real Property Acquisition, Outgrant and Disposal Transactions, Environmental Agreements, Environmental Compliance Assessments, Environmental Quality Control Committee (EQCC), Army Environmental Training Program, Installation/State Environmental Training Plans, ITAM, and Pest Management Program
AR 350-19, The Army Sustainable Range Program (superceded AR 210-21)	Assigns responsibilities and provides policy and guidance for managing and operating U.S. Army ranges and training lands to support their long-term viability and utility to meet the National defense mission.
AR 350-4, Integrated Training Area Management (ITAM)	Sets forth the objectives, responsibilities and policies for the ITAM program. ITAM establishes procedures to achieve optimum, sustainable use of training lands by implementing a uniform land management program and includes inventorying and monitoring land condition,

	integrating training requirements with land carrying capacity, educating land users to minimize adverse impacts, and providing for training land rehabilitation and maintenance.
HQDA INRMP Policy Memorandum (21 March 1997), *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)*	Provides guidance to ensure that natural resource conservation measures and Army activities on mission land are integrated and are consistent with Federal stewardship requirements.

Official Code of Georgia Annotated

Georgia Water Quality Control Act; OCGA 12-5-20 *et seq.*	Charges the Environmental Protection Division of the Department of Natural Resources with responsibility for maintaining and regulating the quality and quantity of water resources within the state of Georgia.
Georgia Water Use Classifications and Water Quality Standards; Chap. 391-3-6-.03	Establishes water quality standards for the state of Georgia for all water use classifications.
Georgia Safe Drinking Water Act of 1977; OCGA 12-5-170 *et seq.*	Charges the Environmental Protection Division with establishing and maintaining a program to ensure adequate water of the highest quality for water-supply systems.
Comprehensive State-Wide Water Management Planning Act; OCGA 12-5-520 *et seq.*	Charges the Environmental Protection Division with development and implementation of a plan to manage water resources in a sustainable manner to support the state's economy, protect public health and natural systems, and to enhance the quality of life for all citizens.
Georgia Erosion and Sedimentation Act 0f 1975 (amended 2003); OCGA 12-7-1 *et seq.*	Sets policy for control of erosion and sedimentation and creates program for permitting of land-disturbing activities and penalties for violations.
Georgia Pesticide Control Act of 1976; OCGA 2-7-50 *et seq.*	Controls pesticide labeling, distribution, storage, transportation, and disposal of pesticides in the state of Georgia.
Georgia Hazardous Waste Management Act; OCGA 12-8-60 *et seq.*	Develops a comprehensive state-wide program for the management of hazardous wastes through the regulation of the generation, transportation, storage, treatment, and disposal of hazardous wastes.
Georgia Air Quality Act; OCGA 12-9-1 *et seq.*	Sets policy for control of air pollution and creates program for permitting, inspecting, and enforcing air quality regulations.
Rules of the Georgia Department of Natural Resources, Wildlife Resources Division 391-4-1 *et seq.*	Establishes rules and regulations for hunting, fishing, and protection of wildlife, both game and rare/unusual.
Conservation of Historic Areas; OCGA 12-3-50 *et seq.*	Charges the Department of Natural Resources, Office of the State Archaeologist, with protecting and promoting prehistoric and historic resources of the state.

APPENDIX F

Animal and Plant Species found on VTS-Catoosa

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PLANT SPECIES

Growth Form: F = fern G = grass/graminoid H = herb
S = shrub T = tree V = vine

Federal Status abbreviations:
LE = listed as endangered
LT = listed as threatened

State Status abbreviations:
E = state listed as endangered
T = state listed as threatened
R= Rare species
SC = Special Concern species

Scientific name in all capitals indicates species introduced to the U.S.; in bold indicates the species is included on the TN-EPPC 2004 list of Invasive Exotic Pest Plants in Tennessee.

Scientific Name	Common Name	Growth Form	Fed Status	GA Status
Adiantum pedatum	Maidenhair fern	F		
Asplenium platyneuron	Ebony spleenwort	F		
Asplenium rhizophyllum	Walking fern	F		
Athyrium filix-femina	Common ladyfern	F		
Botrychium sp.	Grapefern	F		
Botrychium virginianum	Rattlesnake fern	F		
Onoclea sensibilis	Sensitive fern	F		
Osmunda regalis	Royal fern	F		
Pellaea atropurpurea	Purple cliffbrake	F		
Phegopteris hexagonoptera	Broad beechfern	F		
Pleopeltis polypodioides ssp. Polypodioides	Resurrection fern	F		
Polypodium virginianum	Rockcap fern; rock polypody	F		
Polystichum acrostichoides	Christmas fern	F		
Pteridium aquilinum	Bracken fern	F		
Andropogon gerardii	Big bluestem	G		
Andropogon virginicus	Broomsedge	G		
Arundinaria gigantea	River cane	G		
Buchloe dactyloides	Buffalograss	G		
Chasmanthium latifolium	Indian woodoats	G		
Chasmanthium latifolium	River oats; indian woodoats	G		
CYNODON DACTYLON	Bermudagrass	G		
Dichanthelium boscii	Bosc's panicgrass	G		
Digitaria sanguinalis	Crabgrass	G		
Elymus hystrix	Eastern bottlebrush grass	G		
Festuca spp.	Fescue	G		
Juncus effusus	Common rush	G		
Leersia oryzoides	Rice cutgrass	G		
MICROSTEGIUM VIMINEUM	Nepalese browntop	G		

PHYLLOSTACHYS AUREA	Bamboo	G
SCHEDONORUS PHOENIX	Tall fescue	G
Scirpus cyperinus	Woolgrass	G
Scirpus validus	Soft-stem bulrush	G
SETARIA PUMILA ssp.PUMILA	Yellow foxtail	G
SETARIA VIRIDIS	Green foxtail	G
SORGHUM HALEPENSE	Johnson grass	G
Achillea millefolium	Yarrow	H
Actaea pachypoda	Baneberry	H
Allium canadense	Wild onion	H
ALLIUM VINEALE	Wild garlic	H
Ambrosia artemisiifolia	Annual ragweed	H
Ambrosia trifida	Great ragweed	H
Angelica triquinata	Filmy angelica	H
Antennaria plantaginifolia	Woman's tobacco	H
Antennaria solitaria	Singlehead pussytoes	H
Antennaria sp.	Pussytoes	H
Aplectrum hyemale	Puttyroot orchid	H
Apocynum cannabinum	Indianhemp	H
Arisaema dracontium	Green dragon	H
Arisaema triphyllum	Jack-in-the-pulpit	H
Aristolochia serpentaria	Virginia snakeroot	H
Arnoglossum reniforme	Great Indian plantain	H
Asarum canadense	Canadian wildginger	H
Asclepias amplexicaulis	Clasping milkweed	H
Asclepias tuberosa	Butterfly-weed	H
Asclepias variegata	Redring milkweed	H
Astilbe biternata	Appalachian false goat's beard	H
Aureolaria laevigata	Entireleaf yellow false-foxglove	H
Aureolaria virginica	Downy yellow false-foxglove	H
Baptisia sp. (white-flowered)	Wild-indigo	H
Bidens cernua	Nodding beggartick	H
Boehmeria cylindrica	False nettle	H
Cardamine angustata	Slender toothwort	H
Cardamine concatenata	Cutleaf toothwort	H
Cardamine diphylla	Toothwort; crinkleroot	H
Cardamine dissecta	Forkleaf toothwort	H
Cardamine spp.	Bittercress	H
Chamaecrista fasciculata var. fasciculata	Partridge pea	H
Chamaesyce maculate	Spotted spurge; spotted sandmat	H
Chimaphila maculata	Spotted wintergreen	H
Cicuta maculata	Water hemlock	H

Claytonia virginica	Spring-beauty	H	
Clitoria mariana	Butterfly-pea, Atlantic pigeonwings	H	
Collinsonia verticillata	Stoneroot; whorled horse-balm	H	
Conyza canadensis var. canadensis	Canadian horseweed	H	
Coreopsis major	Greater tickseed	H	
Coreopsis tripteris	Tall tickseed	H	
Crotalaria sagittalis	Arrowhead rattlebox	H	
Cynoglossum virginianum	Wild comfrey	H	
DAUCUS CAROTA	Queen Anne's lace	H	
Desmanthus illinoensis	Illinois bundleflower	H	
Desmodium nudiflorum	Nakedflower ticktrefoil	H	
Desmodium rotundifolium	Prostrate ticktrefoil	H	
Diodia virginiana	Virginia buttonweed	H	
Dodecatheon meadia	Pride of Ohio; shooting star	H	
Elephantopus carolinianus	Carolina elephantsfoot	H	
Enemion biternatum	Eastern false rue anemone	H	
Equisetum hyemale	Scouringrush horsetail	H	
Erigenia bulbosa	Harbinger-of-spring	H	SC
Erigeron annuus	Eastern daisy fleabane	H	
Erigeron philadelphicus	Philadelphia fleabane	H	
Eryngium prostratum	Creeping coyote-thistle; creeping eryngo	H	
Erythronium americanum	Dogtooth violet	H	
Euonymus americanus	Bursting-heart	H	
Eupatorium perfoliatum	Common boneset	H	
Eupatorium purpureum	Joe-pye weed	H	
Eupatorium rotundifolium	Roundleaf thoroughwort	H	
Eupatorium sessilifolium	Upland boneset	H	
Euphorbia corollata	Flowering spurge	H	
Fragaria virginiana	Wild strawberry	H	
Galium aparine	Stickywilly	H	
Galium triflorum	Fragrant bedstraw	H	
Geranium carolinianum	Carolina geranium	H	
Geranium maculatum	Spotted geranium	H	
Gillenia stipulata	American ipecac	H	
GLECHOMA HEDERACEA	Ground-ivy	H	
Goodyera pubescens	Downy rattlesnake plantain	H	
Helenium flexuosum	Purple-headed sneezeweed	H	
Helianthus tuberosus	Jerusalem artichoke	H	
Hepatica nobilis var. *acuta*	Sharplobe hepatica	H	
Hepatica nobilis var.*obtusa*	Roundlobe hepatica	H	
Heuchera americana	American alumroot	H	

Hexastylis arifolia var. ruthii	Ruth's Little brown jug	H	
Hieracium gronovii	Hairy hawkweed; queendevil	H	
Houstonia caerulea	azure bluet	H	
Houstonia purpurea var. purpurea	Houstonia; Venus' pride	H	
Hypoxis hirsuta	Yellowstargrass; common goldstar	H	
Impatiens capensis	Jewelweed	H	
Impatiens pallida	Pale touch-me-not	H	
Iris spp.	Wild iris	H	
Iris verna	Dwarf iris	H	
Justicia americana	Waterwillow	H	
Krigia sp.	Dwarfdandelion	H	
LAMIUM AMPLEXICAULE	Henbit	H	
LAMIUM PURPUREUM	Purple dead nettle	H	
LATHYRUS LATIFOLIUS	Perennial pea	H	
Lemna perpusilla	Duckweed	H	
LESPEDEZA BICOLOR	Bicolor lespedeza; shrub lespedeza	H	
LESPEDEZA CUNEATA	Sericea lespedeza	H	
LEUCANTHEMUM VULGARE	Oxeye daisy	H	
Liatris aspera	Tall blazing star	H	
Lobelia cardinalis	Cardinalflower	H	
Lobelia inflata	Indian-tobacco	H	
Ludwigia alternifolia	Bushy seedbox	H	
Lycopodium clavatum	Running clubmoss	H	SC
Lycopodium digitatum	Ground pine; fan clubmoss	H	
LYSIMACHIA NUMMULARIA	Creeping Jennie	H	
LYTHRUM SALICARIA	Purple loosestrife	H	
Maianthemum racemosum	Feathery false lily of the valley	H	
Matelea carolinensis	Maroon Carolina milkvine	H	
Medeola virginiana	Indian cucumber	H	
MENTHA SPICATA	Spearmint	H	
Mertensia virginica	Virginia bluebells	H	SC
Mimosa microphylla	Littleleaf sensitive-briar	H	
Mimulus ringens	Allegheny monkeyflower	H	
Mitchella repens	Partridge-berry	H	
Monarda fistulosa	Wild bergamot	H	
NARCISSUS PSEUDONARCISSUS	Daffodil	H	
NASTURTIUM OFFICINALE	Watercress	H	
Nothoscordum bivalve	crowpoison	H	
Nuttallanthus canadensis	Canada toadflax	H	
Oenothera biennis	Common evening-primrose	H	
ORNITHOGALUM UMBELLATUM	sleepydick / star-of-bethlehem	H	

Oxalis rosea	sorrel	H	
Oxalis stricta	Common yellow oxalis	H	
Oxalis violacea	Violet woodsorrel	H	
Packera glabella	Butterweed	H	
Packera obovata	Roundleaf ragwort	H	
Packera tomentosa	Wooly ragwort	H	
Panax quinquefolius	American ginseng	H	SC
Pedicularis canadensis	Lousewort; wood betony	H	
PERILLA FRUTESCENS	Beefsteakplant	H	
Phlox amoena	Hairy phlox	H	
Phlox divaricata	Wild blue phlox	H	
Phyla nodiflora	turkey tangle fogfruit	H	
Phytolacca americana	American pokeweed	H	
Pilea pumila	Clearweed	H	
PLANTAGA LANCEOLATA	English plantain	H	
Plantago major	Common plantain	H	
Podophyllum peltatum	Mayapple	H	
Polemonium reptans	Greek valerian	H	SC
Polygonum hydropiperoides	Water-pepper; swamp smartweed	H	
Polygonum pensylvanicum	Pennsylvania smartweed	H	
Polygonum sagittatum	Arrowleaf tearthumb	H	
Polygonum virginianum	Jumpseed	H	
Potentilla canadensis	Dwarf cinquesfoil	H	
Potentilla simplex	Common cinquefoil	H	
Prenanthes sp.	Rattlesnakeroot	H	
Prunella vulgaris	Common selfheal	H	
Pycnanthemum incanum	Hoary mountainmint	H	
Pycnanthemum loomisii	Loomis' mountainmint	H	
Pycnanthemum tennuifolium	Narrowleaf mountainmint	H	
Ranunculus abortivus	Littleleaf buttercup	H	
Ranunculus fascicularis	Early buttercup	H	
Ranunculus recurvatus	Blisterwort	H	
Rhexia mariana	Maryland meadowbeauty	H	
Rudbeckia hirta	Black-eyed Susan	H	
Ruellia carolinensis	Carolina wild petunia	H	
RUMEX CRISPUS	Curly dock	H	
Sagittaria latifolia	Arrowhead	H	
Salvia lyrata	Lyreleaf sage	H	
Salvia urticifolia	Nettleleaf sage	H	
Sanguinaria canadensis	Bloodroot	H	
Sanicula canadensis	Canadian blacksnakeroot	H	
Saururus cernuus	Lizard's tail	H	
Scutellaria elliptica	Hairy skullcap	H	

Scutellaria montana	Large-flowered skullcap	H	LT	T
Scutellaria ovata	Heartleaf skullcap	H		
SHERARDIA ARVENSIS	Blue fieldmadder	H		
Silene virginica	Fire pink	H		
Sisyrinchium mucronatum	Needletip blue-eyed grass	H		
Smallanthus uvedalius	Hairy leafcup	H		
Solanum carolinense	Carolina horsenettle	H		
Solidago gigantea	Giant goldenrod	H		
Sparganium spp.	Bur-reed	H		
Spigelia marilandica	Woodland pinkroot	H		
STELLARIA MEDIA	Common chickweed	H		
Stellaria pubera	Star chickweed	H		
Symphyotrichum cordifolium	Common blue wood aster	H		
Symphyotrichum pilosum var. pilosum	White heath aster	H		
Symphyotrichum praealtum	Willowleaf aster	H		SC
TARAXACUM OFFICINALE	Dandelion	H		
Thalictrum thalictroides	Rue anemone	H		
Tiarella cordifolia	heartleaf foamflower	H		
Tipularia discolor	Crippled cranefly	H		
Tradescantia hirsuticaulis	hairystem spiderwort	H		
Tradescantia subaspera	zigzag spiderwort	H		
Tradescantia virginiana	Virginia spiderwort	H		
TRIFOLIUM REPENS	White clover	H		
Trillium catesbaei	Catesby’s wakerobin; bashful wakerobin	H		
Trillium luteum	Yellow trillium; yellow wakerobin	H		
Trillium rugelii	Southern nodding trillium; illscented wakerobin	H		
Triodanis perfoliata	Clasping Venus' looking-glass	H		
Typha latifolia	Cattail	H		
Urtica sp.	Stinging nettle	H		
Uvularia perfoliata	Perfoliate bellwort	H		
Uvularia sessilifolia	Sessileleaf bellwort	H		
Valerianella radiata	Beaked cornsalad	H		
VERBASCUM THAPSUS	Woolly mullein	H		
Verbesina alternifolia	Wingstem	H		
Verbesina occidentalis	Yellow crownbeard	H		
Verbesina virginica	White crownbeard	H		
Vernonia sp.	Ironweed	H		
VERONICA PERSICA	Speedwell	H		
Vicia caroliniana	Carolina vetch	H		
VINCA MINOR	Periwinkle	H		
Viola blanda	Sweet white violet	H		

Viola hirsutula	Southern woodland violet	H	
Viola palmata	Early blue violet	H	
Viola pedata	Bird-foot violet	H	
Viola sororia	Common blue violet	H	
Xanthium strumarium	Rough cocklebur	H	
Xyris sp.	Yellow-eyed grass	H	
Alnus serrulata	Smooth alder	S	
Amorpha fruticosa	False indigo-bush	S	
Asimina triloba	Pawpaw	S	
Callicarpa americana	American beautyberry	S	
Calycanthus floridus	Eastern sweetshrub	S	
Ceanothus americanus	New Jersey Tea	S	
Cephalanthus occidentalis	Buttonbush	S	
Cornus amomum	Silky dogwood	S	
Corylus americana	American hazelnut	S	
Cuscuta spp.	Dodder	S	
Dirca palustris	Leatherwood	S	
Gaylussacia baccata	Black huckleberry	S	
Gelsemium sempervirens	Carolina jessamine; evening trumpetflower	S	
Hamamelis virginiana	American witchhazel	S	
Hydrangea arborescens	Wild hydrangea	S	
Hypericum galioides	Bedstraw St. Johnswort	S	
Kalmia latifolia	Mountain laurel	S	
LIGUSTRUM SINENSE	Chinese privet	S	
Lindera benzoin	Spicebush	S	
Phoradendron leucarpum	Oak mistletoe	S	
Physocarpus opulifolius	Ninebark	S	
Rhododendron periclymenoides	Pink azalea	S	
Rhododendron sp.	Azalea	S	
Rhus aromatica	Fragrant sumac	S	
Rhus copallinum	Winged sumac	S	
Rhus glabra	Smooth sumac	S	
Rhus typhina	Staghorn sumac	S	SC
Rosa carolina	Carolina rose	S	
ROSA MULTIFLORA	Multiflora rose	S	
Rubus alleghaniensis	Blackberry	S	
Rubus hispidus	Dewberry	S	
Rubus occidentalis	Black raspberry	S	
RUBUS PHOENICOLASIUS	Wineberry	S	
Salix discolor	Pussy willow	S	
Sambucus nigra ssp. Canadensis	Common elderberry	S	
Staphylea trifolia	Bladderpod	S	

Symphoricarpos orbiculatus	Coralberry	S
Toxicodendron radicans	Poison-ivy	S
Vaccinium arboreum	Farkleberry	S
Vaccinium corymbosum	Highbush blueberry	S
Vaccinium pallidum	Low bush blueberry	S
Vaccinium stamineum	Deerberry	S
Viburnum acerifolium	Maple leaf viburnum	S
Viburnum dentatum	Southern arrowwood	S
Viburnum nudum	Possumhaw	S
Viburnum prunifolium	Blackhaw	S
Viburnum rufidulum	Rusty blackhaw	S
Yucca filamentosa	Adam's needle	S
Acer barbatum	Southern sugar maple	T
Acer negundo	Boxelder	T
Acer rubrum	Red maple	T
Acer saccharinum	Silver maple	T
Aesculus flava	Yellow buckeye	T
AILANTHUS ALTISSIMA	Tree-of-heaven	T
ALBIZIA JULIBRISSIN	Mimosa	T
Amelanchier arborea	Downy serviceberry	T
Aralia spinosa	Devil's- walking stick	T
Betula nigra	River birch	T
Carpinus caroliniana	Ironwood	T
Carya alba	Mockernut hickory	T
Carya cordiformis	Bitternut hickory	T
Carya glabra	Pignut hickory	T
Carya ovalis	Red hickory	T
Carya ovata	Shagbark hickory	T
Carya pallida	Sand hickory	T
Castanea dentata	American chestnut	T
Celtis occidentalis	Northern hackberry	T
Cercis canadensis	Redbud	T
Cornus florida	Dogwood	T
Crataegus sp.	Hawthorne	T
Diospyros virginiana	Persimmon	T
Fagus grandifolia	American beech	T
Frangula caroliniana	Carolina buckthorn	T
Fraxinus americana	White ash	T
Fraxinus pennsylvanica	Green ash	T
Gleditsia triacanthos	Honeylocust	T
Ilex opaca	American holly	T
Juglans nigra	Black walnut	T
Juniperus virginiana	Eastern redcedar	T

Liquidambar styraciflua	Sweetgum	T
Liriodendron tulipifera	Tuliptree; yellow-poplar	T
Maclura pomifera	Osage orange	T
Magnolia macrophylla	Bigleaf magnolia	T
Morus rubra	Red mulberry	T
Nyssa sylvatica	Blackgum	T
Ostrya virginiana	Eastern hophornbeam	T
Oxydendrum arboreum	Sourwood	T
PAULOWNIA TOMENTOSA	Princess-tree	T
Pinus echinata	Shortleaf pine	T
Pinus taeda	Loblolly pine	T
Pinus virginiana	Virginia pine	T
Planera aquatica	Water elm; planertree	T
Platanus occidentalis	Sycamore	T
Prunus americana	American plum	T
Prunus serotina	Black cherry	T
Quercus alba	White oak	T
Quercus falcata	Southern red oak	T
Quercus marilandica	Blackjack oak	T
Quercus michauxii	Swamp chestnut oak	T
Quercus phellos	Willow oak	T
Quercus prinus	Chestnut oak	T
Quercus rubra	Northern red oak	T
Quercus shumardii	Shumard oak	T
Quercus stellata	Post oak	T
Quercus velutina	Black oak	T
Robinia pseudoacacia	Black locust	T
Salix nigra	Black willow	T
Sassafras albidum	Sassafras	T
Tilia americana	American basswood	T
Ulmus alata	Winged elm	T
Ulmus americana	American elm	T
Ulmus rubra	Slippery elm	T
Amphicarpaea bracteata	American hogpeanut	V
Apios americana	Groundnut	V
Berchemia scandens	Alabama supplejack	V
Bignonia capreolata	Crossvine	V
Campsis radicans	Trumpet creeper	V
Clematis virginiana	Virgin’s bower	V
DIOSCOREA OPPOSITIFOLIA	Chinese yam	V
Dioscorea villosa	Wild yam	V
EUONYMUS FORTUNEI	Wintercreeper	V
Ipomoea pandurata	Wild potato vine	V

LONICERA JAPONICA	Japanese honeysuckle	V
Lonicera sempervirens	Trumpet honeysuckle	V
Menispermum canadense	Canada moonseed	V
Parthenocissus quinquefolia	Virginia creeper	V
Passiflora incarnata	Purple passion-flower	V
Passiflora lutea	Yellow passionflower	V
PUERARIA MONTANA	kudzu	V
Smilax bona-nox	Saw greenbriar	V
Smilax glauca	Catbriar	V
Smilax hugeri	Huger's carrionflower	V
Smilax rotundifolia	Common greenbriar	V
Smilax tamnoides	Bristly greenbriar	V
Vitis cinerea	Graybark grape	V
Vitis labrusca	Fox grape	V
Vitis rotundifolia	Wild grape; muscadine	V

VERTEBRATE SPECIES

Federal Status abbreviations:
LE = listed as endangered
LT = listed as threatened
PS = listed as threatened or endangered in a portion of native range (none are protected within GA)

State Status abbreviations:
E = state listed as endangered
T = state listed as threatened
R = rare species
SC = special concern species

Amphibians

Common Name	Scientific Name	Federal Status	State Status
Blanchard's tree frog	*Acris crepitans blanchardi*		
northern cricket frog	*Acris crepitans crepitans*		
southern cricket frog	*Acris gryllus*		
spotted salamander	*Ambystoma maculatum*		
American toad	*Anaxyrus americanus*		
Fowler's toad	*Anaxyrus woodhousii fowleri*		
spotted dusky salamander	*Desmognathus conanti*		
mountain dusky salamander	*Desmognathus ochrophaeus*		
blackbelly salamander	*Desmognathus quadramaculatus*		
southern two-lined salamander	*Eurycea cirrigera*		
long-tailed salamander	*Eurycea longicauda*		
cave salamander	*Eurycea lucifuga*		
eastern narrowmouth toad	*Gastrophryne carolinensis*		
Cope’s gray treefrog	*Hyla chrysoscelis*		
green treefrog	*Hyla cinerea*		
gray treefrog	*Hyla versicolor*		
American bullfrog	*Lithobates catesbeianus*		
green frog	*Lithobates clamitans melanota*		
southern leopard frog	Lithobates sphenocephalus		
red-spotted newt	*Notophthalmus viridescens*		
northern slimy salamander	*Plethodon glutinosus*		
mountain chorus frog	*Pseudacris brachyphona*		SC
spring peeper	*Pseudacris crucifer*		
upland chorus frog	*Pseudacris feriarum*		
red salamander	*Pseudotriton ruber*		
pickerel frog	*Rana palustris*		
wood frog	*Rana sylvatica*		

Reptiles

Common Name	*Scientific Name*	Federal Status	State Status
copperhead	*Agkistrodon contortrix*		
green anole	*Anolis carolinensis*		
spiny softshell	*Apalone spinifera*		
six-lined racerunner	*Aspidoscelis sexlineatus*		
common snapping turtle	*Chelydra serpentina*		
northern painted turtle	*Chrysemys picta picta*		
northern black racer	*Coluber constrictor*		
wormsnake	*Craphophis amoenus*		
timber rattlesnake	*Crotalus horridus*		
ring-necked snake	*Diadophis punctatus*		
black rat snake	*Elaphe obsoleta obsoleta*		
common map turtle	*Graptemys geographica*		R
eastern mud turtle	*Kinosternon subrubrum*		
black kingsnake	*Lampropeltis getula nigra*		
scarlet king snake	*Lampropeltis triangulum elapsoides*		
common water snake	*Nerodia sipedon*		
midland water snake	*Nerodia sipedon pleuralis*		
rough green snake	*Opheodrys aestivus*		
queen snake	*Regina septemvittata*		
gray ratsnake	*Pantherophis spiloides*		
common five-lined skink	*Plestiodon fasciatus*		
broad-headed skink	*Plestiodon laticeps*		
eastern fence lizard	*Sceloporus undulatus*		
little brown skink	*Scincella lateralis*		
common musk turtle	*Sternotherus odoratus*		
eastern box turtle	*Terrapene carolina*		
common slider	*Trachemys scripta*		
red-eared slider	*Trachemys scripta elegans*		
softshell turtle	*Trionyx sp.*		

Fish

Common Name	*Scientific Name*	Federal Status	State Status
rock bass	*Amblopites rupestris*		
yellow bullhead	*Ameiurus natalis*		
stoneroller	*Campostoma anomalum*		
large scale stoneroller	*Campostoma oligolepis*		
white sucker	*Catostomus commersonii*		
banded sculpin	*Cottus carolinae*		
greenside darter	*Etheostoma blennioides*		
rainbow darter	*Etheostoma caeruleum*		
blueside darter	*Etheostoma jessiae*		SC
redline darter	*Etheostoma rufilineatum*		SC
Tennessee snubnose darter	*Etheostoma simoterum*		
banded darter	*Etheostoma zonale*		SC
blackstripe topminnow	*Fundulus notatus*		

blackspotted topminnow	*Fundulus olivaceous*		
western mosquitofish	*Gambusia affinis*		
bigeye chub	*Hybopsis amplops*		
northern hog sucker	*Hypentilium nigricans*		
mountain brook lamprey	*Ichthyomyzon greeleyi*		
least brook lamprey	*Lampetra aepyptera*		
redbreast sunfish	*Lepomis auritus*		
redbreast-green hybrid	*Lepomis auritus X cyanellus*		
green sunfish	*Lepomis cyanellus*		
green-redear hybrid	*Lepomis cyanellus X microlophus*		
pumpkinseed sunfish	*Lepomis gibbosus*		
warmouth	*Lepomis gulosis*		
warmouth-bluegill hybrid	*Lepomis gulosis X macrochirus*		
bluegill	*Lepomis macrochirus*		
longear sunfish	*Lepomis megalotis*		
redear sunfish	*Lepomis microlophus*		
striped shiner	*Luxilus chrysocephalus*		
warpaint shiner	*Luxilus coccogenis*		
scarlet shiner	*Lythrurus fasciolaris*		SC
redeye bass	*Micropterus coosae*		
spotted bass	*Micropterus punctulatus*		
largemouth bass	*Micropterus salmoides*		
black redhorse	*Moxostoma duquesnei*		
golden redhorse	*Moxostoma erythrurum*		
logperch	*Percina caprodes*		
longnose darter	*Percina nasuta*		
stargazing minnow	*Phenacobius uranops*		T
bluntnose minnow	*Pimephales notatus*		
black crappie	*Pomoxis nigromaculatus*		
blacknose dace	*Rhinichthys atratulus*		
longnose dace	*Rhinichthys cataractae*		
creek chub	*Semotilus atromaculatus*		

Birds

Common Name	***Scientific Name***	**Federal Status**	**State Status**
Cooper's Hawk	*Accipiter cooperii*		
Sharp-shinned Hawk	*Accipiter striatus*	PS	
Red-winged Blackbird	*Agelaius phoeniceus*		
Wood Duck	*Aix sponsa*		
Henslow's Sparrow	*Ammodramus leconteii*		
Grasshopper sparrow	*Ammodramus savannarum*		
Green-winged Teal	*Anas carolinensis*		
Mallard	*Anas platyrhynchos*		
American Black Duck	*Anas rubripes*		
American Pipit	*Anthus rubescens*		
Ruby-throated Hummingbird	*Archilochus colubris*		
Great Egret	*Ardea alba*		
Great Blue Heron	*Ardea herodias*		
Ring-necked Duck	*Aythya collaris*		

Tufted Titmouse	*Baeolophus bicolor*		
Cedar Waxwing	*Bombycilla cedrorum*		
American Bittern	*Botaurus lentiginosus*		
Canada Goose	*Branta canadensis*		
Great Horned Owl	*Bubo virginianus*		
Red-tailed Hawk	*Buteo jamaicensis*		
Red-shouldered Hawk	*Buteo lineatus*		
Broad-winged Hawk	*Buteo platypterus*	PS	
Green Heron	*Butorides virescens*		
Pectoral Sandpiper	*Calidris melanotos*		
Chuck-will's-widow	*Caprimulgus carolinensis*		
Whip-poor-will	*Caprimulgus vociferus*		
Northern Cardinal	*Cardinalis cardinalis*		
American Goldfinch	*Carduelis tristis*		
House Finch	*Carpodacus mexicanus*		Exotic
Turkey Vulture	*Cathartes aura*		
Veery Thrush	*Catharus fuscescens*		
Hermit Thrush	*Catharus guttatus*		
Gray-cheeked Thrush	*Catharus minimus*		
Swainson's Thrush	*Catharus ustulatus*		
Brown Creeper	*Certhia americana*		
Belted Kingfisher	*Ceryle alcyon*		
Chimney Swift	*Chaetura pelagica*		
Killdeer	*Charadrius vociferus*		
Northern Harrier	*Circus cyaneus*		
Marsh Wren	*Cistothorus palustris*		
Sedge Wren	*Cistothorus platensis*		
Yellow-billed Cuckoo	*Coccyzus americanus*	PS	
Northern Flicker	*Colaptes auratus*		
Northern Bobwhite	*Colinus virginianus*	PS	
Eastern Wood-Pewee	*Contopus virens*		
Black Vulture	*Coragyps atratus*		
American Crow	*Corvus brachyrhynchos*		
Blue Jay	*Cyanocitta cristata*		
Bobolink	*Dolichonyx oryzivorus*		
Pileated Woodpecker	*Dryocopus pileatus*		
Gray Catbird	*Dumetella carolinensis*		
Least Flycatcher	*Empidonax minimus*		SC
Acadian Flycatcher	*Empidonax virescens*		
Rusty Blackbird	*Euphagus carolinus*		
American Kestrel	*Falco sparverius*		
Wilson's Snipe	*Gallinago delicata*		
Kentucky Warbler	*Geothlypis formosa*		
Common Yellowthroat	*Geothlypis trichas*		
Sandhill Crane	*Grus canadensis*	PS	
Purple Finch	*Haemorhous purpureus*		
Worm-eating Warbler	*Helmitheros vermivorum*		
Barn Swallow	*Hirundo rustica*		
Wood Thrush	*Hylocichla mustelina*		
Yellow-breasted Chat	*Icteria virens*		

Baltimore Oriole	*Icterus galbula*
Orchard Oriole	*Icterus spurius*
Dark-eyed Junco	*Junco hyemalis*
Swainson's Warbler	*Limnothlypis swainsonii*
Tennessee Warbler	*Leiothlypis peregrina*
Nashville Warbler	*Leiothlypis ruficapilla*
Hooded Merganser	*Lophodytes cucullatus*
Belted Kingfisher	*Megaceryle alcyon*
Eastern Screech-owl	*Megascops asio*
Red-bellied Woodpecker	*Melanerpes carolinus*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Wild Turkey	*Meleagris gallapavo*
Swamp Sparrow	*Melospiza georgiana*
Song Sparrow	*Melospiza melodia*
Northern Mockingbird	*Mimus polyglottos*
Black-and-white Warbler	*Mniotilta varia*
Brown-headed Cowbird	*Molothrus ater*
Great Crested Flycatcher	*Myiarchus crinitus*
Connecticut Warbler	*Oporornis agilis*
Osprey	*Pandion haliaetus*
Louisiana Waterthrush	*Parkesia motacilla*
Northern Waterthrush	*Parkesia noveboracensis*
Northern Parula	*Parula americana*
Savannah Sparrow	*Passerculus sandwichensis*
Fox Sparrow	*Passerella iliaca*
Blue Grosbeak	*Passerina caerulea*
Indigo Bunting	*Passerina cyanea*
Cliff Swallow	*Petrochelidon pyrrhonota*
Double-crested Cormorant	*Phalacrocorax auritus*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
Eastern Towhee	*Pipilo erythrophthalmus*
Scarlet Tanager	*Piranga olivacea*
Summer Tanager	*Piranga rubra*
Pied-billed grebe	*Podilymbus podiceps*
Carolina Chickadee	*Poecile carolinensis*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Vesper Sparrow	*Pooecetes gramineus*
Purple Martin	*Progne subis*
Common Grackle	*Quiscalus quiscula*
Ruby-crowned Kinglet	*Regulus calendula*
Golden-crowned Kinglet	*Regulus satrapa*
Eastern Phoebe	*Sayornis phoebe*
American Woodcock	*Scolopax minor*
Ovenbird	*Seiurus aurocapilla*
Louisiana Waterthrush	*Seiurus motacilla*
Northern Parula	*Setophaga americana*
Black-throated Blue Warbler	*Setophaga caerulescens*
Bay-breasted Warbler	*Setophaga castanea*

Cerulean Warbler	*Setophaga cerulea*	R
Hooded Warbler	*Setophaga citrina*	
Yellow-rumped Warbler	*Setophaga coronata*	
Prairie Warbler	*Setophaga discolor*	
Yellow-throated Warbler	*Setophaga dominica*	
Blackburnian Warbler	*Setophaga fusca*	
Magnolia Warbler	*Setophaga magnolia*	
Palm Warbler	*Setophaga palmarum*	
Chestnut-sided Warbler	*Setophaga pensylvanica*	
Yellow Warbler	*Setophaga petechia*	
Pine Warbler	*Setophaga pinus*	
American Redstart	*Setophaga ruticilla*	
Cape May Warbler	*Setophaga tigrina*	
Black-throated Green Warbler	*Setophaga virens*	
Eastern Bluebird	*Sialia sialis*	
Red-breasted Nuthatch	*Sitta canadensus*	
White-breasted Nuthatch	*Sitta carolinensis*	
Brown-headed Nuthatch	*Sitta pusilla*	
Yellow-bellied Sapsucker	*Sphyrapicus varius*	
American Goldfinch	*Spinus tristis*	
Chipping Sparrow	*Spizella passerina*	
Field Sparrow	*Spizella pusilla*	
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	
Barred Owl	*Strix varia*	
European Starling	*Stumus vulgaris*	Exotic
Eastern Meadowlark	*Sturnella magna*	
European Starling	*Sturnus vulgaris*	
Tree Swallow	*Tachycineta bicolor*	
Carolina Wren	*Thryothorus ludovicianus*	
Brown Thrasher	*Toxostoma rufum*	
Solitary Sandpiper	*Tringa solitaria*	
House Wren	*Troglodytes aedon*	
Winter Wren	*Troglodytes troglodytes*	SC
American Robin	*Turdus migratorius*	
Eastern Kingbird	*Tyrannus tyrannus*	
Tennessee Warbler	*Vermivora peregrina*	
Blue-winged Warbler	*Vermivora pinus*	
Nashville Warbler	*Vermivora ruficapilla*	
Yellow-throated Vireo	*Vireo flavifrons*	
White-eyed Vireo	*Vireo griseus*	
Red-eyed Vireo	*Vireo olivaceus*	
Philadelphia Vireo	*Vireo philadelphicus*	
Canada Warbler	*Wilsonia canadensis*	
Mourning Dove	*Zenaida macroura*	
White-throated Sparrow	*Zonotrichia albicollis*	

Mammals

Common Name	*Scientific Name*	Federal Status	State Status
domestic dog	*Canis familiaris*		
coyote	*Canis latrans*		
beaver	*Castor canadensis*		
Virginia opossum	*Didelphis virginianus*		
red bat	*Lasiurus borealis*		
hoary bat	*Lasiurus cinereus*		
North American river otter	*Lontra canadensis*		
bobcat	*Lynx rufus*		
groundhog	*Marmota monax*		
striped skunk	*Mephitis mephitis*		
meadow vole	*Microtus pennsylvanicus*		
pine/woodland vole	*Microtus pinetorum*		
mink	*Mustela vison*		
gray bat	*Myotis grisescens*	LE	E
little brown bat	*Myotis lucifugus*		
northern long-eared bat	*Myotis septentrionalis*		
evening bat	*Nycticeius humeralis*		
golden mouse	*Ochrotomys nuttalli*		
white-tailed deer	*Odocoileus virginianus*		
muskrat	*Ondantra zibethecus*		
marsh rice rat	*Oryzomys palustris*		
cotton mouse	*Peromyscus gossypinus*		
white-footed mouse	*Peromyscus leucopus*		
deer mouse	*Peromyscus maniculatus*		
eastern pipestrelle	*Pipistrellus subflavus*		
raccoon	*Procyon lotor*		
eastern harvest mouse	*Reithrodontomys humulis*		
eastern gray squirrel	*Sciurius carolinensis*		
fox squirrel	*Sciurius niger*		
hispid cotton rat	*Sigmodon hispidus*		
eastern cottontail	*Sylvilagus floridanus*		
marsh rabbit	*Sylvilagus palustris*		
eastern chipmunk	*Tamias striatus*		
gray fox	*Urocyon cinereoargenteus*		
red fox	*Vulpes vulpes*		

AQUATIC INVERTEBRATES

Phyllum	Class	Order	Family	Species	State Status
COELENTERATA	Hydrozoa		Hydridae	*Hydra americana*	
PLATYHELMINTHES	Turbellaria	Tricladida	Dugesiidae	*Girardia (Dugesia) tigrina* *Cura foremanii*	
NEMATODA	unk	unk	unk	undetermined sp.	
MOLLUSCA	Gastropoda	Basommatophora	Ancylidae	*Ferrissia rivularis*	
			Lymnaeidae	*Fossaria sp.*	
			Physidae	*Physella sp.*	
			Planorbidae	*Gyraulus parvus*	
		Mesogastropoda	Pleuroceridae	*Elimia cf. Clavaeformis*	
				Elimia sp.	
				Leptoxis praerosa	SC
				Leptoxis sp.	
				Pleurocera sp.	
			Viviparidae	*Campeloma decisum*	
	Bivalvia	Veneroida	Corbiculidae	*Corbicula fluminea*	
			Sphaeriidae	*Musculium parturneium*	
				Musculium transversum	
				Pisidium sp.	
				Sphaerium fabale	
				Sphaerium sp.	
ANNELIDA	Clitellata	Branchiobdellida	Branchiobdellidae	undetermined sp.	
		Haplotaxida	Enchytraeidae	undetermined sp.	
			Lumbricidae	undetermined sp.	
			Naididae	*Arcteonais lomondi*	
				Dero sp.	
				Nais bretscheri	
				Nais bretscheri	

ANNELIDA	Clitellata	Haplotaxida	Naididae	*Nais communis*
				Nais sp.
				Slavina appendiculata
				Stylaria lacustris
				undetermined sp.
		Lumbriculida	Lumbriculidae	undetermined sp.
		Tubificida	Tubificidae w.o.h.c.	*Limnodrilus claparedianus*
				Limnodrilus hoffmeisteri
				Limnodrilus sp.
				undetermined sp.
	Hirudinea	Rhynchobdellida	Glossiphoniidae	*Helobdella sp.*
ARTHROPODA	Arachnida	Acariformes	Hygrobatidae	*Atractides sp.*
			Lebertiidae	*Lebertia sp.*
	Crustacea	Amphipoda	Crangonyctidae	*Crangonyx sp.*
			Hyalellidae	*Hyalella azteca*
		Cladocera	Chydoridae	*Alona sp.*
			Daphnidae	*Daphnia sp.*
		Copepoda	unk	undetermined sp.
		Cyclopoida	unk	undetermined sp.
			unk	undetermined sp.
		Decapoda	Cambaridae	*Cambarus sp.*
				Orconectes sp.
				Procambarus sp.
		Isopoda	Asellidae	*Caecidotea sp.*
				Lirceus sp.
		Ostracoda	Candoniidae	*Candona sp.*
			unk	undetermined sp.
	Insecta	Coleoptera	Curculionidae	undetermined sp.
			Dryopidae	*Copelatus sp.*
				Helichus basalis
				Helichus sp.
			Dytiscidae	*Hydroporus sp.*
			Elmidae	*Ancyronyx variegata*
				Dubiraphia quadrinotata
				Dubiraphia sp.

ARTHROPODA	Insecta	Coleoptera	Elmidae	*Dubiraphia vittata*
				Macronychus glabratus
				Microcylloepus pusillus
				Optioservus ovalis
				Optioservus sp.
				Oulimnius latiusculus
				Promoresia sp.
				Stenelmis sp.
			Gyrinidae	*Dineutus sp.*
			Haliplidae	*Peltodytes sp.*
			Hydrophilidae	*Helochares sp.*
				Stactobiella sp.
			Psephenidae	*Psephenus herricki*
			Ptilodactylidae	*Anchytarsus bicolor*
			Scirtidae	*Cyphon sp.*
		Collembola	unk	undetermined sp.
		Diptera	Athericidae	*Atheric lantha*
			Ceratopogonidae	*Bezzia/Palpomyia gp.*
			Chaoboridae	*Chaoborus punctipennis*
			Chironomidae	*Lopescladius sp.*
				Ablabesmyia annulata
				Ablabesmyia mallochi
				Ablabesmyia rhamphe gp.
				Ablabesmyia sp.
				Brillia flavifrons
				Cardiocladius obscurus
				Chaetocladius sp.
				Chironomus sp.
				Cladopelma sp.
				Cladotanytarsus sp.
				Clinotanypus pinguis
				Clinotanypus sp.
				Conchapelopia sp.
				Corynoneura sp.
				Cricotopus bicinctus
				Cricotopus sp.

ARTHROPODA	Insecta	Diptera	Chironomidae	*Cricotopus tremulus*
				Cryptochironomus fulvus
				Cryptochironomus sp.
				Diamesa sp.
				Dicrotendipes neomodestus
				Dicrotendipes sp.
				Diplocladius cultriger
				Einfeldia natchitocheae
				Eukiefferiella claripennis gp.
				Eukiefferiella devonica gp.
				Hydrobaenus sp.
				Larsia sp.
				Limnophyes sp.
				Micropsectra sp.
				Microtendipes pedellus gp.
				Microtendipes sp.
				Monopelopia sp.
				Nanocladius sp.
				Natarsia sp.
				Nilotanypus fimbriatus
				Nilotanypus sp.
				Orthocladius (Symposiocladius) lignicola
				Orthocladius sp.
				Pagastia sp.
				Paracladopelma sp.
				Parakiefferiella sp.
				Paralauterborniella nigrohalteralis
				Parametriocnemus lundbecki
				Parametriocnemus sp.
				Paratanytarsus sp.
				Paratendipes sp.
				Pentaneura sp.
				Phaenopsectra punctipes gp.
				Phaenopsectra sp.
				Polypedilum flavum (convictum)

ARTHROPODA	Insecta	Diptera	Chironomidae	*Polypedilum halterale gp.*
				Polypedilum illinoense
				Polypedilum sp.
				Potthastia longimana
				Procladius bellus
				Procladius sp.
				Prodiamesa olivacea
				Psectrocladius sp.
				Psectrocladius sp.
				Pseudochironomus sp.
				Pseudorthocladius sp.
				Rheocricotopus robacki
				Rheocrocotopus glacricollis
				Rheotanytartsus exiguus gp.
				Rheotanytartsus sp.
				Smittia sp.
				Stempellina sp.
				Stictochironomous sp.
				Synorthocladius semivirens
				Tanypus stellatus
				Tanytarsus sp.
				Thienemanniella sp.
				Thienemanniella xena
				Thienemannimyia sp.
				Tribelos jucundum
				Tvetenia bavarica gp.
				Tvetenia paucunca
				Tvetenia sp.
				Tvetenia vitracies
				Zaverlia sp.
				Zaverliella sp.
				Zavrelimyia sp.
			Culicidae	undetermined sp.
			Dixidae	*Dixa sp.*
			Empididae	*Hemerodromia sp.*
			Psychodidae	*Pericoma sp.*

ARTHROPODA	Insecta	Diptera	Simuliidae	*Simulium sp.*
			Stratiomyidae	*Myxosargus sp.*
			Stratiomyidae	*Odontomyia sp.*
			Tabanidae	*Chrysops sp.*
				Tabanus sp.
			Tipulidae	*Antocha sp.*
				Hexatoma sp.
				Limnophila sp.
				Ormosia sp.
				Pseudolimnophila sp.
				Tipula sp.
		Ephemeroptera	Acanthametropodidae	*Ameletus sp.*
			Baetidae	*Acentrella ampla*
				Acentrella sp.
				Acerpenna sp.
				Baetis flavistriga
				Baetis intercalaris
				Baetis sp.
				Centroptilum sp.
				Diphetor hageni
				Plauditus sp.
				Pseudocloeon sp.
			Caenidae	*Caenis sp.*
			Ephemerellidae	*Attenella sp.*
				Ephemerella sp.
				Eurylophella sp.
				Serratella sp.
			Ephemeridae	*Hexagenia sp.*
			Heptageniidae	*Maccaffertium (Stenonema) sp.*
				Stenacron interpunctatum
				Stenonema femoratum
			Heptageniidae	*Stenonema mediopunctatum*
				Stenonema sp.
				Stenonema terminatum
			Isonychiidae	*Isonychia sp.*
			Leptophlebiidae	*Leptophlebia sp.*

ARTHROPODA	Insecta	Ephemeroptera		*Paraleptophlebia sp.*
		Hemiptera	Veliidae	*Rhagovelia obesa*
		Megaloptera	Corydalidae	*Corydalus cornutus*
				Nigronia serricornis
			Sialidae	*Sialis sp.*
		Odonata	Aeshnidae	*Basiaeschna janata*
				Boyeria vinosa
			Calopterygidae	*Calopteryx maculata*
				Calopteryx sp.
			Coenagrionidae	*Argia sp.*
				Enallagma sp.
			Cordulegastridae	*Cordulegaster sp.*
			Corduliidae	*Epitheca (Epicordulia) sp.*
			Gomphidae	*Gomphus sp.*
				Hagenius brevistylus
				Lanthus parvulus
				Lanthus sp.
				Stylogomphus albistylus
			Libellulidae	*Erythemis simpicicollis*
				Perithemis sp.
		Plecoptera	Capniidae	undetermined sp.
			Leuctridae	*Leuctra sp.*
			Nemouridae	*Amphinemura delosa*
				Amphinemura sp.
			Perlidae	*Acroneuria abnormis*
				Acroneuria evoluta
				Acroneuria sp.
				Perlesta placida sp. gp.
				Perlesta sp.
			Perlodidae	*Isoperla sp.*
				undetermined sp.
		Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*
		Trichoptera	Calamoceratidae	*Anisocentropus pyraloides*
			Glossosomatidae	*Agapetus sp.*
				Glossosoma sp.
			Goeridae	*Goera sp.*

ARTHROPODA	Insecta	Trichoptera	Hydropsychidae	*Ceratopsyche morosa*
				Ceratopsyche sp.
				Cheumatopsyche sp.
				Hydropsyche betteni gp.
				Hydropsyche sp.
			Hydroptilidae	*Hydroptila sp.*
			Leptoceridae	*Ceraclea sp.*
				Oecetis avara
				Oecetis sp.
				Triaenodes sp.
			Limnephilidae	*Pycnopsyche sp.*
			Philopotamidae	*Chimarra aterrima*
				Chimarra obscurus
				Chimarra sp.
			Phryganeidae	*Ptilostomis sp.*
			Polycentropodidae	*Phylocentropus sp.*
				Polycentropus sp.
			Psychomyiidae	*Lype diversa*
			Rhyacophilidae	*Rhyacophila carolina*
				Rhyacophila fenestrata/ledra
				Rhyacophila sp.
			Uenoidae	*Neophylax fuscus*
				Neophylax sp.

APPENDIX G

American Indian Tribes Consulted by Tennessee Army National Guard

(Tribes printed in grey have indicated that they do not have an interest in the land making up the VTS-Catoosa.)

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(318)253-8174x6451 / (318)253-7711 fax
earlii@tunica.org

United Keetoowah Band of Cherokee Indians in Oklahoma

Honorable George Wickliffe, Chief
2450 S. Muskogee Avenue
P.O. Box 746
Tahlequah, OK 74465
(918)431-1818 / (918)456-5126 fax

Lisa C. LaRue-Baker, Acting THPO
2450 S. Muskogee Avenue
Tahlequah, OK 74464
(918)822-1952
Ukbthpo-larue@yahoo.com

APPENDIX H

Pest Management Forms:

General Information

List of Approved Pesticide Chemicals for Use on VTS-C

Format for Reporting Pesticide/Herbicide Applications

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GENERAL PEST MANAGEMENT INFORMATION

- Pest management activities on TNARNG properties are guided by the TNARNG Integrated Pest Management Plan.

- Only certified applicators may apply any herbicide or pesticide (general use or restricted use) on TNARNG facilities. Applicator must have either a DoD Pesticide Applicator Certification or a Tennessee Commercial Applicator Certification for the appropriate category of pesticide.

- All pesticide/herbicide applications made by contractor or TNARNG staff will be reported to the Pest Management Coordinator (PMC). The reporting form to be used is included in this Appendix. Contact information for the PMC is located at the bottom of the forms.

- Control of pests of facilities (e.g., termites, spiders, mice) is handled through contract by the training site maintenance office. Contract exterminators may only apply the approved pesticides listed below. Contract exterminators will fill out a Pest Control Treatment Record completely for each chemical utilized on a visit. The training site will submit a copy of this form to the PMC (see bottom of reporting form for contact information).

- Weed control and turf maintenance applications may be made be state certified applicators on staff. All in-house applications of herbicides and pesticides must be reported to the PMC quarterly.

- In certain situations, a non-certified person may apply a pesticide on a self-help basis for personal protection on a job site. The following limitations apply to self-help pesticide applications:

  - Self-help applications will include only those products listed for self-help. Applications of these products must be reported to the PMC annually.

  - Self-help applications are for personal safety and comfort within the workplace and as such will be made only to small areas. Applications to an entire building or armory do not qualify as self-help. If a large portion of the facility requires treatment, a contracted pesticide applicator is needed.

  - Food preparation areas are NOT to be treated with self-help applications. Kitchens and related areas require professional treatment.

SELF-HELP PRODUCTS:

Product description	Brand name examples	Active ingredient (s)
Cockroach bait station	Combat Quick Kill	Fipronil
Ant bait station	MaxForce Ant Bait	Fipronil
Ant bait	Advance Dual Choice Amdro Fire Ant Bait	N-ethyl perfluorooctane sulfonamide
	Amdro Fire Ant Bait	Hydramethylnon
Aerosol insecticide	Kill Zone House & Garden Insect Killer Formula 3	D-trans Allethrin, 0.15%, and Resmethrin, 0.2%
	PT 565 Plus XLO	Pyrethrin
Wasp spray	PT 515 Wasp Freeze and Hornet Killer	pyrethrin, allethrin, d-phenothrin, or resmethrin
	Wasp Stopper II Plus	
Boric acid (roach killer)	Roach Kill	boric acid
Roach trap	Mr. Sticky	NA
Rodent glue trap	Victor Holdfast	NA
Roundup Weed & Grass Killer Ready-to-Use Plus	Roundup Week & Grass Killer Ready-to-Use Plus	Glyphosate and Pelargonic acid
Spring mouse trap	NA	NA
Fly swatter	NA	NA
Indoor Fly Catcher, cylindrical sticky trap	NA	NA
Insect Fly Catcher, sticky strips	NA	NA

For more information on self-help applications, contact the PMC.

APPROVED PESTICIDES FOR USE
ON TENNESSEE ARMY NATIONAL GUARD PROPERTIES

Generic formulations of identical chemical composition may be substituted for these trade-name approved pesticides.

Product Name	Chemical Name	% of A.I.	EPA #
Mosquito - Larvae			
Agnique MMF	POE isooctadecanol	100	53263-28
Altosid	S-Methoprene	8.62	2724-375
Altosid LL	S-Methoprene	20	2724-446
Altosid Pellets	S-Methoprene	4.25	2724-448
Altosid XR	S-Methoprene	2.1	2724-421
Bactimos Briquets/Mosquito Dunks	Bti	10.31	6218-47
Vectolex-CG	Bacillus sphaericus	7.5	73049-20
Mosquito - Adults			
Aqua-Reslin	Permethrin Piperonyl butoxide	20 20	432-796
Bio-Mist 1.5 + 7.5	Permethrin Piperonyl butoxide	1.5 7.5	8329-40
Fyfanon	Malathion	96.5	67760-34
Kontrol 4,4	Permethrin Piperonyl butoxide	4.6 4.6	73748-4
Mosquito Beater	Naphthalene Butoxypolypropylene glycol	4.5 0.5	4-123
Permanone 10%EC	Permethrin	10	432-1132
Scourge 4+12	Resmethrin Piperonyl butoxide	4.14 12.42	432-716
ULD BP-100	Pyrethrin Piperonyl butoxide Octacide-264	1 2 2.94	499-452
ULD BP-300	Pyrethrin Piperonyl butoxide Octacide-264	3 6 10	499-450
Fire Ants			
Amdro Pro	Hydramethylnon	0.73	241-322
Avenger	Deltamethrin	0.05	40208-6
Award Fire Ant Bait	Fenoxcarb	1	100-722
Chipco Top Choice Fire Ant Bait	Fipronil	0.0143	432-1217
Maxforce Fire Ant Bait	Hydramethylnon	1	432-1265
Filth Flies			
Golden Malrin	Methomyl Muscamone	1.1 0.049	2724-274
Stimukil Fly Bait	Methomyl Muscamone	1 0.04	53871-3

Product Name	Chemical Name	% of A.I.	EPA #
Termites			
Bora-Care	Boron sodium oxide	40	64405-1
Dursban TC	Chlorpyrifos	44.9	62719-47
Premise 75	Imidacloprid	75	3125-455
Termidor 80WG	Fipronil	80	7969-209
Termidor SC	Fipronil	9.1	7969-210
Tim-Bor Professional	Boron sodium oxide	98	64405-8
Bees & Wasps			
Prescription Treatment Wasp-Freeze	D-Phenothrin D-trans-Allethrin	0.12 0.129	499-362
General Arthropod Control			
Advance Ant Bait	Abamectin	0.011	499-370
Borid	Boric acid	99	9444-129
Catalyst	Propetamphos	18.9	2724-450
CB-80 Extra	Pyrethrin Piperonyl butoxide	0.5 4	9444-175
Cynoff EC	Cypermethrin	24.8	279-3081
DeltaDust	Deltamethrin	0.05	432-772
DeltaGard G	Deltamethrin	0.1	432-836
Demand CS	Lamda-cyhalothrin	9.7	100-1066
Demon EC	Cypermethrin	25.3	100-1004
Drax Ant Bait	Boric Acid	5	9444-131
Drione	Pyrethrin Piperonyl butoxide Silica gel	1 10 40	432-992
Dual Choice Ant Bait	Sulfluramid	0.5	499-459
Gentrol Point Source	Hydropene	90.6	2724-469
Kicker	Pyrethrin Piperonyl butoxide	6 60	432-1145
Maxforce Gel	Hydramethylnon	2.15	432-1254
Maxforce Roach Bait	Fipronil	0.05	432-1460
Niban Bait	Boric acid	5	64405-2
Nylar IGR	Nylar	1.3	11715-307-57076
PCO Fogger	Nylar Belmark Prallethrin	0.6 0.1 0.04	9444-168
Perma-Dust	Boric acid	35.5	499-384
PI Contact	Pyrethrin Piperonyl butoxide	0.5 4	499-444
Precor Plus Fogger	Permethrin	0.58	2724-454
PT565 Plus XLO	Pyrethrin Piperonyl butoxide Octacide-264	0.5 1 1	499-290
R Value's Roach Kill	Boric acid	99	9444-130
Saga WP	Tralomethrin	40	432-755
Sevin 80S	Sevin	80	264-316

Product Name	Chemical Name	% of A.I.	EPA #
General Arthropod, Cont.			
Suspend SC	Deltamethrin	4.75	432-763
Tempo SC Ultra	Cyfluthrin		3125-498
Tempo 20WP	Cyfluthrin		3125-377
ULD BP-100	Pyrethrin Piperonyl butoxide Octacide-264	1 2 2.94	499-452
ULD BP-300	Pyrethrin Piperonyl butoxide Octacide-264	3 6 10	499-450
Ultracide	Nylar Pyrethrin Permethrin Octacide-264	0.1 0.05 0.4 0.4	499-404
Zero-In 797-A	Pyrethrin Piperonyl butoxide Silica gel	1 10 40	432-992-70799
Rodents and Other Vertebrates			
Contrac Rodenticide	Bromadiolone	0.005	12455-69
Ditrac Blox	Diphacinone	0.005	12455-80
Fastrac Pacs	Bromethalin	0.01	12455-97
Final All-Weather Blox	Brodifacoum	0.005	12455-89
Talon-G Pellets	Brodifacoum	0.005	100-1052
WeatherBlok XT	Brodifacoum	0.005	100-1055
4-the-Birds	Polybutene	93	8254-5-56
All Vegetation – Bare Ground			
Arsenal	Imazapyr	27.6	241-273
Escort	Metsulfuron	60	352-439
Hyvar XL	Bromacil	21.9	352-346
Krovar IDF	Bromacil Diuron	40 40	352-505
Oust XP	Sulfometuron	75	352-601
Outrider	Sulfosulfuron	75	524-500
Reward Aquatic Herbicide	Diquat dibromide	37.3	100-1091
Round-up Pro	Glyphosate	41	524-475
Round-up Ultra	Glyphosate	41	524-475
Round-up UltraDry	Glyphosate	71.4	524-504
Sahara DG	Imazapyr Diuron	7.78 62.22	241-372
Pre-emergent Herbicide			
Balan 2.5G	Benfluralin	2.5	62179-96
Banvel + 2,4-D	Dicamba 2,4-D	12.4 35.7	66330-287

Product Name	Chemical Name	% of A.I.	EPA #
Pre-emergent, Cont.			
Gordon's Pro Turf & Ornamental Barrier	Dychlobenil	4	2217-675
Surflan A.S.	Oryzalin	40.4	70506-44
MSMA	Monosodium methanearsonate	47.6	19713-42
Pennant (grasses)	S-Metolachor	83.7	100-950
Selective Post-emergent			
MSMA (grasses)	Monosodium methanearsonate	47.6	19713-42
Poast (grasses)	Sethoxydim	18	7969-58
Gordon's Pro Trimec Plus (broadleaf)	Dicamba MSMA 2,4 D Mecoprop-p	1.46 18 5.83 2.93	2217-808
Cool Season Grasses			
Plateau	Imazipic-ammonium	23.6	241-365
Plant Growth Regulator			
Cutless 50W	Flurprimidol	50	67690-15
Embark	Mefluidide	28	2217-759
Primo	Cimectacarb	12	100-729
Brush & Forestry			
Accord Site Prep	Glyphosate	41	62719-322
Arsenal	Imazapyr	27.6	241-273
Garlon 3A	Triethylamin triclopyr	44.4	62719-37
Garlon 4	Butoxyethyl triclopyr	61.6	62719-40
Escort	Metsulfuron	60	352-439
Oust XP	Sulfometuron	75	352-601
Round-up Pro	Glyphosate	41	524-475
Tordon K	Picloram	24.4	62719-17
Velpar L	Hexazinone	25	352-392
Velpar ULW	Hexazinone	75	352-450
Aquatic Weeds & Algae			
Aquashade	Acid Blue 9 Acid Yellow 23	23.63 2.39	33068-1
Cutrine Ultra Algaecide	Copper	9	8959-53
Reward	Diquat dibromide	37.3	100-1091
Rodeo	Glyphosate	53.8	62719-324
Sonar AS	Fluoridone	41.7	67690-4
2,4-D amine 4	2,4-D	47.3	1381-103

Pest Control Treatment Record

(Have the contractor fill this form out or provide a printed receipt providing all information.)

Site:_____ Treatment Date:_____

Location of Treatment:_____

Type of Pest Problem:_____

Indicators of Pest Problem:_____
(What did you observe and where? Number of pests seen, signs of damage,…)

Chemical Pesticide/Herbicide Application
Pest control contractors must be state-certified for commercial application – include copy of certification if not on file with contract.

Pesticide/Herbicide Trade Name:_____

EPA Registration Number:_____

Active Ingredient(s) and % Concentration: _____ _____%

_____ _____%

_____ _____%

Quantity of Concentrate Used (if applicable):_____

Quantity of Finished Pesticide Applied:_____

% Active Ingredient as Applied:_____%

Size of Treated Area: _____

Application Rate:_____

Applicator Name:_____ Certification #_____

Man Hours Used:_____ Category(s)_____

Pest Control Company:_____ License #_____

Maintain copies of this form on site.
Send copies quarterly to: TNARNG
Attn: Laura Lecher
Milan Training Site
325 Arsenal Lane
Milan, Tennessee 38348-2605
Or Fax: (731)222-5323

For more information call: (731)222-5321 or email: Laura.Lecher@us.army.mil

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APPENDIX I

Annual Review of the INRMP

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INRMP ANNUAL REPORT

To:

From:

Subject: ARNG Annual Report on Implementation Status of the Integrated Natural Resource Management Plan (INRMP)

Date:

Reporting Period:
(Period report covers, i.e. 1 May 06 – 1 May 07.)

Annual Coordination Meeting: *(Identify the date and attendees of annual coordination. Indicate if this correspondence will be used in lieu of 'face-to-face' meetings. Use the following headers to document review findings)*

Program Overview: *(Short paragraph addressing the goals and objectives of the plan, the status of the mission requirements relative to the current plan and the issue of "no net loss" to training.)*

Current Implementation Status: *(List all projects for the current reporting period, those completed or on-going, and those that were planned but not initiated. Also indicate if any projects were rescheduled and the proposed new timeline. If a table is already available, paste in or submit as separate sheet and reference here.)*

Proposed Implementation: *(List all projects and actions planned for the next reporting period. If a table is already available, paste in or submit as a separate sheet and reference here.)*

Installation Personnel: *(List by title natural and cultural resource management personnel involved with implementation of the INRMP.)*

USFWS Regional Office Contact Information: *(Enter Point of Contact and contact information.)*

USFWS Field Office Contact Information: *(Enter Point of Contact and contact information.)*

State Fish and Game Agency Contact Information: *(Enter Point of Contact and contact information as applicable. Include all agencies or division involved.)*

APPENDIX J

Upcoming INRMP Natural Resources Projects

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Upcoming Natural Resources Projects for INRMP

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

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

Table J-1: VTS-C natural resource goals, objectives, targets and predicted implementation years for each management sphere.

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method[2]	Proponent [3]	Status	STEP Project Number
1. Ecosystem Management	**Goal 1**	**Provide the ecosystem types needed for training.**						
	1-1	**Manage for mission-suitable habitats or "missionscape".**						
	1a	Missionscape statement review and update	R	Annual	IH	ENV	Ongoing	N/A
	1b	Missionscape plan review and update	R	Annual	IH	ENV	Ongoing	N/A
	1c	Develop mgmt. actions to improve mission habitats.	R	As need	IH	ENV		As need
	Goal 2	**Maintain or improve ecosystem, habitat, and species diversity.**						
	1-2	**Identify ecotypes present on the training site and maintain up to date information regarding those systems.**						
	1d	Vegetation community planning level survey every 10 years	R	2022	C $40,000	ENV		TNONG190004
	1e	Wetland survey to include quality assessment every 10 years	R	2022	C $58,000	ENV	Complete	TNONG160007
	1f	Surface water quality assessment every 5 years	R	2020	C $30,000	ENV		TNONG190003
	1-3	**Characterize the species composition, ecosystem health, and wildlife use of the significant habitats on VTS-C.**						
	1g	RTE planning level survey (PLS) every 5 years.	R	2019	C $96,600	ENV		TNONG180001
	1h	Bat PLS survey every 5 years.	R	2021	C $80,000	ENV	Complete 2017	TNONG160010
	1i	Avian PLS every 5 years.	R	2018	C $37,500	ENV	In prog.	TNONG160005
	1j	Insect baseline survey then every 5 years.	N	2018	C $38,000	ENV	In prog.	TNONG160002
	1k	Aquatic fauna PLS every 5 years.	R	2020	C $50,000	ENV		TNONG190003
	1l	Mammal survey every 10 years	R	2025	C $25,000	ENV		TNONG160004
	1m	Herpetofauna survey every 10 years	R	2025	C $35,000	ENV		TNONG160004
	Goal 3	**Protect unique communities.**						
	1-4	**Develop management strategies to protect ecotypes/habitats of importance**						
	1n	Map and priority list of extant ecosystems	N	2022	IH	ENV		N/A
	1o	Identify threats to significant habitats.	N	Annual	IH	ENV	Ongoing	N/A
	1p	Collect threat and training use details	N	2022	IH	ENV	Ongoing	N/A
	1q	Habitat protection plan development	N	2023	IH	ENV		N/A
	1-5	**Manage for ecosystem health, wildlife, and improved habitat quality**						

[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] Probable method of conducting project: C = contract; IH = in-house; OA = Outside Agency. Cost is estimate only and is not guarantee of available funding.
[3] Party responsible for funding and/or conduct of action: ENV = environmental office; FAC = facilities maintenance funds; ITAM = training funds; SITE = training site staff.

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method[2]	Proponent [3]	Status	STEP Project Number
	1r	Eliminate invasive species where feasible	R	Ongoing	IH	ENV	In prog.	TNONG160011
	1s	Implement conservation/restoration of natural vegetation communities.	R	As Needed				As need
	1t	Identify locations for native species restoration	N	2022	IH	ENV		N/A
	1u	Develop restoration plan	N	2023	IH	ENV		N/A
	1v	Implement restoration plan when feasible	N	As Needed	IH	ENV		As need
	1w	Institute prescribed fire to meet management needs	R	As feasible		ENV		TN255180001
	1x	Implement measures of biodiversity to evaluate habitat health	R	As feasible	IH	ENV		N/A
2. RTE Management	**Goal 1**	**Monitor, maintain, and enhance large-flowered skullcap populations on VTS-C**						
	2-1	**Quantify and monitor groups of large-flowered skullcap on VTS-C.**						
	2a	Large-flowered skullcap annual monitoring	N	Annual	IH	ENV		TN255060001
	2b	Annual report of skullcap population condition	N	Annual	IH	ENV		N/A
	2c	Re-evaluate & update monitoring protocol annually	R	Annual	IH	ENV		N/A
	2-2	**Protect the large-flowered skullcap on VTS-C.**						
	2d	Maintain a posted perimeter around skullcap groups	R	Ongoing	IH	ENV		TN255060018
	2e	GPS group boundaries and adjust signs every 5 years	R	2020	IH	ENV		TN255060018
	2f	Adjust sign positions around groups as needed	R	As need	IH	ENV		N/A
	2g	Update posters and training materials as needed	R	As need	IH	ENV		N/A
	2h	Maintain communication with GDNR & USFWS including consultation on major actions as needed	R	Ongoing	IH	ENV		TN255060019
	2i	Develop protection protocols as needed	R	As need	IH	ENV		N/A
	2-3	**Investigate management alternatives and their impacts.**						
	2j	Work with Universities and other researchers to further skullcap knowledge as needed.	R	As needed	IH & Others	ENV		As need
	2k	Prescribed burning study results/report	N	When feasible	IH	ENV		See Target 1w
	2l	IPP control protocol development and study results/report when feasible	N	When feasible	IH	ENV		N/A
	2m	Test mgmt. practices that could improve skullcap habitat in cooperation with USFWS when feasible	N	When feasible	IH	ENV		As need

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method [2]	Proponent [3]	Status	STEP Project Number
	2n	Participate in the large-flowered skullcap working group	N	Annual	IH	ENV	Ongoing	N/A
	2o	Develop a Conservation Management Agreement with USFWS & GDNR to help meet meat delisting requirements	N	2019	IH	ENV	In prog.	N/A
	Goal 2	**Monitor, maintain, and enhance federally listed bat species and their populations on VTS-C.**						
	2-4	**Monitor and characterize use of federally listed bat species on VTS-C.**						
	2p	Survey bat species every 5 years (same as Target 1h)	1h	2021	See 1h	ENV		See Target 1h
	2q	Radio-track bats during surveys to identify roosts/hibernacula when feasible	R	When feasible		ENV		See Target 1h
	2r	Survey bats at roosts/hibernacula if found, as needed	N	As needed	IH & other agencies	ENV		As need
	2s	Survey with protocol incorporating Indiana bat protocol requirements as needed (Target 1h)	1h					See Target 1h
	2t	Protect tricolor bat hibernaculum with fence and signage	N	2019	IH, $10,000	ENV		TN255190001
	2u	Protect tricolor bat hibernaculum entrance and internal conditions through restricted timber harvest and prescribed fire.	n	2019	IH	ENV		N/A
	2-5	**Protect and enhance populations of federally listed bat species on VTS-C.**						
	2v	Develop/update an RTE bat management plan	N	2020	IH	ENV	Complete	Complete
	Goal 3	**Prevent accidental take of federally listed species and ensure ESA compliance.**						
	2-6	**Quantify and monitor populations of state and federal RTE species on VTS-C.**						
	2w	RTE PLS every 5 years, (same as Target 1g)	1g	2019	See 1g	ENV		See Target 1g
	2x	Eastern hellbender and habitat survey.	N	2021	Other agency	ENV	Hab. Comp.	N/A
	2y	Develop mgmt. plans and monitoring protocols for new RTE species as needed.	R	As needed	IH	ENV		N/A
	2z	Regular communication with GADNR & USFWS, including consultation on major projects (Target 2h)	2h	As needed	See 2h	ENV		See Target 2h
	Goal 4	**Maintain or enhance native plant communities that support listed species.**						
	2-7	**Identify and manage native plant communities currently or potentially supporting RTE species.**						

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method [2]	Proponent [3]	Status	STEP Project Number
	2aa	Develop community-based RTE habitat mgmt. plans as needed	N	As needed	IH	ENV		N/A
	2ab	Control invasive plants where impacting RTE habitats as needed	N	As needed	IH	ENV	In prog.	TNONG160011
	2ac	Monitor community health through long-term vegetation monitoring (in conjunction with 1d)	N	2023	IH	ENV		See Target 1d
3. Reclamation / Mitigation	**No projects at this time.**							
4. Erosion control	**Goal 1**	**Prevent, identify, and minimize the development of erosion and sedimentation problems on VTS-C.**						
	4-1	**Prevent erosion issues from occurring.**						
	4a	BMP training module	N	2013	IH $1,000	ENV		Complete
	4b	Develop erosion repair guide	N	2012	IH $2,000	ENV		Complete
	4-2	**Identify and minimize potential erosion problems early on**						
	4c	Monitor for potential erosion issues during regular site visits	R	Ongoing		ENV		N/A
	4d	Develop reporting form for soldiers and staff	N	2019	IH	ENV		N/A
	4e	Place reporting form on ENV website for easy access	N	2019	IH	ENV		N/A
	4f	Erosion report tracking system	N	2019	IH	ENV		N/A
	4g	Annual erosion surveys	R	Annual	IH	ENV/SITE		N/A
	Goal 2	**Identify and rehabilitate existing erosion problems.**						
	4-3	**Repair identified/existing erosion issues.**						
	4h	Coordinate repair of erosion issues (typically facility responsibility) including plan development	R	Ongoing		ENV/Site		N/A
	4i	Implement erosion control methods in plan	R	As Needed		ENV/Site		N/A
	4j	Revegetate erosion sites in accordance with plan	R	As Needed		ENV/Site		TN255110002 Tiger Creek
	4-4	**Restore sections of Tiger Creek streambank that are badly eroded/sloughing.**						
	4k	Complete restoration plan development.	N	2020	IH	ENV	In process	N/A
	4i	Revegetate streambanks in accordance with plan	N	2013/14	IH/C OT $20,000	ENV		TN255110002 Tiger Creek
5. Watershed Management	**Goal 1**	**Improve understanding of ecosystem dynamics and stressors within watersheds.**						
	5-1	**Improve knowledge of riparian areas and their conditions.**						

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method[2]	Proponent [3]	Status	STEP Project Number
	5a	Conduct vegetation community and aquatic fauna surveys as noted in Section 4.2.1	1d & 1k	2022 & 2020		ENV		See Targets 1d & 1k
	5b	Survey streams as part of regular erosion surveys as noted in Section 4.2.4	4g	Annual	IH	ENV		N/A
	5c	Implement water quality monitoring every 5 years	1f	2020	C	ENV		TNONG190003
	Goal 2	**Minimize nutrient, sediment, and non-point source pollution entering streams.**						
	5-2	**Improve buffering quality of the riparian areas**						
	5d	Riparian habitat assessments	N	2019	IH $5,000	ENV		TNONG160009
	5e	Restore degraded buffers with appropriate native vegetation, as needed	R	As needed		ENV		N/A
	5f	Repair erosion and sedimentation problems as identified, in accordance with Section 4.2.4	R	As needed		ENV		N/A
	5g	Control invasive species in the riparian communities	R	Ongoing	Funds Available	ENV		TNONG160011
	5h	Monitor riparian ecosystems to determine effects of management (Section 4.2.11)	1d, R	2022		ENV		See Target 1d
	5-3	**Protect shoreline of Tiger Creek and all riparian areas from potential causes of erosion.**						
	5i	Restrict all vehicular traffic in SMZ	R	Ongoing	IH	ENV		N/A
	5j	Post SMZs and maintain biennially	N	2019	IH $5,000	ENV	Ongoing	TNONG180004
	5k	Maintain SMZs during timber harvest and clearing	N	As need	IH	ENV		N/A
	5l	SMZ training module	N	20121	IH $1,000	ENV		Complete
	Goal 3	**Improve trout habitat quality throughout VTS-C streams.**						
	5-4	**Improve water quality for trout habitat**						
	5m	Measure trout habitat/water quality in conjunction with regular water quality assessment every 5 years	1f	2020		ENV		See Target 1f
	5n	Develop and implement plans for improving stream habitat as needed.	As needed		IH	ENV		N/A
6. Wetlands Protection	**Goal 1**	**Manage for healthy resilient wetlands with no net loss of acreage, function, or values.**						
	6-1	**Improve knowledge of existing wetlands and their conditions.**						
	6a	Wetland surveys every to include assessment of quality every 10 years as noted in Section 4.2.1.	1e	2022		ENV		See Target 1e
	6b	Wetland floristic study	1d	2022		ENV		See Target 1d
	6c	Wetland fauna study	1k	2020		ENV		See Target 1k
	6-2	**Implement and enforce buffer areas around wetlands.**						
	6d	Post signs identifying 50’ buffer zones	R	2019	IH $3,000	ENV		TNONG180004

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method [2]	Proponent [3]	Status	STEP Project Number
	6e	Identify areas around wetlands requiring vegetative buffer or filter strip for protection	R	Ongoing		ENV		N/A
	6f	Buffer zone vegetative/compliance assessment	N	2019	IH	ENV		N/A
	6g	Wetland buffer training module	C	2019	IH	ENV		N/A
7. Forest Management	**Goal 1**	**Provide optimum forestland training opportunities for TNARNG.**						
	7-1	**Improve training areas by selected timber harvesting techniques.**						
	7a	Consult with training site staff	C	Annual	IH	ENV		N/A
	7b	Identify appropriate management practices to create desired training conditions, as needed.	R	As needed	IH/COE	ENV		N/A
	7c	Implement timber management to support training, as needed.	R	As needed	IH/COE	ENV		N/A
	Goal 2	**Manage for forest health, and habitats of RTE, wildlife, and native plant species and communities.**						
	7-2	**Maintain needed forest information.**						
	7d	Repeat forest inventory every 10 years.	R	2024	C $54,000	ENV		TN255160001
	7e	Conduct PLSs as noted in Section 4.2.1	R	Ongoing	Variable	ENV		See Targets 1d-1m
	7-3	**Improve forest health and habitat quality.**						
	7f	Review inventory and PLS data and update forest management plan	R	As needed	C	ENV		N/A, Program On Hold
	7g	Perform timber stand improvement activities.	R	As need	C	ENV		N/A
	7h	Conduct prescribed burning when feasible	R	When feasible	C	ENV		See Target 8f
	7i	Control invasive exotic species where needed IAW Annex 3	R	As need	IH/C	ENV		N/A
	7j	Maintain appropriate stand conditions near waterways	R	As need	IH	ENV		N/A
	7k	Monitor changes to biodiversity and species composition through long-term vegetation monitoring	1d	2022		ENV		See Target 1d
8. Fire Management	**Goal 1**	**Control and minimize threats to property and personnel associated with wild and prescribed fire.**						
	8-1	**Ensure effective fire break system.**						
	8a	ID additional fire break needed	C	2018	IH & C	ENV, FAC		In Progress
	8b	Create firebreaks where and when needed	C	Ongoing	IH	ENV, FAC		N/A
	8c	Maintain firebreaks as needed.	C	Ongoing	FAC	ENV, FAC		N/A
	8-2	**Implement prescribed fire program.**						

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method [2]	Proponent [3]	Status	STEP Project Number
	8d	Obtain required training for TNARNG personnel	C	Annual	IH & Partners	ENV, FAC		N/A
	8e	Obtain equipment required for prescribed burning	C	Annual	IH	ENV		N/A
	8f	Coordinate with GAFC or others for burn boss and to conduct prescribed burns when needed.	C	As need	IH	ENV		TN255180001
	8g	Conduct post-burn evaluations and monitoring	C	Annual	IH	ENV		N/A
	8h	Review and update WFMP annually, revise every 5 years	C	Annual & 2022	C $47,000	ENV		TNONG160001
9. Fish & Wildlife Management	**Goal 1**	**Maintain fish and wildlife populations through maintenance of healthy vegetative communities, habitats, and ecosystems.**						
	9-1	**Gain updated and complete data on wildlife use of VTS-C.**						
	9a	Perform PLSs for species groups as outlined in Section 4.2.1.	C	Ongoing	IH & C	ENV		See Targets 1g-1m
	9-2	**Manage habitats for all native species.**						
	9b	Maintain SMZs and wetland buffers	R	Ongoing	IH	ENV		See Target 6d
	9c	Install nest boxes and maintain annually as needed	R	As need	IH	ENV		N/A
	9d	Restore grasslands to native plants where feasible. See Section 4.2.1.	R	Where feasible	IH	ENV		N/A
	9e	Monitor vegetation community condition through PLS. See Section 4.2.1.	1d	2022	C	ENV		See Target 1d
	9f	Implement vegetative community/habitat management actions as needed.	R	As need	IH	ENV		N/A
	9g	Wildlife training module	C	2013	IH $1,000	ENV		Completed
	9-3	**Manage animal pests to protect training land availability, ecosystem health, and RTE species.**						
	9h	Conduct population counts for deer, beaver, feral hog or other species as needed.	R	As need	IH	ENV		N/A
	9i	Consult with GADNR on species carrying capacity	R	As need	IH	ENV		N/A
	9j	Implement population control when needed	R	As need	Out agency & C	ENV		N/A
10. Pest Management	**Goal 1**	**Ensure pest management on VTS-C accomplishes the intent and requirements of the TNARNG IPMP.**						
	10-1	**Implement the TNARNG IPMP**						
	10a	Accomplish required pesticide application reporting.	N	Quarterly	FAC	ENV		N/A
	10b	Review program to ensure legal compliance.	N	Annual	IH	ENV		N/A
	10c	Review program for proper IPMP procedures are followed.	N	Annual	IH	ENV		N/A
	Goal 2	**Control animal and plant pests as needed to achieve training and environmental objectives.**						

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method [2]	Proponent [3]	Status	STEP Project Number
	10-2	**Control IPP for ecosystem health.**						
	10d	Invasive pest plant survey every 5 years	R	2012	C $35,000	ENV		TNONG160006
	10e	Implement appropriate pest plant control plans	R	As need	IH/C	ENV		N/A
	10f	Monitor IPP change through long-term vegetation monitoring	C	2022	C	ENV		See Target 10d
	10-3	**Control pest species for training area improvement.**						
	10g	Identify problem IPPs and develop control plans	R	As need	IH	ENV		N/A
	10h	Implement control plans.	R	As need	FAC	ENV/FAC		N/A
	10i	Monitor IPP change through long-term vegetation monitoring	C	2022	C	ENV		See Target 10d
	10-4	**Control pests for training site user safety and comfort.**						
	10j	Install and maintain bat boxes and bird nest boxes	C	Annual	IH	ENV		N/A
	10k	Annual fire ant survey	N	Annual	IH	ENV		N/A
	10l	Control pest animal populations as needed.	R	Ongoing	FAC	ENV		N/A
	10-5	**Control pest animals for the protection of natural communities and RTE species and to minimize loss of training land.**						
	10m	Monitor feral pig impacts through vegetation surveys	R	2022	C	ENV		See Targets 1d & 10d
	10n	Implement controlled hunting of feral pigs	R	As need	OA	FAC		As need
	10o	Monitor beaver population during stream erosion surveys	R	Annual	IH	ENV		N/A
	10p	Implement beaver trapping and dam removal	R	As need	OA	FAC		As need
11. Long-term Monitoring	Goal 1	**Use analyses of data collected through long-term vegetation plots to monitor effects of training and land management activities on VTS-C.**						
	11-1	**Develop and implement a vegetation monitoring program.**						
	11a	Develop vegetation monitoring protocol	C	2023	C	ITAM		N/A
	11b	Establish permanent vegetation monitoring plots	C	2024	IH	ITAM		N/A
	11c	Resample monitoring plots as appropriate	C	As need	IH	ITAM		N/A
12. Grounds Maintenance	Goal 1	**Apply environmentally beneficial grounds maintenance techniques to maintain an attractive and functional landscape that meets training and other TNARNG needs.**						
	12-1	**Utilize regionally native species for plantings whenever feasible.**						
	12a	Use native grasses to seed exposed soils when compatible with area use	R	Ongoing	IH	ENV		As need
	12b	Use native shrubs, trees, and wildflowers for aesthetic plantings	R	Ongoing	IH	ENV		As need
	12c	Develop native planting guide	N	2011	IH $500	ENV	Complete	Complete

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method[2]	Proponent [3]	Status	STEP Project Number
	12-2	**Blur the "edge" between maintained and natural areas.**						
	12d	Survey for transition areas needing improvement	C	Ongoing	IH	ENV		N/A
	12e	Develop and implement plans to improve transition zones where needed	C	Ongoing	IH	ENV		As need
	12-3	**Adjust maintenance schedule to benefit environment.**						
	12f	Create list of values impacted by ground maintenance and determine appropriate scheduling.	C	2022	IH	ENV		N/A
	12g	Modify maintenance calendar in INRMP to achieve needed protections.	C	2022	IH	ENV		N/A
13. Recreational Use Management	**No outdoor recreation permitted in down-range areas of VTS-C at this time.**							
14. Cultural Resources	**All aspects defined in TNARNG ICRMP.**							
15. GIS	**Goal 1**	**Maintain, update, and expand the GIS database to make accurate data available for training and management planning.**						
	15-1	**Maintain constantly improving GIS.**						
	15a	Identify the data layers captured and still needed.	C	Ongoing	IH	ENV		N/A
	15b	Update or create data layers as needed.	C	Ongoing	IH	ENV		N/A
	15c	Make data available through interactive web applications.	C	Ongoing	IH	ENV		Complete
	15d	Review contract wording as needed	C	As need	IH	ENV		As need
16. EMS	**EMS in development.**							
17. Climate Change	**Goal 1**	**Develop and implement a climate change response plan.**						
	17-1	**Conduct necessary research to predict likely local influences of climate change.**						
	17a	Review climate change predictions.	N	2022	IH	ENV		N/A
	17-2	**Develop and implement a climate change response plan**						
	17b	Determine which changes TNARNG can practically affect through management actions.	N	2022	IH	ENV		N/A
	17c	Identify functional approaches to manage change.	N	2022	IH	ENV		N/A
	17d	Develop a climate change management plan	N	2022	IH	ENV		N/A
	17e	Implement the climate change management plan.	N	2023	IH	ENV		As need
18. Pollinator Management	**Goal 1**	**Determine pollinator use and habitat condition on site.**						
	18-1	**Conduct necessary research to identify pollinators using the site, and the condition of their habitat.**						

Management Area	Targets (Objectives in Green) Structural Organization: Goals in Blue, supporting Objectives in Green, and their supporting targets in Black		Project Origin [1]	Year	Est. Cost& Method [2]	Proponent [3]	Status	STEP Project Number
	18a	Conduct a comprehensive survey of terrestrial macroinvertebrates.	N	2018	C $109,000	ENV		See Target 1j
	18b	Survey pollinator habitat conditions on site.	N	2022	IH			N/A & 1j
	Goal 2	**Develop and implement a pollinator management plan.**						
	18-2	**Develop and implement a pollinator management plan.**						
	18c	Identify specific issues with pollinator species composition and habitat conditions.	N	2022	IH	ENV		N/A
	18d	Identify appropriate and practicable management approaches to address identified issues.	N	2022	IH	ENV		N/A
	18e	Develop/implement pollinator management plan.	N	2023	IH	ENV		N/A

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Annex 1

RARE, THREATENED, AND ENDANGERED SPECIES MANAGEMENT PLAN

TABLE OF CONTENTS

Page

1.0 Large-flowered Skullcap 1-4
1.1 Background 1-4
1.2 Protection 1-4
1.3 Monitoring 1-7
1.4 Research 1-8
1.5 Assessment of Impacts on Large-Flowered Skullcap and Mitigation 1-12
2.0 Gray Bat 1-18
2.1 Background 1-18
2.2 Protection 1-19
2.3 Monitoring 1-19
2.4 Research 1-19
2.5 Assessment of Impacts on Gray Bat 1-19
3.0 Northern Long-Eared Bat 1-20
3.1 Background 1-20
3.2 Protection 1-21
3.3 Monitoring 1-22
3.4 Research 1-22
3.5 Assessment of Impacts on Northern Long-Eared Bat 1-22
4.0 Chickamauga Crayfish 1-22
4.1 Background 1-23
4.2 Protection 1-23
4.3 Monitoring 1-23
4.4 Research 1-23
4.5 Assessment of Impacts on Chickamauga Crayfish 1-23

The goals of TNARNG rare species management are straightforward: to protect or enhance populations of rare, threatened, or endangered (RTE) species, to minimize damage to individuals of those species, to maintain and enhance the native communities that support those species, and to remain in compliance with the Endangered Species Act.

To date, TNARNG has identified the large-flowered skullcap (*Scutellaria montana*), which is a federally listed threatened species; the gray bat (*Myotis grisescens*), which is federally endangered; the northern long-eared bat (*M. septentrionalis*), which is federally threatened; and the Chickamauga crayfish (*Cambarus extraneus*), which is Georgia state threatened, on VTS- Catoosa. The next RTE survey is scheduled for FY19. The survey may be initiated earlier if new information suggests it is needed (i.e., a new species from the region is listed as threatened or endangered or a population of a different RTE species which might occur on VTS-C is identified on neighboring land). This plan will be modified to include other species if any are found.

1.0 LARGE-FLOWERED SKULLCAP (*Scutellaria montana*)

The large-flowered skullcap was discovered on VTS-C in 2002, during a survey initiated at the suggestion of the USFWS. Almost 1600 individual plants were counted during that initial survey; they are most extensive on the western side of the training site, but a number of concentrations can be found elsewhere on the site (Figure A1-1).

The skullcap population has been broken down into 26 management groups based on geographic proximity and habitat similarity. Each management group contains at least one monitoring plot (see Section 1.3 below) established in 2004. Annual monitoring has been conducted from 2004 to present, with the only years missed being 2011 and 2014.

1.1 Background

Large-flowered skullcap is a member of the mint family (Lamiaceae) endemic to mature hardwood forests in northwest Georgia and southeast Tennessee. It flowers from mid-May to June, producing a few to many blue and white, two-lobed flowers on a plant. The U. S. Fish and Wildlife Service listed large-flowered skullcap as an endangered species in 1986. At that time there were seven populations known in Georgia and three in Tennessee. Over 90 % of the 7,000 plants known in 1986 occurred at only two sites (USFWS 1996). The USFWS defined a self-sustaining population as containing more than 100 plants. The species was reclassified (down-listed) to threatened in 2002, at which time 48 populations were known for a total of over 50,000 individual plants. Habitat alteration and destruction are considered the most significant threats to this plant.

1.2 Protection

There are a number of factors which pose a potential threat to the large-flowered skullcap: physical damage from human activity, soil disturbance from human activity, browsing or uprooting by wildlife, and wildfire. In order to minimize these threats, TNARNG will take certain steps:

1.2.1 Perimeter posting and mapping:
TNARNG has posted the perimeter of the large-flowered skullcap groups with signs (Figure 3.10 in Chapter 3 or see below) which include a statement of no access during March 1 to June 30 (flowering season) and foot traffic only during the rest of the year. These signs, in conjunction with training and environmental education efforts for the soldiers and training site personnel, should minimize unplanned, human-caused disturbance of the plants.

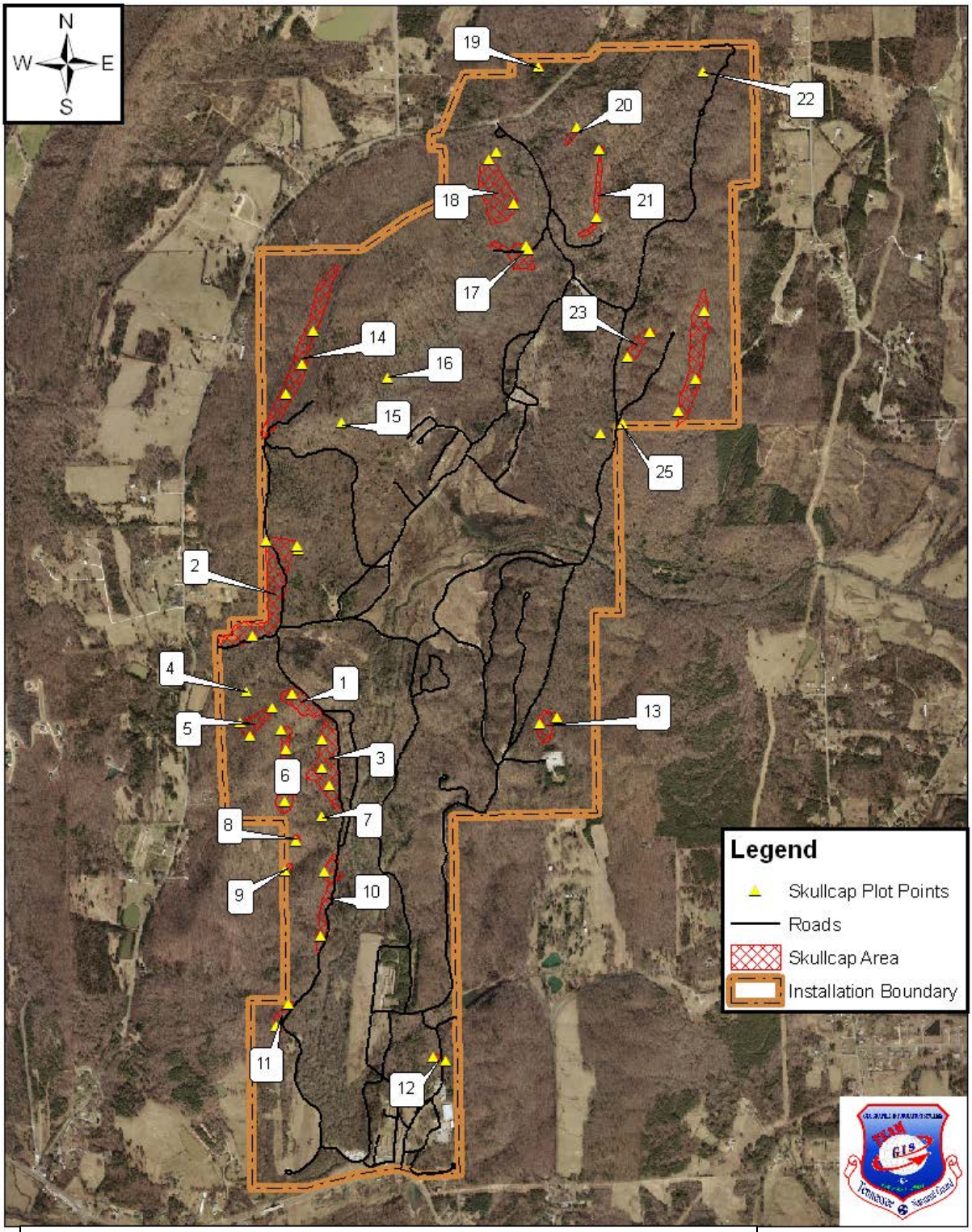


Figure A1-1: Location of large-flowered skullcap management groups at VTS-Catoosa.

The signs are easily seen and should discourage accidental vehicular traffic through known clusters of plants. The signs are generally spaced 50 to 65 m apart. Trees between pairs of signs along the edge of a skullcap group will be marked with yellow paint to provide a more continuous visual barrier. The perimeter around each management group is located just outside the existing plants (no "buffer" area) to minimize restrictions on training area, but will be updated annually to ensure the majority of the plants are within the protected boundary. To date, the spatial boundaries of the groups of plants have changed little from year to year, and it is expected that the locations of the buffer zones will remain relatively constant for the near future. The perimeter of each group has been recorded with GPS, and accurate maps can be produced for training or land management use.

A training module will be developed that explains the purpose behind these signs and provides basic information about the skullcap; this information will be presented to all training site users in their initial on-site briefing. Maps are also available to the training site staff and other users showing the location of the large-flowered skullcap to encourage avoidance of prime skullcap areas during sensitive periods.

1.2.2 Wildlife Control:

Herbivores can pose a threat to large-flowered skullcap. Through the monitoring program, a number of individual plants have been found that have been browsed. It is presumed that white-tail deer are responsible. Browsing does not appear to kill the plant but does limit flowering as the flower buds are typically on the portion that is eaten.

Feral hogs are a more substantial danger to the plant. Areas of disturbance indicative of hog rooting have been found within skullcap groups. It is presumed that hogs will feed on the perennial root of the skullcap and, therefore, could substantially impact the skullcap population.

Feral hog numbers on the training site have been controlled in the past through professional removal. If hog sightings or damage increase above acceptable levels, a project will be initiated to reduce their numbers. White-tailed deer are not currently controlled at VTS-C; there is no hunting on the training site. If monitoring results indicate that deer are significantly impacting the skullcap, a program will be developed to limit the numbers of deer.

An additional wildlife problem on VTS-C is a large population of beavers that are causing extensive flooding. This should not impact large-flowered skullcap, however: all skullcap populations are located at an elevation above those areas threatened by flooding.

1.2.3 Invasive Pest Plants Control:

Invasive exotic plants are becoming a problem throughout the world. Some large-flowered skullcap management groups do contain invasive plants (this information is collected as part of the monitoring described below). The principal problem species are Japanese honeysuckle and Chinese privet. At this time, the infestations do not appear to seriously impact the skullcap, but over time this status may change.

A program for control of these problem plants around the skullcap groups will be developed (see Research section below) in conjunction with the overall training site invasive species control plan.

In the vicinity of large-flowered skullcap management groups, herbicide use will be strictly controlled. Only chemicals which are not soil active and are unlikely to translocate will be applied to invasive plants within 50' of a skullcap management group. Applications will be made in the late fall after the skullcap has gone dormant, and application methods will be utilized which minimize the risk of chemical drift. Additional monitoring will track any changes to treated management groups, and the methodology will be revised if there appears to be any damage to the large-flowered skullcap.

1.2.4 Fire Protection:

Fire is a tool used for natural resources management on VTS-C. The tank range and other open grassland areas are burned regularly to control woody encroachment. Most of the forested areas on the training site are dominated by hardwood species, and so have not been burned regularly in the past. TNARNG has developed a prescribed burn plan for the purposes of fuel reduction and habitat improvement (see Annex 3).

Little is known about the susceptibility of large-flowered skullcap to fire. However, a transplant and prescribed fire study on VTS-C in 2011 gave some indication that they could actually benefit from fire (Kile H.M. 2011). There have also been similar indications from monitoring of populations burned by wildfires in one location in each Georgia and Tennessee. One research goal of the TNARNG is to address this lack of knowledge through experimentation (see Research section below). Further, USFWS has given TNARNG permission to allow light winter under-burns to go through skullcap areas. Whenever possible, fire lines will be made by removal of vegetation rather than by plowing, and will be located well outside of skullcap groups.

1.3 Monitoring

A monitoring protocol has been developed and implemented from FY04 to present. There were significant fluctuations in the plant counts in 2007 and 2008, likely due to drought. The monitoring program will be continued for several more years to track changes and provide data for consideration. The protocol will be reviewed and updated in FY2018.

The monitoring protocol is based on 10-meter radius circular plots. Forty-six of these plots have been established within the 26 management groups (at least one plot in each management group) (Figure A1-2). The number of permanent plots monitored annually was reduced to 20 with an additional 5 monitored every 3 years in 2015 due to budgetary, resource, and access constraints. The 25 plots were proportionally distributed among high, medium, and low density management groups of the population for best overall representation. The plots are not randomly located but are placed subjectively in areas known to contain skullcap plants. The plot centers are permanently marked and recorded via GPS for repeat sampling.

Monitoring is conducted during the flowering season for the large-flowered skullcap which begins in mid-May and runs into June with the peak usually in the end of May. Availability of flowers makes identification simpler and more accurate. Non-flowering specimens are also recorded, however.

Within each monitoring plot, the following information is recorded: each individual *S. montana* plant is identified and characterized in terms of number of stems, flowering/nonflowering, browse or insect damage indications, adult or juvenile (under 10 cm tall). The distance and bearing from the center point of the plot to each plant is measured, allowing mapping of plant locations. In addition, a habitat

description, associated plant species, threats, and evidence of disturbance are also noted for each plot. Figure A1-3 shows the datasheet used for recording this information.

Results from each year of monitoring will be compiled and comparisons made as multiple years' data become available. After a period of five years of monitoring, the trends at each monitoring plot (increasing, decreasing, minimal change) will be evident. At that time, the monitoring protocol will be evaluated and modified, if needed.

1.4 Research

There are a number of gaps in our knowledge of large-flowered skullcap, and TNARNG has a population suitable for study. Certain questions pertaining to management issues are of particular interest, and TNARNG ENV would like to address these questions experimentally with the assistance of USFWS, GADNR, and other interested cooperators.

1.4.1 Transplantation

Certain management groups are threatened by required or anticipated training site construction and other activities (see Section 1.5 below). There are security requirements for a fence and a 25 ft cleared buffer to surround the entire training site. Several management groups lie along this boundary and will be impacted by this clearing: 2, 9, 14, and 24. Other groups (17 and part of 18) fall in areas that will potentially be impacted by proposed range construction. TNARNG is interested in the possibility of transplanting individuals from threatened groups to other "safer" areas on the training site. TNARNG transplanted large-flowered skullcaps from one fence clearing site to another internal location in 2011 with success (Kile HM 2011). Large-flowered skullcap have been transplanted in the past onto the Chattahoochee National Forest with mixed results (Cindy Wentworth and Keith Wooster, personal comm.). More research is needed to clarify when transplantation will be successful, and will be implemented if other unavoidable situations arise.

Preliminary Protocol:

- Plants will be transplanted within their region on training site; i.e., group 9 plants will stay in the southwest cluster of management groups, group 17 plants will stay within 18-20-21 area.
- Appropriate habitat will be identified within 250 m of the existing group, out of danger of the construction or clearing project.
- Transplant sites will be as similar as possible to the original habitat in terms of slope, aspect, elevation, soil series, canopy cover.
- No more than ½ of a group's plants will be moved initially. A mix of both flowering adults and non-flowering juveniles will be moved. Plants will not be taken from within existing monitoring plots in the initial test.
- Plants will be marked with flags during flowering season.
    - Plants will be dug up either after seed set (July) and maintained in a greenhouse over winter or after initiation of dormancy (October) and transplanted immediately.
- As much soil as is feasible to transport will be dug up with each plant to preserve fine roots and mycorrhizal associations.
- Plants will be watered at transplanting to settle the soil, but will be subject to natural conditions after that.
- Transplant sites will be marked and individual plants mapped to allow monitoring of individual success.
- If the initial transplant success is reasonable, the remainder of the plants that are threatened by immediate military development will be relocated using the most successful methods.
- Plants will be monitored for at least 3 years.

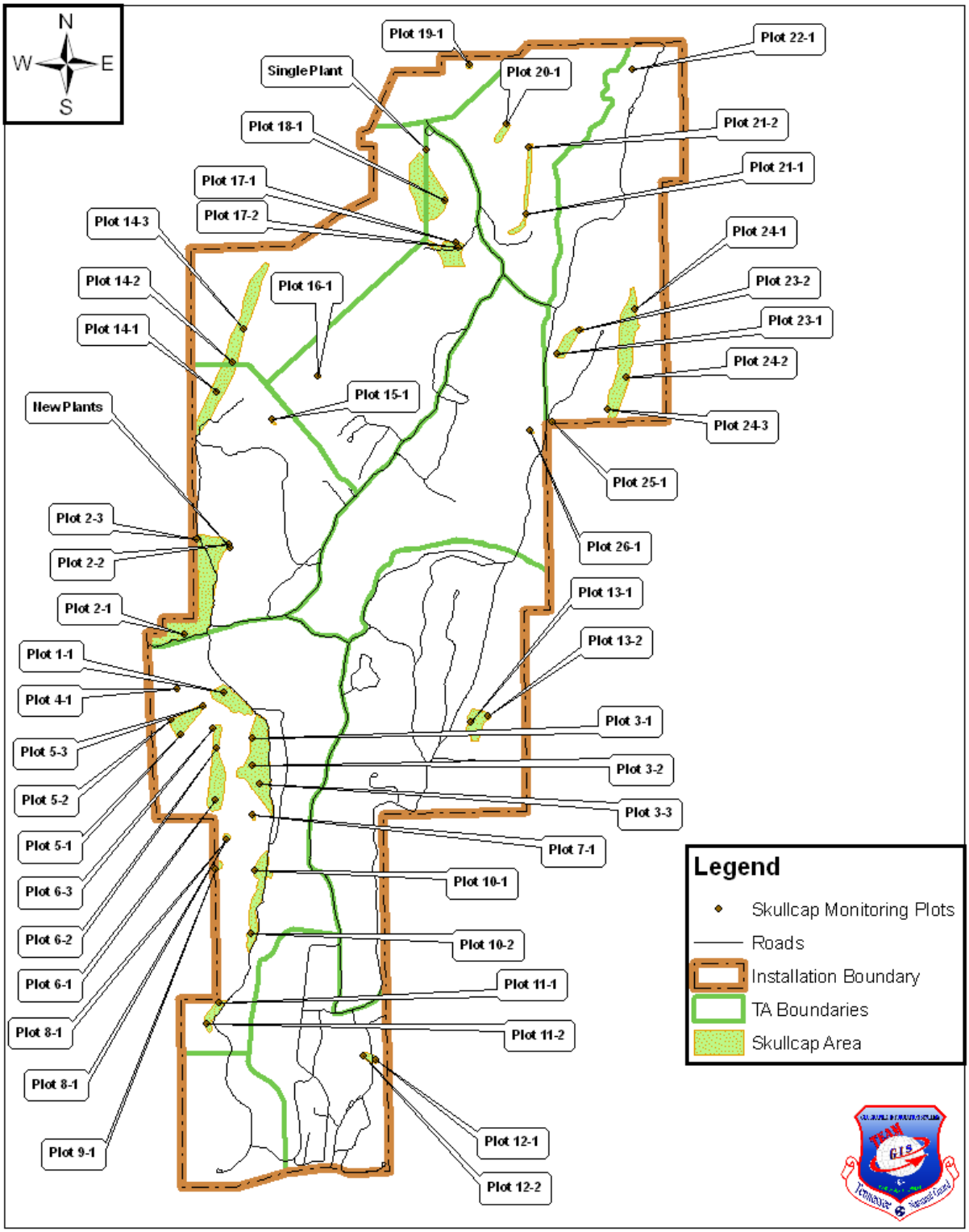
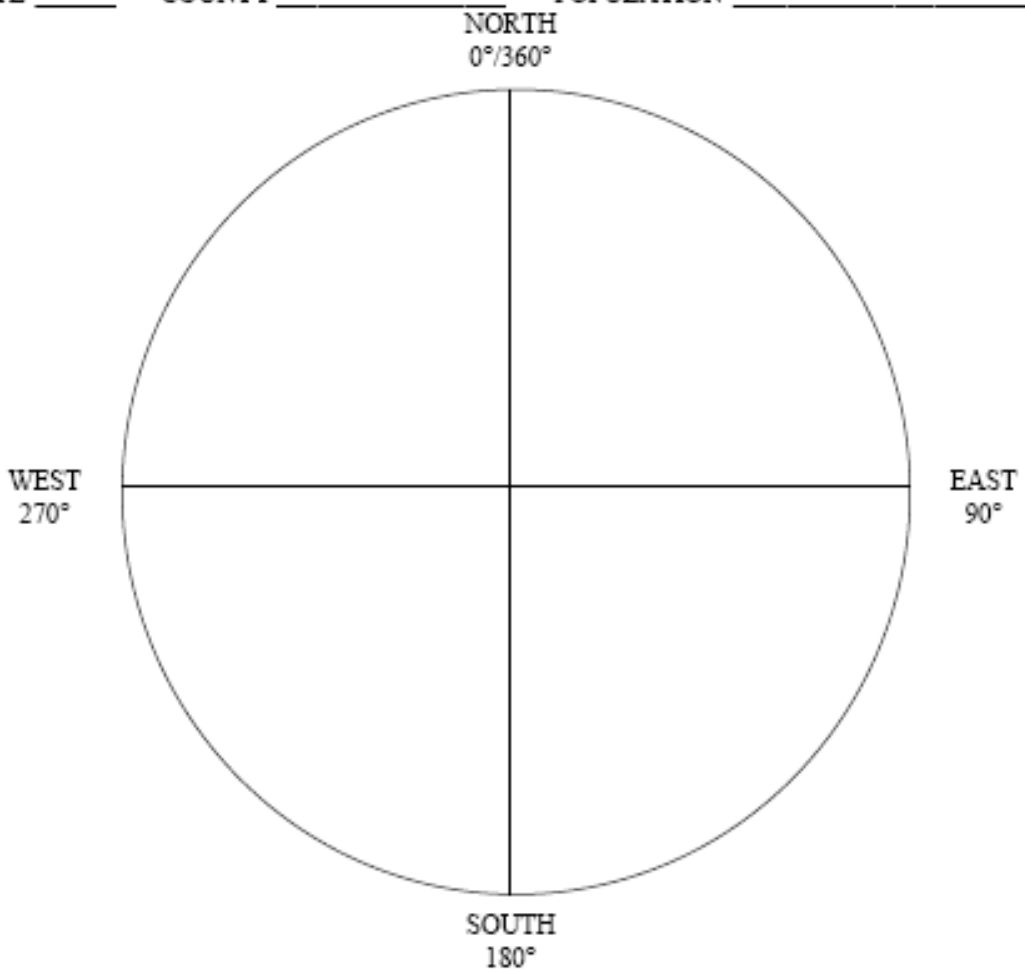


Figure A1-2: Large-flowered skullcap monitoring plot locations on VTS-Catoosa.

Scutellaria montana Monitoring Sheet

DATE _____ INVESTIGATORS _____
STATE _____ COUNTY _____ POPULATION _____



Plant #	# Stems	Flowers[1]	Dist[2]	Dir[3]	Plant #	# Stems	Flowers[1]	Dist[2]	Dir[3]	Plant #	# Stems	Flowers[1]	Dist[2]	Dir[3]
1					10					19				
2					11					20				
3					12					21				
4					13					22				
5					14					23				
6					15					24				
7					16					25				
8					17					26				
9					18					27				

Additional Comments _____

[1]: Plants in flower or not? (yes or no?); [2]: Distance in meters from the plot center; [3]: Compass bearing from the plot center

Figure A1-3: Monitoring datasheet for large-flowered skullcap.

Note: TNARNG will not depend on transplant success to maintain the skullcap population on VTS-C. If a large number of plants are to be destroyed by any given project, arrangements will be made for the greenhouse propagation of new plants, which will be transplanted into training site locations chosen in coordination with the USFWS.

1.4.2 Fire Impact

As noted above, prescribed burning is a tool that will be utilized for natural resources management on VTS-C, but there is currently limited understanding of the impacts of fire on large-flowered skullcap. Kile 2011 conducted a limited transplant and burn experiment on VTS-C and found some success with burning. Other observations from monitoring after wildfires in both Georgia and Tennessee found some benefits realized from burns. Experimental data is however very limited. It would be useful to know whether the skullcap can withstand occasional burning or whether all management groups within a burn area will always require protection. Information about the effect of burning at other locations in Georgia/Tennessee would assist in better understanding the effect of burning at VTS-C, but additional local experiments would ultimately provide the best information with little extrapolation needed. USFWS has given TNARNG permission to allow light winter under-burns to go through skullcap areas.

Preliminary Protocol:

- Large concentrations of large-flowered skullcap will be protected from prescribed fire, either by complete restriction on burning (training area 2 and populations within SMZs such as management group 24) or by construction of a temporary fire break surrounding the group with at least 50 feet of buffer.
- Certain groups will be allowed to burn on the rotation schedule recommended in Annex 3, Prescribed Burn Plan, for fuel control in the hardwood forests of the site.
- Groups which may be subject to burning are 12, 15, 16, 17, and 19. These are all small management groups – relatively low numbers of skullcap present – in areas that will be subject to fuel-control fires in accordance with the prescribed fire plan.
- Groups 15 and 16 fall within the tank range target area which is subject to burning every 2-4 years; groups 12, 17, and 19 will be burned on a 5-7 year rotation.
- All skullcap-impacting burns will be cool, dormant season burns.
- Pre- and post-burn sampling will assess fire weather, fire behavior, flame temperature, litter consumption and impacts on vegetation.
- Data from the permanent monitoring plots will be used to assess skullcap recovery in the years following the burn, relative to pre-burn levels. If response to the initial fire is bad (more than 50% loss of plants), the fire study will be discontinued and all management groups will be protected with plowed or other firebreaks in all future prescribed burn events.

1.4.3 Invasive Pest Plant Control

Weed control is necessary at VTS-C, especially for invasive exotic plants. In areas where such pest plants threaten the skullcap, careful application of herbicides will allow improvement of the skullcap habitat and the opportunity to monitor the impact of invasives and release from invasives. The treatment protocol will include provisos such as no accidental herbicide application to *Scutellaria montana* and no application of translocating chemicals upslope. Management groups 12, 18, 19, 23, and 24 are currently threatened by both privet and Japanese honeysuckle and so are candidates for this investigation. Careful monitoring of the groups which are treated for invasive pest plants will allow both the identification of any detrimental effects that herbicide use might have on large-flowered skullcap and a determination of whether the beneficial effects for the skullcap justify the expense and effort of focused IPP control.

Preliminary Protocol:

- Environmental personnel with appropriate pesticide applicator certification will apply all herbicides.
- Applications will be made during the late fall or early winter after the skullcap has become dormant.
- Privet will be managed primarily by cut-stump method with application of Garlon 3A, Garlon 4 Ultra, or a glyphosate herbicide. Small privet plants (under 1 m tall) may be treated by foliar application of glyphosate.
- Japanese honeysuckle will be treated with foliar application of Garlon or a glyphosate herbicide.
- No more than half of a management group will be treated in the first year.
- Control and treatment plots will be established within each management group.
- Skullcap will be mapped in the study plots in the spring prior to treatment and reassessed the following spring.
- If initial results indicate little damage to the skullcap from the herbicide applications, the pest plant treatments may be expanded to include the entirety of the threatened plots.
- Monitoring of skullcap response will continue for at least 2 years following the last herbicide application.

1.5 Assessment of Impacts on Large-Flowered Skullcap and Mitigation

Many aspects of TNARNG management and use of the VTS-C have the potential to impact the large-flowered skullcap. It is one goal of this management plan to ensure that those impacts are as benign and minimal as possible while still allowing the essential military training mission to continue unhindered. Table 4.3 in Chapter Four provides a list of all anticipated environmental projects for the period of this INRMP, as well as the primary ITAM and site improvement projects planned. The majority of these projects will have little influence on the skullcap due either to the non-impact nature of the project (e.g., wildlife surveys) or its location (e.g., management of existing grassland ranges). Those projects which could influence the large-flowered skullcap are presented below with more detail on the possible impacts and the measures to be taken to ensure protection of the VTS-C large-flowered skullcap population.

1.5.1 Skullcap management

A number of projects planned for the period of this INRMP are designed to improve conditions for the large-flowered skullcap on VTS-C. These projects should have a positive influence on the threatened species and negative impacts should be minimal. Such projects include: annual monitoring, maintaining the posted perimeter around *S. montana* management groups, prescribed fire, and controlling pest animals which may threaten the flower (feral hogs and white-tailed deer).

In order to investigate management alternatives and impacts on *S. montana*, three research projects are proposed: transplanting of individual skullcap plants, assessing fire impacts, and monitoring the influence of chemical and manual control of invasive pest plants. These are described in more detail in Section 1.4 above. The transplant experiment will not result in any additional take of large-flowered skullcap plants: the only individuals to be transplanted will be a part of the anticipated "take" of the fence-line clearance project (see below under "Training Site Maintenance"). These plants will be relocated prior to the planned disturbance and, if the transplant process is successful, will provide a reduction in the take from the clearing project. One small transplantation project was successfully conducted by Kile 2011. However, because of the uncertainty involved in transplantation, it will not be considered an official mitigation to the take.

The fire impact study will involve 5 management groups which totaled 191 large-flowered skullcap plants in the 2002 survey. This is approximately 12% of the training site total in 2002. Application of

prescribed fire to these groups may result in the death of individual plants. In the worst case scenario, between 50 and 100% of these plants could be killed in the first fire, and the experiment would be terminated. Maximum loss possible would be 12% of the training site population, located in 5 discrete groups. The concentration of large-flowered skullcap groups in the southeastern region of the training site would be unaffected. It is anticipated, however, that fire will not be so damaging and that while there will be a percentage of plants killed, the majority will survive.

Herbicide treatment of invasive pest plants within large-flowered skullcap groups carries some risk for the protected plants from chemical drift and translocation. Careful choice of herbicide and treatment methods, as discussed in Section 1.4 will minimize the hazard. As a precaution, initial treatments will only cover one-half of any IPP infested management group. Any herbicide damage to large-flowered skullcap in these groups will require a revision of methods prior to any further chemical IPP control efforts within the management groups. It is anticipated that there will be no detrimental impacts from this controlled herbicide use on the large-flowered skullcap. If IPP can be controlled in the vicinity of the large-flowered skullcap, it will be a beneficial impact.

Overall, the skullcap management projects included in this plan are expected to improve conditions for the large-flowered skullcap on the VTS-C. There will probably be some take of individual plants associated with the fire research projects, but the number of lost plants is anticipated to be low and non-significant to the population as a whole.

1.5.2 General natural resources management actions:

Most of the projects identified in Table 4.3 for natural resources management, other than the RTE projects discussed above, will have little impact on *S. montana*. Wildlife surveys, riparian restoration, and wetlands protection have little relation to the protected plant. Three areas of management, however, could affect the skullcap: forest management, prescribed fire, and chemical pest plant control.

TNARNG intends to conduct timber harvests as needed to meet training requirements on VTS-C over the period of this INRMP (see Annex 2). USFWS will be consulted with regard to any timber harvests that have the potential to influence skullcaps or any listed species (bats). These harvests would predominantly be commercial thinnings of either overmature timber or dense sub-dominant timber. There is significant temporary soil and understory disturbance associated with timber harvest, and so efforts will be made to avoid impacting large-flowered skullcap during these actions:

- Known large-flowered skullcap groups will be reserved from timber sales with an additional 50’ buffer surrounding. No trees will be harvested within these protected areas, nor will any equipment be allowed to pass through these areas. Additional signs or other markings will be installed around the groups and buffer prior to any nearby timber sale.
- Timber harvests within stands that contain or are adjacent to known skullcap groups will be conducted during the fall or winter when the plant is dormant to minimize any accidental damage which may occur.

No direct take of large-flowered skullcap plants is anticipated from the timber harvests scheduled for the period of this INRMP on VTS-C. There is the potential for a flush of growth by invasive pest plants such as privet and honeysuckle following the opening of the canopy by timber harvest. It is anticipated that the 50’ buffer will help minimize such a threat to the large-flowered skullcap, but IPP presence will continue to be monitored in conjunction with the annual RTE monitoring, and specific control efforts will be initiated if needed.

Prescribed burning is a useful tool for land management, but the resilience of large-flowered skullcap to various fire regimes is not well-known. Kile 2011 found positive results related to burning in a transplant and burning experiment on site. Two populations burned by wildfire showed positive results as well.

Most burning at VTS-C will be conducted in the grassland areas, thus posing no threat to the skullcap. However, longer-interval burns will be conducted within forest stands as needed to lower fuel loads and minimize wildfire risks. See Annex 3 for the schedule of burns for VTS-C. USFWS has granted permission to conduct cool dormant season under-burns through skullcap areas. A gradual cautious approach with monitoring to evaluate effects to skullcaps will be used in implementing this approach. Implementation of this approach will be modified as needed to avoid negative impacts to the large-flowered skullcaps.

As discussed above in Section 1.4, certain skullcap management groups (12, 15, 16, 17, and 19) will be subjected to the scheduled prescribed burns for experimental purposes. These five management groups represent 191 plant, or approximately 12% of the total VTS-C population in the 2002 survey. If post-burn sampling indicates a mortality rate of 50% or higher, the burn study will be discontinued. Some take of large-flowered skullcap plants is anticipated as a result of the experimental prescribed fire evaluation, but will be limited by the constraints of the experimental design. Damage to the overall population from fire impacts should be negligible.

Chemical weed control is utilized on VTS-C against both invasive exotic pest plants and the more benign weeds degrading parking areas, roads, and the managed landscape of the cantonment. Annexes 4 and 5 discuss both occasions of herbicide use and the restrictions thereon. Care will be taken to avoid accidental contamination of large-flowered skullcap with herbicide:

- There will be no application of any herbicide for general weed control within 50’ of a large-flowered skullcap management group.
- There will be no application of any soil active herbicide within 50 yds (or directly uphill) of a management group.
- All appropriate efforts (IAW the label) will be made to avoid drift of herbicide products.

These rules have been in effect for all roadside and other general herbicide applications made by contract or TNARNG personnel since the large-flowered skullcap was found on VTS-C, and to date there have been no indications of damage to individual plants or to the population as a whole from these treatments.

The INRMP includes a plan (Annex 4) for attempting to control the invasive pest plants on the training site, as well. These control efforts will include the large-flowered skullcap management groups and so will be exempt from the first of the above restrictions. However, within management groups and the 50’ buffer herbicides will be very carefully applied to avoid accidental damage:

- There will be no foliar application of any herbicide during the large-flowered skullcap growing season.
- Stem treatments (basal bark, cut-stump, stem injection) will be the preferred methods of application whenever feasible.
- There will be no use of soil active herbicides.

As noted in Section 1.4 above, initial treatments will only cover one-half of any IPP infested management group. Any herbicide damage to large-flowered skullcap in these groups will require a revision of methods prior to any further chemical IPP control efforts within the management groups. No significant detrimental impacts are expected from the careful application of chemical weed control at VTS-C.

1.5.3 Training activities:

Training activities on the VTS-C have the potential for minor impacts on the large-flowered skullcap, but in practice such impacts are easily avoided. Due to the topography of the region and the forested condition of most of the site, vehicular traffic is restricted to established roads and trails and to prepared open maneuver areas, thus avoiding known large-flowered skullcap groups. Foot traffic can have some

impact, especially in the Land Navigation Course in the north-central portion of the site. All known large-flowered skullcap groups are posted with signs restricting entry during the growing season (vehicular traffic is prohibited at all times), and training maps display the skullcap locations as off-limits, so there is limited threat to the plants from soldiers on foot. Likewise, bivouac sites experience high foot traffic, as well as vehicular disturbance immediately off-road, but such training areas are situated at a distance from known large-flowered skullcap groups to avoid disturbance. Range operations hold little threat to the protected plants on the existing live-fire and non-live-fire ranges (range maintenance, on the other hand, is discussed below). Overall, TNARNG training operations have little impact on the large-flowered skullcap.

1.5.4 Training Site Maintenance and Improvement Projects:

Training site maintenance and improvement involves a wide variety of actions; most will have little effect on the large-flowered skullcap, but certain construction projects, in particular, may have a substantial impact on the large-flowered skullcap on VTS-C. Maintenance of range facilities and grounds has little influence on the skullcap, which are generally not located in close proximity to these heavily managed portions of the training site. The use of prescribed fire to maintain the target area of the tank range has affected management groups 15 and 16 in the past; these two groups are now protected by a fire break and will remain so protected until the prescribed fire experiment discussed in Section 1.4 (and above under "Skullcap management") is initiated. Road maintenance has the potential to impact those management groups located directly beside the major roads, but all groups have been marked, and training site personnel avoid altering the road shoulder in the vicinity of the large-flowered skullcap.

Several construction and training site improvement projects are planned for the period of this INRMP; these are listed at the end of Table 4.3. Several buildings and associated parking areas will be added to the cantonment area. This area is already developed and contains only one small management group (#12) on the eastern side. All building, road, and parking area construction will be located well away from this group and so there will be no impact on the large-flowered skullcap. Reclamation of an old roadway across the northern edge of the training site is anticipated. This will be routed around management groups 20 and 21, and so will have little impact on the skullcap (see Figure A1-4).

Portions of the Land Navigation Course in the north-central portion of the training site are overgrown with dense understory vegetation that makes foot travel difficult. These areas will have their understory opened up by prescribed fire and mechanical vegetation removal. Several management groups fall within this area (17, 18, 19, and 20), but they are posted and mapped, and vegetation removal will occur no closer than 50' from the group edges. No direct impact on the large-flowered skullcap is anticipated. Annual monitoring will continue to track IPP presence, and if the understory clearing leads to greater competitive stress from exotic plants, pest plant control will be initiated.

Security requirements include complete fencing around military installation boundaries. At this time the VTS-C perimeter is only partially enclosed. Fencing efforts will continue during the period of this INRMP, typically in 2500'-5000' segments. Several management groups (2, 9, 11, 14, 19, 24, and 25) abut or straddle the boundary. In order to minimize impact on these plants, all fence building activities will occur during the dormant season. Due to the terrain of the training site, erection of the fence is done manually, with minimal disturbance to the soil. Transport of the equipment to the boundary is typically via ATV. Pathways are marked in advance by the ENV office if there are any nearby skullcap management groups to be avoided. There is potential for damage to individual plants that lie directly on the fenceline, but there should be minimal peripheral impact from the construction of the security fence.

Security requirements also dictate that 25' line-of-sight clearance be maintained on either side of the boundary fence. This clearing of trees and routine mowing will would significantly impact management group 2, which was successfully transplanted to an interior site (Kile 2011). These security related

actions could somewhat impact other groups, including 9, 14, 24, 25, and possibly 8, 11, and 19 (see Figure A1-1). These groups or potentially impacted portions of them will be transplanted if work is scheduled to occur in them as well. The degree of impact will be dictated by the number of plants within that 25' buffer. Clearing of the trees will vastly alter the habitat. In addition, the process of cutting the timber and clearing the lower vegetation will probably damage many of the large-flowered skullcap plants in that strip. TNARNG anticipates eventual loss of all skullcap plants within 30' of the fenceline after the clearing is completed; TNARNG estimated as many as 100 plants could be lost, though all those in group 2 have already been transplanted successfully. The members of group 2 are still considered part of the authorized take of 100 due to uncertainty of long term success at the new location.

In order to mitigate this loss, the TNARNG will tally the number of plants which fall within this hazard zone prior to any clearing. A nursery (the Atlanta Botanical Garden or other acceptable to the USFWS) will be contracted to propagate large-flowered skullcap from the VTS-C population (if possible, from the threatened management groups). When ready, the nursery stock will be out-planted to an appropriate location on the VTS-C, as determined from soil, slope/aspect, and vegetative characteristics, which is not subject to immediate military need. The goal will be 75% replacement of plants lost to fenceline clearing.

Although nursery-propagated large-flowered skullcap plants were used as replacements for the take associated with the fenceline clearing and the new range complex, the TNARNG utilized some of the "taken" individuals for the transplant experiment described in Section 1.4, which proved successful.

While uncertain, there is still potential for construction of a new range complex to occur (Figure A1-4). Three ranges could be established in the north-central portion of the training site in the vicinity of large-flowered skullcap management groups 17 and 18: a 300m x 300m Modified Record Fire Range (MRFR), a 100m x 30m Zero Range, and a 100m x 30m Combat Pistol Range. Topography, the shape of the VTS-C, the location of existing ranges, and surface danger zone requirements dictate the location of these ranges. None of the ranges will directly impact any known large-flowered skullcap; however, the support facilities for the MRFR and the Zero Range may could upon skullcap group 17. Support facilities to be developed will include: an access road, three parking areas of approximately 1/3 acre each, and an observation tower, ammo breakdown area, target house, and covered training area at each range. Approximately 40 acres could be cleared for the range complex construction.

Grading for the access road and the support facilities at the Zero Range would likely result in incidental take of some large-flowered skullcap from management group 17 (69 plants). It is anticipated that less than 25% of plants in management group 17 would be lost during construction. Management group 18 (94 plants) would be thoroughly marked and completely avoided with all construction and earth-moving efforts.

TNARNG would mitigate the loss of plants from management group 17 as for the fenceline clearing: large-flowered skullcap would be nursery propagated to replace the individuals lost, with a goal of at least 75% successful replacement. The replacement plants would be out-planted to the west of the management group, if appropriate habitat is available. If not, they would be planted in appropriate habitat in another part of the training site. Aside from the direct take associated with clearing ground for the range and associated construction, there would be the potential for loss of large-flowered skullcap plants to excess competition which could arise when the forest cover just beyond the management group is removed. To minimize this impact, TNARNG would plant evergreen tree species (eastern red cedar, shortleaf pine, and/or Virginia pine) along the edges of cleared areas that lie within 30 feet of a large-flowered skullcap group. The goal would be to provide a dense edge to minimize increased sunlight intrusion into what had been forest interior.

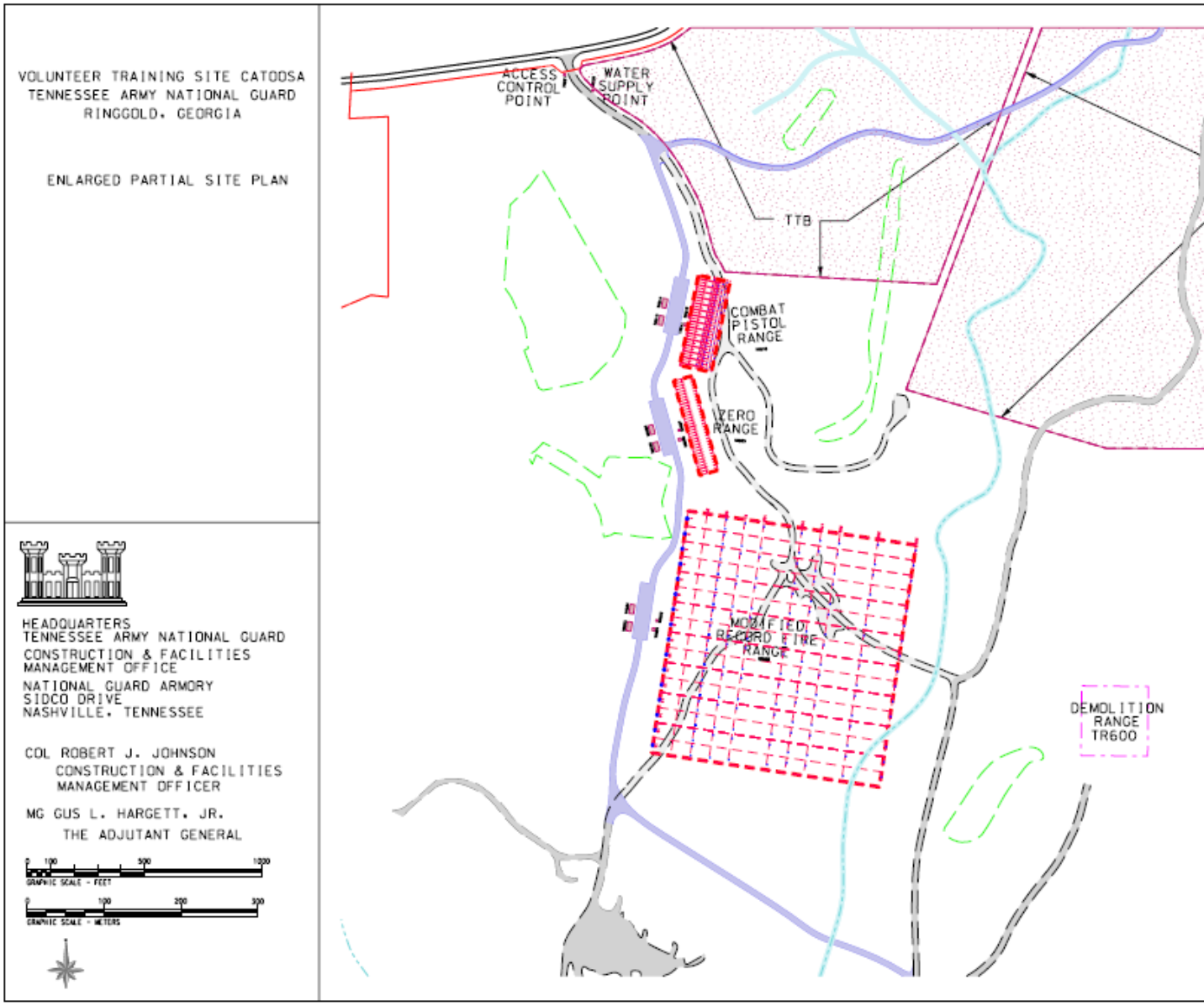


Figure A1-4: Proposed ranges and associated construction for the VTS-Catoosa. — indicates new road construction.

– – delineates existing large-flowered skullcap management groups.

Overall, the projects identified in this INRMP will influence the large-flowered skullcap. While many of the impacts will be positive, a small number of projects will result in incidental take of protected plants. Implementation of this plan will likely have an adverse effect on individual large-flowered skullcap plants on the VTS-C. However, it is not likely to adversely affect the total large-flowered skullcap population health on the training site, and the projects presented in this plan are necessary for the training site to provide needed training facilities and to remain in compliance with DoD security standards.

2.0 GRAY BAT (*Myotis grisescens*)

Gray bats were first captured on VTS-C during a baseline bat survey in 2006. Ten individuals were trapped along Tiger Creek during the June mist-netting session; three individuals (one a recapture from summer) were caught in September. No cave roosts or hibernacula have yet been located on the training site. Due to the distances gray bats may travel while foraging (up to 20 km), it is uncertain whether these bats are resident on the training site or merely utilizing the foraging habitat. However, several of the females captured in June 2006 were pregnant, indicating the likelihood of a maternity colony near the training site.

A project completed in 2009 utilized radio-tracking to try to locate the local roost sites. Ten gray bats were captured and seven were radio-tagged and tracked for several days. The tagged bats included three reproductive males, two adult females, and two juvenile females. None of the bats was successfully followed to its roost; however, no transmitter signals could be located on or in the immediate vicinity of the training site during the daylight hours. It therefore concluded that gray bats utilize the VTS-C only as foraging habitat.

A 2013 bat Planning Level Survey (PLS) incorporated mist-netting and acoustic surveys, along with habitat surveys and evaluations. Twenty gray bats were captured using mist nets, and numerous gray bat calls were recorded and identified through acoustic methods. Radio telemetry work was not conducted due to lack of funding. The habitat surveys found the site to have moderate commuting and foraging habitat in forested areas, except high along streams. The western slope of the ridge below the observation tower road has large numbers of marginal roost trees. One high quality roost tree was found near the east bank of Catoosa Springs Branch. Only four low quality caves were found on site.

A karst and cave survey that included bat work was conducted on site in 2016. A qualified bat biologist searched all accessible caves for bats or evidence if their use in fall and winter visits. No grey bats or suitable hibernation caves were located.

A bat PLS is currently in progress. This plan will be updated with its findings and conclusions when they are received. No telemetry work is being conducted as part of the survey due to lack of funding.

Further surveys will be conducted as funding becomes available to more completely characterize the gray bat usage of VTS-C. As a part of this investigation, a project is planned to radio-track the bats foraging on the training site to locate any roosts or hibernacula on site.

2.1 Background

Gray bats occur primarily in the karst regions of the southeastern United States. They migrate between winter hibernation sites and summer maternity caves. Gray bat colonies are usually restricted to caves or cave-like habitats located within one kilometer of a river or reservoir. In winter they utilize only deep, vertical caves having a temperature of 6-11ºC. The largest member of its genus in the eastern United States, the gray bat weighs from 7 to 16 grams. Its forearm ranges from 40 to 46 millimeters in length (U.S. Fish and Wildlife Service, 1982). One feature which distinguishes this species from all other eastern bats is its uni-colored dorsal fur. The other bats have bi- or tri-colored fur on their backs. Also, the gray bat's wing membrane connects to the foot at the ankle instead of at the base of the first toe as in other species of *Myotis* (U.S. Fish and Wildlife Service 1982). Gray bats feed on insects, of which the majority are aquatic species, particularly mayflies.

The gray bat was listed as federally endangered in 1976. The principle reasons for decline are believed to be human disturbance of caves and loss of appropriate cave habitat through human alteration or natural change.

2.2 Protection

The principle protection for the gray bat on the training site is maintenance of the quality foraging habitat that Tiger Creek provides. Gray bats feed primarily on aquatic insects, especially mayflies, which are particularly susceptible to pollutants. Objectives described in Section 4.2.5 are intended to maintain or improve water quality through the protection of riparian habitat. Careful implementation of Streamside Management Zones and attention to erosion issues should ensure appropriate feeding habitat for the gray bat. SMZ restrictions on timber harvest and construction will also maintain forested travel corridors along streams for bats.

Plans for continued bat PLSs, which include plans for radio telemetry work, make it possible that caves, maternity colonies, or roost sites could be still be found on VTS-C. If a cave or other hibernaculum is found in the future, a plan will be developed with the help of USFWS to protect the site, gate the opening, if necessary, and post or fence the immediate surroundings to minimize disturbance from training activities.

In addition to maintaining habitat, training will be developed to educate training site personnel and users on the significance of bats for insect control and to debunk fears commonly associated with bats.

2.3 Monitoring

A bat PLS is currently in progress that incorporates mist-net, acoustic, and habitat components. Gray bats will be readily captured or detected using these techniques. No radio telemetry is incorporated into this research due to lack of funding. Results involving gray bats from the survey will be incorporated into this plan.

With agreement from USFWS, future bat surveys on VTS-C will be conducted on a five-year cycle. Telemetry work to aid in understanding gray bat use of the site and to locate maternity colonies, roosts, or hibernacula of gray bats using the site will be incorporated as funding is available. The current monitoring protocol for bat PLSs used on VTS-C includes techniques that are effective and meet all USFWS requirements for gray, northern long-ear, and Indiana bat surveys. The protocol will be updated before each survey in accordance with USFWS guidance.

2.4 Research

No research projects are planned for the gray bat on VTS-C at this time.

2.5 Assessment of Impacts on Gray Bat

VTS-C contains no known roost sites or hibernacula. The gray bat is known to forage over Tiger Creek, but no other use of the training site has been documented. Training activities on the site have minimal impact on the riparian areas: utilization of the riparian areas is limited to established road crossings and some foot traffic within the land navigation course. Riparian areas on the training site are protected by streamside management zone best management practices for all land management activities. This INRMP includes projects designed to maintain or improve water and habitat quality in the streams and riparian areas (see Section 4.2.5 and Table 4.3 in Chapter 4 for more detail). The gray bat may benefit

from such habitat improvement actions. Overall, the TNARNG anticipates that the implementation of this INRMP is not likely to significantly affect the gray bat.

3.0 NORTHERN LONG-EARED BAT (*Myotis septentrionalis*)

Northern Long-eared bats (NLEB) were first captured on VTS-C during a baseline bat survey in 2006. Two individuals were trapped, one along Tiger Creek and one along a ridge, during the June mist-netting session; one individual was caught along Tiger Creek in September. No maternity colony or roost trees, or hibernacula, are known to occur on the installation.

A project directed at radio-tracking gray bats in 2009 failed to capture any NLEBs during mist-netting operations. A 2012-2013 bat Planning Level Survey (PLS) incorporated mist-netting and acoustic surveys, along with habitat surveys and evaluations. The 2012-2013 survey detected NLEBs acoustically in the fall session and captured one NLEB in mist-nets during the summer session. A possible acoustic detection of a NLEB may have been recorded during the 2013 summer monitoring session, but was not statistically significant (i.e. inadequate p-value). The habitat component of the survey found the site to have moderate commuting and foraging habitat in forested areas, except high along streams. The western slope of the ridge below the observation tower road has large numbers of marginal roost trees. One high quality roost tree was found near the east bank of Catoosa Springs Branch. Only four low quality caves were found on site.

A karst and cave survey that included bat work was conducted on site in 2016. A qualified bat biologist searched all accessible caves for bats or evidence if their use during fall and winter visits. No NLEBs were located during the summer or winter visits.

A bat PLS is currently in progress. This plan will be updated with its findings and conclusions when they are received. No telemetry work is being conducted as part of the survey due to lack of funding.

Further surveys will be conducted as funding becomes available to more completely characterize the NLEB use of VTS-C. As a part of this investigation, a project is planned to radio-track any listed bats captured on the training site, to locate any roosts or hibernacula that are present.

3.1 Background

The NLEB is a medium sized bat weighing 5-8g (0.18-0.28oz) with medium to dark brown fur on the back and tawny to pale brown fur on the belly, and dark brown ears and wing membranes. It is distinguished from other Myotis species by its large ears (17mm or 0.67in) which extend 5mm (0.20in) or less past the nose/muzzle when laid forward. While most mortality occurs in the juvenile age class, banding data indicate the NLEB can live up to 18.5 years in the wild.

Their diet, which varies geographically and seasonally, consists of a diverse assortment of insects, with moths, beetles and arachnids being the most common. The species typically forages in mature forests, above the understory layer (1-3m high) but below the canopy on hillsides and ridges. This habitat reflects their foraging behaviors of both catching insects in flight and gleaning insects from vegetation. They will also forage along waterways, in small forest openings, and along roads.

The species emerges from hibernation and migrates to summer habitats from mid-March to mid-May, where they form small (30-60 member) maternity colonies or very small (1-10 member) groups at roost sites. The maternity colonies decline in number from pregnancy to post-lactation periods. Pups can fly at approximately 21 days. NLEBs switch roosts every 2-3 days, requiring habitat with multiple suitable roosts available within close proximity. Summer roost sites and maternity colonies are located under

sloughing bark, or in cavities, crevices, or hollows in live or dead trees. Maternity colonies are typically located under more open canopies and warmer locations in 4-10in DBH hardwood trees. Males and non-reproductive females may roost in cooler locations such as caves, mines, and more closed canopy forests. The species is not tied to particular tree species (mostly hardwoods), but are rather associated with greater structural complexity of habitat and availability of roosting resources.

Migration back to hibernacula occurs in mid-August to mid-October. Individual NLEBs swarm at various hibernacula until they enter hibernation in October-November. Hibernacula can include very large to very small caves and mines with relatively consistent temperatures (32^oF - 42^oF), no air currents, and high humidity. The species typically hibernates in small cracks and crevices in walls and ceilings, with only their noses and ears visible, but will hang in the open as well.

The NLEB was listed as a threatened species under ESA in May 2015 (80 FR 17973 – 18033). A final 4(d) rule under the act became effective in January 2016, defining take prohibitions and providing measures that are necessary and advisable for conservation of the species. Critical habitat was not proposed or designated for the NLEB. The mortality caused by White Nose Syndrome (WNS) is believed to far exceed all other causes, and is thought to be the primary reason for the species' decline. Other threats include modification or closing of hibernacula entrances (second greatest threat), human disturbance of hibernating bats, forest conversion and management, and other causes of habitat loss.

3.2 Protection

Primary protections implemented specifically for NLEB on site involve compliance with all requirements under the final 4(d) rule. Trees and snags over three inches DBH are not cut without prior evaluation and approval from TNARNG Natural Resource staff and USFWS. While no roost trees, maternity colonies, or hibernacula are known to occur on or within 0.25 mile of VTS-C, plans for continued bat PLSs include radio telemetry work with captured NLEB and gray bats, making it possible that they could be found. All requirements within the 4(d) rule will be complied with if these features are found. If a cave or other hibernaculum is found in the future, a plan will be developed with the help of USFWS to protect the site, gate the opening, if necessary, and post or fence the immediate surroundings to minimize disturbance.

All species on VTS-C are maintained and protected through a habitat protection/enhancement approach, rather than through single species management. The NLEB, through its habitat, is protected and enhanced through a number of programs. Their forest habitat is maintained and enhanced through invasive pest plant (IPP) removal, prescribed fire, and forest management programs. The IPP program removes Chinese privet and other invasive plants to thin extremely dense understory conditions and maintain the diversity of native understory plant species. This maintains the diverse and abundant insect forage species and restores the semi-open understory condition they require. Prescribed fire further maintains the diversity and semi-open condition of the understory, providing for plant and insect species diversity and flying conditions that benefit the NLEB. The forest management program ensures that no trees are harvested without specific end objectives, and all proposed harvests must first be evaluated and authorized by Natural Resources staff and coordinated and approved by USFWS. This protects the forest conditions and potential roost trees required by the NLEB. The species is further protected through implementation of an IPMP, which prevents negative impacts to habitat and forage insects from pesticides.

While NLEB mostly forage on side hills and ridges, they also forage along streams and use them as travel corridors. Objectives described in Section 4.2.5 are intended to maintain or improve water quality through the protection of riparian habitat. Careful implementation of Streamside Management Zones and attention to erosion issues ensure appropriate riparian and stream corridors. SMZ restrictions on timber harvest and construction also maintain forested travel corridors along streams.

In addition to maintaining habitat, training will be developed to educate training site personnel and users on the significance of bats for insect control and to debunk fears commonly associated with bats.

3.3 Monitoring

A bat PLS is currently in progress that incorporates mist-net, acoustic, and habitat components. NLEBs will be readily captured or detected using these techniques. No radio telemetry is incorporated into this research due to lack of funds. Results involving NLEB from the survey will be incorporated into this plan.

With agreement from USFWS, future bat surveys on VTS-C will be conducted on a five-year cycle. Telemetry work to aid in understanding NLEB use of the site and to locate maternity colonies, roosts, or hibernacula of NLEBs using the site will be incorporated as funding is available. The current monitoring protocol for bat PLSs used on VTS-C includes techniques that are effective and meet all USFWS requirements for gray, northern long-ear, and Indiana bat surveys. The protocol will be updated with the most recent USFWS guidance before each survey.

3.4 Research

No research projects are planned for the NLEB on VTS-C at this time.

3.5 Assessment of Impacts on Northern Long-Eared Bat

The NLEB is a forest dwelling bat that also uses stream corridors, roadways, and forest openings. This INRMP is set up in a way that protects or enhances the habitat requirements of NLEBs. Forest habitats are protected and improved through compliance with all requirements in the final NLEB 4(d) rule, implementation of forest habitat management and enhancement with prescribed fire, IPP removal, forestry, and IPM programs. While none are known to occur on site at this time, appropriate trees and snags for roosts and maternity colonies are protected through evaluation and approval requirements prior to any tree or snag removal. Proper forest structure is maintained and improved through IPP removal, prescribed fire, and training site rules governing off road maneuver. Monitoring provides data on NLEB use of the site, and when funded concurrent radio telemetry could lead to local hibernacula, that would be protected. Riparian corridors and habitats, and water quality for forage insects is protected and enhanced through implementation of SMZs, use of BMPs, and erosion minimizing land use requirements and repairs. Forest openings and grasslands, and associated forage insect populations are maintained through prescribed fire, the forestry program, and other management practices. Implementation of the IPMP minimizes the impacts of pesticides on native vegetation, enhances plant diversity, and therefore enhances forage insect populations. The NLEB may benefit from these habitat protection and improvement actions. The TNARNG therefore anticipates that implementation of this INRMP is not likely to significantly affect the NLEB.

4.0 CHICKAMAUGA CRAYFISH (*Cambarus extraneus*)

The Chickamauga crayfish is a Georgia State threatened species. It has no federal listing status, but is considered imperiled with a G2 status. Chickamauga crayfish were first captured on VTS-C during a RTE PLS survey in June, 2012. They were observed or captured at four locations on Tiger Creek and Broom Branch. They were not found in Catoosa Springs Branch.

Further surveys will be conducted as part of five-year RTE PLSs or as funding becomes available to more completely characterize Chickamauga crayfish usage of VTS-C.

4.1 Background

Chickamauga crayfish have a very small range, restricted to the south Chickamauga creek basin in Catoosa, Walker, and Whitfield counties, Georgia, and Hamilton county Tennessee (250-1,000 square kilometers, or 100-400 square miles). They can reach a length of 100mm (4 inches). They are identified from other crayfish by their mottled brown and tan obviously striped abdomen. The pattern consists of a pale stripe running down the middle of the abdomen, with a dark stripe on each side of it, and another pale stripe on the outsides of them. The species is usually found under rocks or in leaf material and woody debris in slow to moderately flowing sections of small to moderate sized streams.

Threats and trends of the species have not been assessed. However, it is believed that while some Georgia populations are doing well, populations in Chattanooga and other rapidly developing areas are declining. The species small range makes it vulnerable to extinction. Rapid human population growth in the area creates the potential for excessive and improper land conversion, development practices, and stream impoundment. Heavy sedimentation from poor development and land management practices can cover needed substrates and hiding places, making individuals vulnerable to predation. In addition, the introduction of non-native crayfishes subjects them to greater competition for resources.

4.2 Protection

The use of VTS-C as a field training facility serves the valuable function of protecting the land from development or conversion to other uses. The principle protection for the Chickamauga crayfish on the training site is maintenance of quality riparian areas, aquatic habitats, and water quality. Objectives described in Section 4.2.5 are intended to maintain or improve water quality through the protection of riparian habitat. Implementation of SMZs, BMPs, and quick repair of erosion issues that do occur ensures quality habitat for the Chickamauga crayfish. Use of an IPM approach will prevent pesticides from damaging riparian areas or entering the creek. Continued monitoring of the species through RTE PLSs on a five-year cycle will ensure that any declines in the population are noticed, thus triggering investigation of causes and management responses.

4.3 Monitoring

The population will continue to be monitored through RTE PLSs on a five-year cycle. This will detect any major changes in the population, and trigger investigations for possible reasons.

4.4 Research

No research projects are planned for the Chickamauga crayfish on VTS-C at this time.

4.5 Assessment of Impacts on the Chickamauga Crayfish

Continued training use of VTS-C prevents conversion of the area to housing developments, agriculture, and other uses, which could cause loss or damage of crayfish habitat. Implementation of SMZs, BMPs, proper forestry practices, IPM practices, and rapid repair of erosion issues that occur will protect Chickamauga crayfish habitat in the various streams on the training center. The species may benefit from these habitat protection and improvement actions. The TNARNG therefore anticipates that implementation of this INRMP is not likely to significantly affect the Chickamauga crayfish.

BIOLOGICAL OPINION OF THE U.S. FISH AND WILDLIFE SERVICE
Regarding Impacts on the Large-flowered Skullcap
(Scutellara montana)

Annex 2

FOREST MANAGEMENT PLAN
VTS-CATOOSA

TABLE OF CONTENTS

Page

1.0 Introduction **2-4**
2.0 Large-flowered Skullcap **2-4**
3.0 Forest Inventory **2-4**
Figure A2.1: Training Areas and large-flowered skullcap occurrences 2-5
Table A2.1: Forest product volume summary 2-6
4.0 Forest Management Guidelines **2-7**
4.1 Forest Management Objectives 2-8
4.2 Timber Harvest Operations 2-8
4.3 Pest Management 2-9
4.4 Salvage of Disaster Damaged Trees 2-10
5.0 Environmental Considerations **2-10**
5.1 Cultural Resources 2-10
5.2 Sensitive Species 2-11
5.3 Forestry Best Management Practices 2-12
Table A2.2: Forestry Best Management Practices 2-12
5.4 Monitoring and Inspections 2-17
6.0 Management Prescriptions **2-19**
6.1 Cantonment Area 2-20
Figure A2.2: Forest stands in the Cantonment Area 2-21
6.2 Training Area 1 2-22
Figure A2.3: Forest stands in Training Area 1 2-23
6.3 Training Area 2 2-24
Figure A2.4: Forest stands in Training Area 2 2-25
6.4 Training Area 3 2-26
Figure A2.5: Forest stands in Training Area 3 2-27
6.5 Training Area 4 2-28
Figure A2.6: Forest stands in Training Area 4 2-29
6.6 Training Area 5 2-30
Figure A2.7: Forest stands in Training Area 5 2-31
6.7 Training Area 6 2-32
Figure A2.8: Forest stands in Training Area 6 2-33
6.8 Training Area 7 2-34
Figure A2.9: Forest stands in Training Area 7 2-35
6.9 Training Area 8 2-36
Figure A2.10: Forest stands in Training Area 8 2-37
6.10 Training Area 9 2-38
Figure A2.11: Forest stands in Training Area 9 2-39
6.11 Training Area 10 2-40
Figure A2.12: Forest stands in Training Area 10 2-41
7.0 Implementation Schedule **2-42**
Table A2.3: Timber stand harvest priority for VTS-Catoosa 2-43

1.0 INTRODUCTION

The forestlands of VTS-C were inventoried in 2005. A management plan was then developed based on forest health and timber management needs. This plan has been modified to include military needs and plans. It presents the recommended forestry management prescriptions for the forest stands occurring within the Cantonment Area and each of the 10 training areas that comprise VTS-Catoosa (see Figure A2.1). Details of timber volumes and other stand characteristics are available in the Forest Inventory (Thompson Engineering 2006).

Individual forestry management prescriptions are provided for the forest stands occurring within each training area. The forest management prescriptions are generally focused on actions that would enhance the quality and economic value of the forestry resources on VTS-Catoosa. The use of prescribed fire is also addressed for each forest stand. Recommendations for prescribed burning are almost always restricted to burns that would be directed toward reducing excessive accumulations of fuels to reduce wildfire risks and, in most cases, would be conducted infrequently on a 6-year rotation, unless otherwise specified. Annex 3 should be referred to for information on the weather guidelines that should be considered when conducting prescribed burns and for the management objectives that are to be accomplished by burning.

2.0 LARGE-FLOWERED SKULLCAP

The presence of the large-flowered skullcap (*Scutellaria montana*) on VTS-Catoosa will influence timber management operations performed on the installation. The large-flowered skullcap is designated by the U.S. Fish and Wildlife Service as a threatened herbaceous perennial plant that occurs in mature oak-pine forests. While the large-flowered skullcap can benefit from selective thinning of the forest canopy, it does not compete well with the explosive growth of understory plants that is typically encouraged following timber harvests. Populations of the large-flowered skullcap have been found at a number of locations on VTS-Catoosa (Figure A2.1). Since the forested habitat favored by the plant is prevalent throughout most of the installation, all forestry management operations should consider that the plant may be present whenever a timber management action is being planned within any of the 10 training areas. Skullcap management groups and a 50 foot buffer surrounding them will be withheld from any timber sales that occur on the training site, and harvests in the vicinity of skullcap groups will be timed to avoid the growing season for the plant. Logging and skidding equipment will not travel through skullcap management groups at any time.

3.0 FOREST INVENTORY

The forest inventory for VTS-Catoosa was conducted in April 2005 by personnel with the Forest Management Group, Inc., located in Hattiesburg, Mississippi. The forest inventory was developed using the established training areas and Cantonment Area to serve as the basic forestry management units. Figure A2.1 shows the locations of the Cantonment Area and the 10 training areas that make up the VTS-Catoosa.

The forest resources occurring within the forestry management units were inventoried. Each management unit was subdivided as appropriate into individual forest stands based on the sharing of common characteristics that served to define each stand. Among the parameters considered to delineate the forest stands were species composition, age, size, condition, etc. Delineation of the stands was accomplished by both the use of aerial imagery and ground observations of the different timber types and ages. A

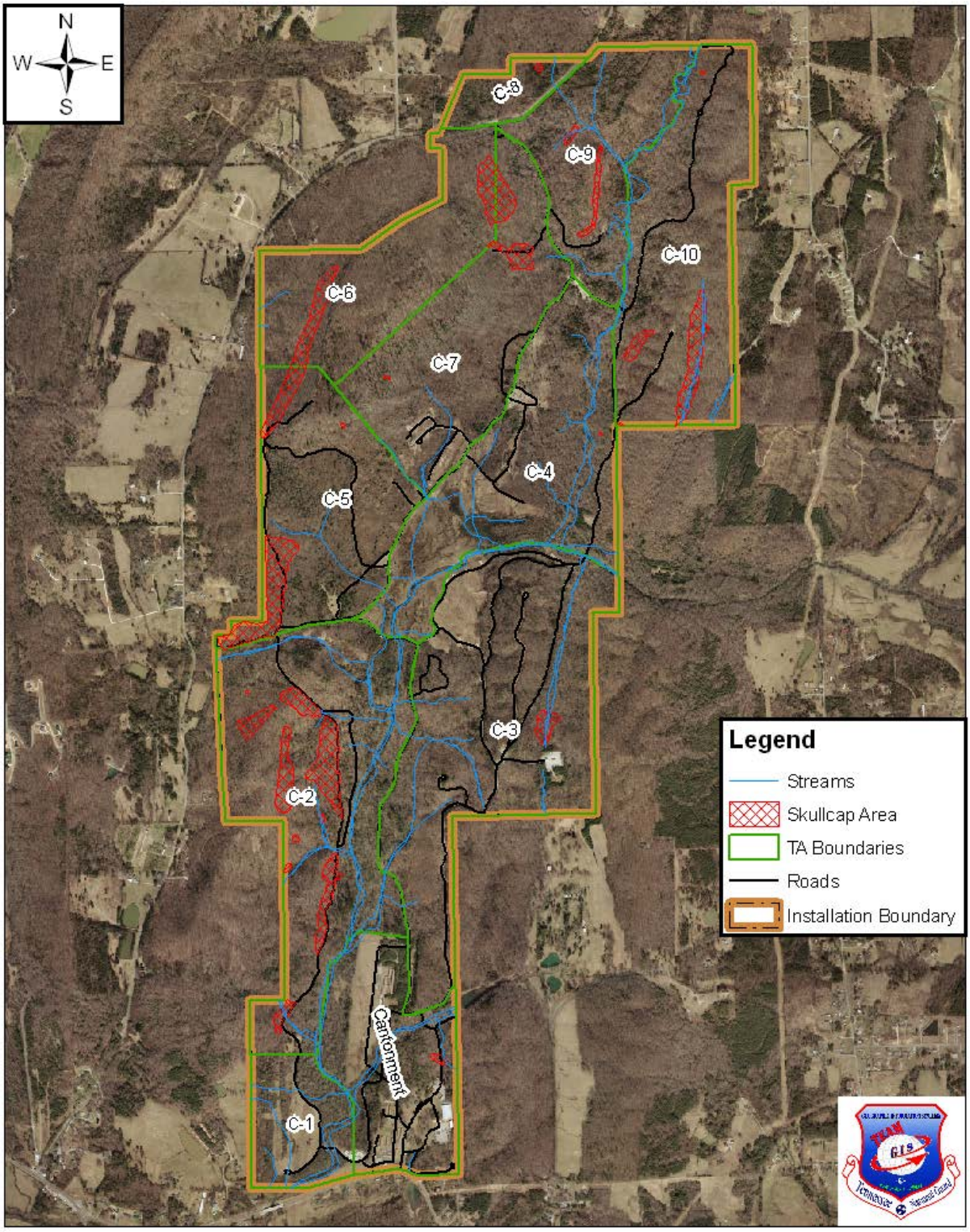


Figure A2.1: Training areas and large-flowered skullcap occurrences on VTS-Catoosa.

consistent forest stand numbering system was used throughout the inventory to identify each stand based on the major land features and forest types that characterized each stand.

The forest inventory provides the volumes of sawtimber (in tons and board feet) and pulpwood (in tons and cords) that was available within each stand at the time the inventory was performed in April 2005. The sawtimber is apportioned between pine, pine poles, CNS (chip-n-saw: pine timber that can yield both 2x4s and chips), spruce pine, red oak, white oak, hickory, poplar, cedar, ash, walnut, and miscellaneous hardwood (i.e., all other hardwood species that may be present). The pulpwood is apportioned between pine and hardwoods. The timber volume data is presented on both a per acre basis and as a total per stand for each product class.

The forest inventory also provides supplementary information to better understand the major characteristics of each stand. That information includes:

- Dominant and co-dominant tree species occurring within each stand
- Average basal area and DBH of trees within each stand on a per acre basis
- Average number of snags per acre
- The minimum and maximum age of the trees
- A general assessment of the overall health of the stand
- An evaluation of the current condition of the stand
- General remarks on other major characteristics of the stand where appropriate and useful.

The forest inventory determined that a total of 1,313 acres of VTS-Catoosa was covered in forests at the time the forest inventory was conducted in April 2005. Table A2.1 presents summary volume data for the inventoried timber products on a per acre basis and for the entire installation.

Table A2.1: Forest Product Volume Summary for VTS-Catoosa Based on the April 2005 Forest Inventory (from Thompson Engineering, et al. 2006).

Timber Product	**Per Acre**		**Installation Total**	
	Tons	Board feet	Tons	Board feet
Sawtimber				
Pine	5	640.1	6,837	875,273
Pole	0.1	6.4	137	8,751
CNS	1.9	198.8	2,598	266,370
Cedar	0	4.4	0	6,017
Red Oak	10.7	1485.4	14,631	2,031,136
Hickory	2.9	358.2	3,965	489,803
White Oak	7.2	941.7	9,845	1,287,681
Ash	1.1	148.2	1504	202,649
Poplar	4.8	650.9	6,564	890,041
Walnut	0.2	23.6	273	32,271
Misc. Hardwood	2.6	322.4	3,555	440,850
Pulpwood				
Pine	0.6	0.2	820	273
Hardwood	19.5	7.2	36,664	9,845

The Forest Inventory also revealed that the overall average diameter at breast height (DBH) of trees on the entire installation was 11.7 inches and that the installation had an average basal area of 78.1 square feet per acre. The forest stands on VTS-Catoosa are typically dominated by red oaks and white oaks, with a substantial amount of pine being present in some stands. Yellow poplar is also a co-dominant species in some stands and hickory in others. Most stands were characterized by trees ranging from 20-40 years old, but some had trees approaching 70 years in age, while a few stands were dominated by young trees. While the overall health of the forest stands was observed to be good during the April 2005 Forest Inventory, evidence of a past infestation of Southern pine beetles was present based on damage to the pine timber. In addition, frequent hot fires within the Impact Area shared between Training Areas 5 and 7 have resulted in a significant amount of timber damage in the forest stands occurring within these areas.

Army guidance requires all installations with a forestry program to keep their forest inventories current (i.e., not older than 10 years) when such forests are essential to the mission and/or capable of commercial use. Since the existing forest inventory for VTS-Catoosa was conducted in April 2005, the forest resources should be re-inventoried no later than 2015. The inventory intensity should be appropriate at that time to reflect the planned use of the forest and for monitoring the long-term health and sustainability of the forest. In addition to determining the volume of merchantable forest products available on the installation in 2015, the inventory should be directed at evaluating the overall health and characteristics of the forest community and to assessing the effectiveness of the forest management prescriptions that have been implemented during the intervening 10-year period.

4.0 FOREST MANAGEMENT GUIDELINES

Based on the results of the 2005 forest inventory, the health of most of the VTS-Catoosa forest stands is judged to be good to excellent, although a number of the stands showing signs of having experienced past fires that were too hot and caused some damage to the trunks.

VTS-Catoosa forests will be managed on approximately an 80 year rotation. Forest management for the training site will consist of both even-aged and uneven-aged techniques for improving forest health, modifying stands to meet objectives, and regenerating stands when needed.

Generally no more than 60 acres per year will be harvested on the training site. The priority for management will be:

1. Mission needs
2. Fire damaged stands
3. Oldest stands

Final harvests will generally be small clearcuts or large group selection cuts (2-10 acres) as required by topography and accessibility. Openings of at least 2 acres are most effective for encouraging oak regeneration. Openings will be placed at sites containing sufficient advance regeneration of appropriate size when possible. No more than 30% of a stand acreage will fall within the cleared areas in a group selection harvest. The remainder of the stand may be lightly thinned at the same time to release desirable hardwood species.

Some stands will require pre-commercial thinning or mid-story removal to improve growth of the dominant/co-dominant trees or to encourage advance regeneration of desirable species. This will be done as funding allows, on no more than 60 acres per year. The shelterwood-burn method of regeneration will be applied experimentally as feasible (see Annex 3 of the INRMP).

In all harvest activities, there will be no timber removal within 100 feet of creeks. A 100 ft buffer will also be maintained along property boundaries except for the 20 ft security line of site clearing required along the fence-line itself.

Harvest activities will be limited in the vicinity of skullcap management groups. Harvest operations must be scheduled for the fall or winter when the plants are dormant. No vehicles, skidders included, may pass through a management group at any time, and soil disturbance must be minimized. There will be a 50' buffer surrounding the skullcap group; no timber will be cut within the management groups or the buffer zone. Tops and limbs will not be left within a management group or buffer.

4.1 Forest Management Objectives

The individual forestry management recommendations were based upon a consideration of the following broad management objectives developed for the overall forest community occurring on VTS-Catoosa.

- Provide appropriate vegetation cover for training needs as determined by mission requirements.

- Maintain a healthy forest ecosystem appropriate to the region through even and uneven aged management techniques. Forest values to be protected or improved are:
    - Soil conservation and stream quality protection
    - Wildlife habitat
    - Biodiversity
    - Timber and forest products

- Control invasive pest plants (IPP) for the health of the forest.

- Use prescribed fire only as necessary for fuel reduction or to meet military mission needs, unless deemed appropriate to regeneration efforts. Hardwood stands should be burned no more often than every six years.
    - The shelterwood-burn method of hardwood regeneration may be experimentally applied to a stand within training area 10 on a 5-year test case to determine the potential of this method to produce a regenerated oak-dominated forest while enhancing the military mission (see Annex 3).

4.2 Timber Harvest Operations

The periodic harvest of timber is the major measure used to manage forestry resources. The principle purpose of the forest management program on the VTS-Catoosa is to support military mission and ecosystem management goals, while optimizing the forest resource and its associated forest products and benefits. Timber harvest decisions are not to be directed solely to generate revenue.

Timber harvests must be consistent with the military mission and comply with federal laws and policies, including avoiding adverse impacts on sensitive species and cultural resources. Prerequisites for timber harvests include the following:

- A current and approved Forest Management Plan that is normally included in an INRMP.
- National Environmental Policy Act documentation
- Comply with applicable laws
- Be a fiscally sound investment

- Capable of ecosystem sustainability
- Comply with installation safety restrictions
- Consider potential effects on significant archeological resources and historic properties.

The process for conducting a timber sale on VTS-C will start several months prior to harvest time:

- A stand-specific harvest plan will be developed in accordance with this plan (January)
- A Record of Environmental Consideration will be prepared for the harvest plan to satisfy NEPA requirements
- The harvest plan and REC will be sent to the USFWS field office for consideration (before March 1)
- The harvest plan and REC will be sent to the GA SHPO for consideration (before March 1)
- The harvest plan and REC must be submitted to NGB with a Timber Report of Availability (ROA) (by May 30 prior to the fiscal year in which the harvest is planned)

4.3 Pest Management

Trees are susceptible to periodic infestations of insects and fungi that have the potential to result in serious damage to an installation's forest resources and overall landscape. This can result in the diminishment in the quality of the training landscape; economic loss of potential merchantable timber; modification of habitat conditions within the forest ecosystem that could influence wildlife populations; and an increased risk of wildfire. While such infestations are a natural phenomenon, actions may be required on occasion to prevent the spread of the infecting vector and/or remove damaged and diseased trees.

The U.S. Forest Service (USFS) is responsible for protecting forests from insects and disease in cooperation with the owners of forest lands. The Department of Defense (DoD) and the U.S. Department of Agriculture entered into a Memorandum of Agreement (MOA) in 1990 to conduct forest insect and disease suppression on lands administered by the DoD. Under the MOA, the USFS provides technical assistance and funds to provide foliage protection, reduce specific insect and disease populations, reduce risk of artificial spread to uninfested areas, and to prevent tree mortality.

Army installations may receive funds from the USFS for forest pest suppression projects under the terms of the MOA. Installations wanting to receive pest management funding should have a biological assessment of the forest resources in question conducted by the local USFS staff. The biological assessment should recommend the type of technical assistance required and management actions that could be pursued to address the pest problem. This could include population monitoring, surveys, biological evaluations, determination of trends and projected damage, and consideration of environmental and economic impacts. Approximately one year is required before funds are received for approved requests. The USFS funds are provided to the installations through Army channels to the proponent organizations for distribution to the appropriate installations. In the case of the TNARNG, pest management funds are received from the NGB.

The 2005 Forest Inventory revealed that a substantial amount of the pine timber on VTS-Catoosa had been damaged and/or destroyed by an infestation of southern pine beetles that occurred around two years or more ago. Such infestations are cyclic and should be expected to recur in the future at approximately seven-year intervals depending upon weather conditions. Since pines are a major component of the VTS-Catoosa's mixed pine hardwood forest, periodic monitoring should be performed to identify localized outbreaks of southern pine beetles on the installation in the early stages of development, as well as the occurrence of regional infestations. The Georgia Forestry Commission conducts regular aerial surveys to

identify outbreaks and provides that information to landowners. The best time of the year to obtain that information is during the hot summer when the symptoms of infestations are most apparent in the tree canopy from the air. This information should be obtained from the Georgia Forestry Commission's local offices (Scott Griffin, Forest Health Forester, Gainesville, Georgia, 770-538-2666 or Lee Kelley, Area Forester, Lafayette, Georgia, 706-638-5557) each year and a plan developed as needed to remove the infected trees.

Beavers have also been identified as a potential pest that can adversely impact VTS-Catoosa's timber resources. Beaver activity is primarily restricted to the lower reaches of the tributary streams that drain into Tiger Creek. For the most part, beavers seem to be most active in Broom Branch that flows through Training Areas 4, 9, and 10 before joining Tiger Creek. Besides damaging trees, beaver impoundments can restrict access and cause physical damage to roads. Beaver were removed from the training site in 2006 through an MOA with the USDA Animal Damage Control Office in Georgia. The level of beaver activity on the installation should be monitored annually to assess whether such activity is increasing, remaining stable, or declining.

4.4 Salvage of Disaster Damaged Trees

Natural weather phenomena such as tornadoes and ice storms can have a severe impact on forests. For example, large swaths of trees can be uprooted and/or their trunks broken above the ground by tornadoes, while large ice storms can create extensive alterations in the forest canopy by damaging limbs and small branches. If the damage to trees is significant and widespread, individual trees can be weakened and become more susceptible to disease and parasites in the years following the weather event. That damage can reduce growth rates and possibly even result in the death of individual trees.

If the damaged trees represent a significant economic loss or if the physical aftermath creates a safety hazard, impediment to training, or threat of insect infestation, it may prove prudent to undertake salvage operations in an attempt to recover as much of the lost volume and value of the damaged timber as possible. Salvage actions must be pursued relatively quickly following the disaster to prevent the deterioration in the quality of the damaged wood so as to recover as much economic value as possible. Even though prompt action is needed, the environmental evaluation requirements are typically not waived. In the event a salvage harvest is deemed necessary, TNARNG will coordinate with USACE to conduct the necessary environmental review and emergency harvest procedures.

5.0 ENVIRONMENTAL CONSIDERATIONS IN FOREST MANAGEMENT

All timber sales must be consistent with all applicable environmental laws and regulations. Experience has shown that cultural resources (i.e., historic and/or archaeological) and endangered and threatened species issues have the greatest potential to affect forestry management operations, including timber sales.

5.1 Cultural Resources

Forest management activities must not negatively impact cultural resources on the VTS-C. Several aspects of timber management have the potential to affect cultural resources, including timber harvest operations, site preparation and planting, and prescribed fire. A Phase I survey of VTS-C conducted in 1997 identified 20 archaeological sites and 17 historic architectural resources on the installation (Stanyard et al. 1998). These sites are identified in the TNARNG GIS system and will be incorporated into forest management planning. All efforts will be made to minimize any impacts on known cultural resources.

The eleven sites considered eligible for inclusion on the national Register of Historic Places will be excluded from ground-disturbing activities unless full consultation with the Georgia State Historic Preservation Officer (SHPO) has been conducted for the project. Such activities include, but are not limited to, the construction of plowed fire breaks (see Annex 3 for the "no plow zones"), the use of dozers or other heavy equipment to clear stumps and logging slash, and the use of mechanical planting equipment. Historic structures and cemeteries will be protected from damage during forestry activities by maintaining a 50 foot buffer zone surrounding them.

This plan will be submitted for review by the Georgia SHPO prior to implementation. In addition, the SHPO will be contacted for comments on the annual report of timber availability submitted each year for timber sale planning. Other forestry projects which have the potential to impact known cultural resources on the VTS-C will be coordinated with the SHPO as appropriate.

5.2 Sensitive Species

Chapter 3 of the INRMP contains information on sensitive species occurring or having the potential to occur on the installation. The federal listed threatened large-flowered skullcap (*Scutelleria montana*) exists at a number of well marked locations in the oak-pine forests on the installation. The federal listed endangered gray bat (*Myotis grisescens*) has been captured feeding over Tiger Creek on the training site. In addition, seven species of fish that are listed to be of concern to the State of Georgia have been found in the streams on the installation. A number of other species of concern (see Section 3. 9 in Chapter 3) have been reported from Catoosa County, but have not yet been observed on VTS-Catoosa.

Timber management activities will be limited in those areas where large-flowered skullcap occurs. Known large-flowered skullcap groups will be reserved from timber sales with an additional 50' buffer surrounding the group well-posted prior to any nearby timber sale – no trees will be harvested within the protected area, nor will any equipment be allowed to pass through these areas. Timber harvests within stands that contain or are adjacent to known skullcap groups will be conducted during the fall or winter when the plant is dormant to minimize any accidental damage. Large-flowered skullcap groups will be protected from prescribed burning (see Annex 3 for more details). Ground disturbing activities such as the construction of plowed fire breaks, the traverse of heavy equipment, and log skidding will not be allowed in the known large-flowered skullcap locations.

The gray bat has only been found foraging on VTS-C; no roost sites have been located on site. Therefore, impacts from timber management will be minimal, and protection of waterways and riparian areas through the Streamside Management Zone best management practices (see Section 5.3 below) will ensure the maintenance of foraging habitat quality.

Any activities which may impact federal threatened or endangered species require consultation with the USFWS. Annex 1, the Rare Species Management Plan, contains the biological assessment of the potential impacts of the INRMP on the large-flowered skullcap. The TNARNG will initiate formal consultation with the USFWS prior to the implementation of this plan.

All efforts will be made to protect state listed species from detrimental impacts from forest management activities, as well. In the event any are discovered on the training site, the TNARNG will consult with the Georgia Department of Natural Resources, Wildlife Resources Division, to determine any needed modifications to this forest management plan for the protection of such species.

5.3 Forestry Best Management Practices

Protection of watersheds and water quality during forest management activities can be a significant concern. Forestry practices can generate nonpoint source (NPS) pollution including sediment, organic matter, pesticides, nutrients, and elevated water temperatures. Removal of or damage to vegetative cover can increase runoff and erosion. Eight of the 10 training areas on the VTS-C include portions of Tiger Creek or its tributaries within their limits. Only Training Areas 6 and 8 do not contain any part of the stream system.

Tiger Creek and its tributary streams are protected by the State of Georgia through their designation as secondary trout waters. To maintain high water quality conditions appropriate to trout habitat, a relatively contiguous tree canopy cover over trout streams is important in providing shade from excessive solar radiation heating, and suspended sediment concentrations should be at low levels. As a result, trout streams require additional protection from timber harvest operations along their immediate stream banks if they are to continue to support trout populations. A Streamside Management Zone (SMZ) of 50 feet on both sides of designated trout streams and tributaries is required for protection by State of Georgia regulations. There will be no timber harvested within this SMZ on the VTS-C.

Forestry Best Management Practices (BMPs) have been developed to reduce the adverse effects of forest operations on ecosystems and to protect water quality. A BMP is a practice or combination of practices considered to be the most effective means of preventing or reducing the amount of pollution by nonpoint sources to a level compatible with water quality goals and protecting fish and wildlife populations and habitats. BMPs will be applied to all timber management activities on the VTS-C.

Both Tennessee and Georgia forestry offices have developed BMPs for forestry operations: http://www.state.tn.us/agriculture/forestry/bmpmanual.html and http://www.gfc.state.ga.us/ForestManagement/documents/GeorgiaForestryBMPManual.pdf. The recommendations differ very little between the states. The following synthesis of the state BMPs (Table A2.2) will guide forestry activities on VTS-C. BMP training and technical guidance is available from the Georgia Forestry Commission district office (District 1, Rome, GA, 478-751-3465. Further assistance can be requested from the Catoosa County forester (Gary McGinnis, 706-295-6021), the District 1 water quality forester (Carl Melear, 706-295-6021), or the State Water Quality Coordinator (478-751-3498).

Table A2.2: Forestry Best Management Practices for VTS-Catoosa.

Forestry Practice	Activity/Resource	BMPs
Planning		Locate log landings before planning road system.
		Streamside Management Zone (SMZ) planning should be done before beginning timber harvest.
		Plan site preparation before starting work to ensure best treatment is implemented.
Forest Roads	Locating Roads	Identify laws, regulations, and/or ordinances applying to road construction and maintenance.
		Use soil surveys and topographic maps to develop plan.
		Locate control points on maps prior to design
		Evaluate condition of existing roads and only construct new roads when necessary.
		Minimize the number, length, and width of access roads.
		Locate roads outside of Stream Management Zones and sensitive areas.

Forestry Practice	Activity/Resource	BMPs
		Avoid locating roads at the confluence of streams.
		Locate new access roads on high ground on sides of ridges for drainage.
		Locate new access roads on southern and western sides of ridges to expose roadbed to sunlight.
		Minimize stream crossings. When that is not possible, crossings should be constructed at right angles to the stream.
		Locate roads on upper slopes near ridge crests to promote drainage, but avoid the top of ridges.
		Permanent Roads – Follow natural contours and keep grade below 10 percent. Install water control structures properly.
		Temporary Roads – Follow natural contours. Allow grades to run up to 25 percent for short distances provided water control structures are properly installed.
		Conduct site reconnaissance to verify site conditions.
	Constructing Roads	Complete construction several weeks in advance of use by logging traffic to allow road bed time to settle.
		Construct access roads only wide enough to safely handle equipment to minimize soil disturbance.
		Schedule construction during favorable weather.
		Maximize sunlight exposure along roadsides for drainage.
		Install appropriate dips, turnouts, and water bars to control drainage from the road surface. The number and design should be determined by the prevailing slope of the road segments involved.
		Stabilize expose soil on shoulders.
		Runoff from roads should not directly discharge into streams.
		Minimize runoff at stream crossings.
		Push cleared trees and brush to downhill side of road to assist in trapping sediment.
		Maximize sunlight exposure to road surface.
		Revegetate exposed soils in potential problem areas that could generate sediment.
	Road Maintenance	Keep roads free from obstructions and logging debris.
		Maintain points of ingress from paved roads to prevent mud and debris from being carried onto roads.
		Minimize grading and reshaping on hilly terrain unless necessary.
		Keep dips, water bars and water turnouts open
	Road Retirement	Construct water bars or other drainage structures immediately after active logging has ceased.
		If logging will be delayed, construct temporary drainage and erosion control structures.
		Remove temporary fills, bridges, culverts, and pole fords.
		Remove sediment and debris from dips, ditches, and culverts.
		Use mulch and/or seed with lime and fertilizer to prevent soil erosion.
		Periodically inspect retired roads.
Streamside Management Zones (SMZs)	SMZs	Mark SMZ boundary prior to harvest.
		SMZ width should be a minimum of 100 feet for Tiger Creek and its tributaries: 50 feet on either side of the stream.
		No harvest is allowed within the 50-foot SMZ.
		Maintain integrity of stream banks.

Forestry Practice	Activity/Resource	BMPs
		Minimize exposure of mineral soils by spreading logging slash and using it to drive over.
		Minimize soil exposure and compaction to protect ground vegetation.
		Do not use stream channels as roadways for equipment.
		Avoid equipment operation within SMZ.
		Avoid skidding within drains during wet conditions.
		Avoid locating roads in drains except when necessary for crossings.
		Do not empty road runoff into drains.
Stream crossings	Stream crossings	Avoid or minimize stream crossings. When that is not possible, crossings should be constructed at right angles.
		Locate crossings on straightest stream sections.
		Avoid locating crossings at confluence of streams.
		The road fill shall be bridged, culverted, or otherwise designed to prevent restriction of flood flows.
		Borrow shall be obtained from upland sources.
		Fill shall be stabilized and maintained to prevent erosion.
		Minimize disturbance to stream during construction.
		Design to minimize disruption of movement of aquatic life.
		Approaches should be graveled and should rise away from streams at a gentle grade (<3 percent) to minimize erosion.
		Stabilize approaches with rocks if necessary.
		Install broad-based dips and wing ditch turnouts to turn water off roads before entering stream.
		Temporary bridges should be favored over culverts or fords for temporary crossings.
		Minimum encroachment into SMZs when aligning and constructing stream crossings.
	Fords	Use fords for haul roads only, not for skid trails.
		Locate fords where stream banks are low.
		Fords should have a solid bottom.
		Where necessary, use gravel to establish low water crossing. Material should not significantly impound stream flow or impede fish passage or cause erosive currents.
		Remove temporary crossings from channel when operations completed.
	Culverts	Use culverts for watersheds less than 300 acres
		Permanent culverts should be sized to accommodate 25-year, 24-hour storm flows.
		Temporary culverts will accommodate 2-year, 24-hour storm flows, but must be removed after completion of logging.
		Install culverts in a manner that minimizes disturbance of stream. Stabilize fill material with riprap and/or vegetation.
		Place at least 15 inches of fill over the culvert so that the culvert becomes the high spot in the stream crossing so flood flows run around the culvert.
		Inspect culverts periodically to ensure they are free of blockages.
		Install culverts on grade with bottom of channel to allow movement of aquatic life.
	Bridges	Use bridges for watersheds of 300 acres or more.
		Locate bridges across narrow points of stream and on firm soils.

Forestry Practice	Activity/Resource	BMPs
		Protect banks from sloughing during construction.
		Remove temporary bridges.
		Do not cover bridges with soil.
		Use temporary bridges for skid trails to prevent equipment and logs from entering stream channels.
Timber harvesting	Landings or log decks	Locate landings outside of SMZs and away from streams and sensitive areas.
		Minimize number of landings.
		Minimize size of landings.
		Locate landings uphill and skid up to them.
		Locate landings in a stable and well-drained area away from gullies.
		Slope lands 2-5 percent to allow for drainage.
		Stabilize and revegetate landings after use if they pose a potential water quality problem.
		Install drainage and sediment control structures to divert runoff.
	Skid trails	Minimize number of skid trails by using existing trails.
		Skid uphill to log landings.
		Locate skid trails on slopes up to 15 percent. Steeper slopes can be used for short distances if water control/drainage structures are provided.
		Have periodic breaks in grade to help disperse surface flow.
		Runoff from skid trails should not discharge into a stream.
		Control runoff by varying trail grade, water bars, wing ditches and/or sediment control structures.
		Minimize number of stream crossings.
		Avoid skidding across streams, drains, and sensitive areas. However, if that is necessary, skid at right angles.
		Use temporary bridges or spans instead of culverts for crossing structures.
		Use logs as fill over temporary culverts instead of fill dirt.
		Do not use fords to skid across streams.
		Do not operate equipment in streams.
		Avoid skidding directly up or down hill, but follow contours or “zigzag” if possible.
		Use low ground pressure tires on skidders when available and concentrate skidding as much as possible on a few primary skid trails to minimize site disturbance and soil compaction.
		After completing logging, remove temporary bridges and culverts, sediment and debris from dips, ditches, and culverts, and revegetate problem areas.
		Use mulch and/or seed with appropriate amounts of lime and fertilizer when needed to prevent soil erosion.
		Avoid ruts that risk channeling water into a stream.
		Retire trails as soon as possible.
	Logging Debris	Trees should not be felled in or across streams.
		Pull treetops far enough from waterways to prevent them from being washed in during high water.
		Do not drag trees and tops through a stream channel.
		Do not remove stumps and roots from stream banks.
Servicing and Maintaining Equipment		Wash and service any equipment away from any area that may create a water quality problem.
		Dispose of oils and lubricants in their containers and other

Forestry Practice	Activity/Resource	BMPs
		wastes in accordance with applicable regulations.
		Remove all used tires, batteries, oil cans, and trash from site when logging operations are completed.
		Prevent oil and fuel spills. Prevent debris and fuels/lubricants from entering drains from where they could be washed by runoff into streams.
		If a spill occurs, clean up all spilled materials and contaminated soils and dispose of both properly. Notify the Georgia Environmental Protection Division of spill incident.
Site Preparation for Tree Panting	Mechanical	Choose site preparation method that will expose and disturb as little bare soil as possible. Use the minimum intensity for treatment.
		Establish SMZs to minimize sediment entering streams.
		Carry out all mechanical site preparation operations and tree planting along the contour of the land.
		Slopes over 30 percent should use only hand tools and be hand planted and not be subjected to mechanical site preparation.
		Leave logging debris and other litter scattered over erosion problem areas.
	Chemical	Establish SMZs.
		Favor chemical methods over mechanical methods on steep slopes and erodible soils to control undesirable vegetation.
		Follow all EPA label instructions
		Never apply pesticides directly to water except when registered for application over water.
		Establish SMZ to minimize chemicals entering streams.
		Avoid use of chemicals in or near sensitive areas.
		Consider weather conditions and equipment capabilities to avoid herbicide drift.
		Calibrate spray equipment to apply chemicals uniformly and in correct quantities.
		Prevent chemical leaks from equipment and check equipment.
		Mix and load chemicals outside of SMZs and other sensitive areas.
		Rinse spray equipment and discharge rinse water only in areas that are part of the application site. Never rinse tanks or sprayers in or near streams
		Dispose of chemical containers according to label instructions.
		Report all spills to the Georgia Environmental Protection Division.
	Prescribed Fire	Locate windrows well away from drains to prevent materials from being washed into streams.
		Construct firelines on the contour in advance of prescribed burning.
		Avoid high intensity fires in SMZs.
		Plow firelines only as deep and wide as necessary to control the spread of the prescribed fire and to minimize soil disturbance.
		Construct water bars and wing ditches at appropriate intervals on firelines to turn water into adjacent undisturbed areas.
Reforestation		Hand plant on slopes >21 percent.
		Machine plan on the contour between 5 and 20 percent slope.
Fertilization		Determine appropriate amounts and types of fertilizer needed before application.

Forestry Practice	Activity/Resource	BMPs
		Consider weather conditions and equipment capabilities to avoid drift into SMZs.
		Conduct all on-site fertilizer handling away from waterbodies, wells, ditches, and sensitive areas.
		Clean up and/or contain all fertilizer spills immediately.
		Dispose of fertilizer containers and/or excess fertilizer according to applicable governmental regulations and label requirements.

Sources: "Georgia's Best Management Practices for Forestry" (January 1999), Georgia Forestry Commission and "Guide to Forestry: Best Management Practices in Tennessee (2003), Tennessee Department of Agriculture, Division of Forestry

5.4 Monitoring and Inspections

Monitoring is a key element in ecosystem management. Army forest managers are required to balance increasing demands for resource use, such as military training, forest product sales, biodiversity conservation, and, where applicable, recreation use of military lands. The VTS-C forestry program should be periodically monitored to: (1) assess whether or not forest management objectives are being met; and (2) detect trends in forest health and condition in response to the forest management actions proposed in this plan.

Forestry program monitoring on the VTS-C will include:

- The progress of each timber sale will be monitored to ensure that the harvest is being conducted in accordance with the terms of the contract. Monitoring will be coordinated with the USACE's Mobile District if the timber sale is administered by the USACE. At the conclusion of the timber harvest, a final inspection of the site will be conducted jointly by the USACE and the TNARNG to assure the cut was conducted in accordance with the contract stipulations to allow release of the buyers' bond.

- Effective management requires feedback on the results of the management activities. The necessary assessment may be conducted specifically for the forestry program or as a part of another program area. The VTS-C forests will be monitored annually to assess:

  - Whether the overall condition of the forest is meeting military mission requirements
  - The effects of training activities on forest resources
  - Response to forest management activities
  - Wildlife habitat quality
  - Influence of forest management on sensitive species
  - Impacts on cultural resources
  - Erosion problems related to timber management practices and the success of repair efforts
  - Any areas affected by disease or insect infestations (particularly southern pine beetles during summer months)
  - Storm or other natural damage
  - Beaver activity
  - Invasive pest plant problems
  - Fuel loads on the forest floor and the risk for wildfires
  - Areas for inclusion in future timber ROAs
  - Emergency harvests needs

- The baseline forest inventory was conducted for VTS-Catoosa in 2005. Forest resources should be re-inventoried in 2015. If that work is to be accomplished by contract, adequate advance time should be allowed to prepare the scope of work and to award the contract by that timeframe. The 2015 inventory should include a specific task requiring a comparison of the forest condition in 2015 with the results of the 2005 inventory to determine the direction the installation's forest is headed; how effective management measures have been in assuring a quality forest is provided; and identifying adjustments in the long-term management goals in the installation's forest management program.

6.0 MANAGEMENT PRESCRIPTIONS

The following stand descriptions and management prescriptions are based on the 2005 forest inventory. Timber harvests will typically involve thinning the stands to encourage improved growth rather than clearcutting a stand, unless mission needs require a cleared site. Recommendations for the use of prescribed fire are also included; full burn prescriptions are found in the prescribed fire section of the Wildland Fire Management Plan in Annex 3 of the INRMP. There will be no harvesting or prescribed fire within the 50' SMZs bordering Tiger Creek and its tributaries. In addition, there will be no harvesting of timber within any large-flowered skullcap management groups or a 50' buffer surrounding each. Skullcap groups will also be protected from prescribed burning, with the exception of a potential research study, discussed in more detail in Annex 3 and Annex 1.

6.1 Cantonment Area

The 106-acre Cantonment Area is the management center for VTS-Catoosa and contains most of the building infrastructure occurring on the installation. A portion of the southern boundary borders State Highway 2 which provides the primary access onto the installation. The Cantonment Area is dominated by two large open areas, one of which contains the installation's buildings and the other is the range complex. The open areas contribute to the fragmentation of the two forest stands occurring within the Cantonment Area.

Stand Description

Stand cc01 is a mature upland pine and hardwood forest. This highly fragmented 63-acre stand is divided into four units. The stand is dominated by pine and miscellaneous hardwoods, with a mix of oaks, hickory, and poplar. Ages of the trees range from 20 to 50 years. The overall health of the stand is excellent.

Stand cc02 is a 1.9-acre pre-merchantable natural pine stand. The stand is 3 to 5 years old. The overall health of the stand is excellent.

Forest Management Prescription

Stand cc01. Section (a) (17 ac west of the KD range) will be thinned as needed for training use, leaving the 50 ft SMZ along Tiger Creek unharvested. Hardwood trees 20 inches DBH and larger will be selectively removed to make the area traversable. A few small (<1 ac) clearings may be created by taking groups of trees without regard to the size limit.

Section (b) (5 ac west of the road to the southern creek crossing) will not be harvested to ensure sufficient buffer for Tiger Creek.

Section (c) (35 acres north of the barracks, office, and shop complex) will be thinned by small group selection for training and construction needs and to create a patchwork of age classes. Areas to be harvested will be chosen on the basis of advance regeneration and seed tree quality unless intended to remain clear for training or construction. No more than 30% of the section acreage will be harvested in groups. The remainder may be lightly thinned to release desirable hardwood trees. A 50 ft SMZ along all creeks will not be harvested, and a 50 ft unharvested buffer will surround the large-flowered skullcap management group.

Section (d) (6 ac south east of the developed area) will be left unharvested as a visual buffer from the road.

Prescribed burning can be done in this stand every 6 years for fuel reduction. No burning will be conducted in the portion of the stand bordering Tiger Creek or within the large-flowered skullcap group.

Stand cc02. This stand will be allowed to grow and self-thin for the immediate future. There will be no prescribed burning due to density of the young trees.

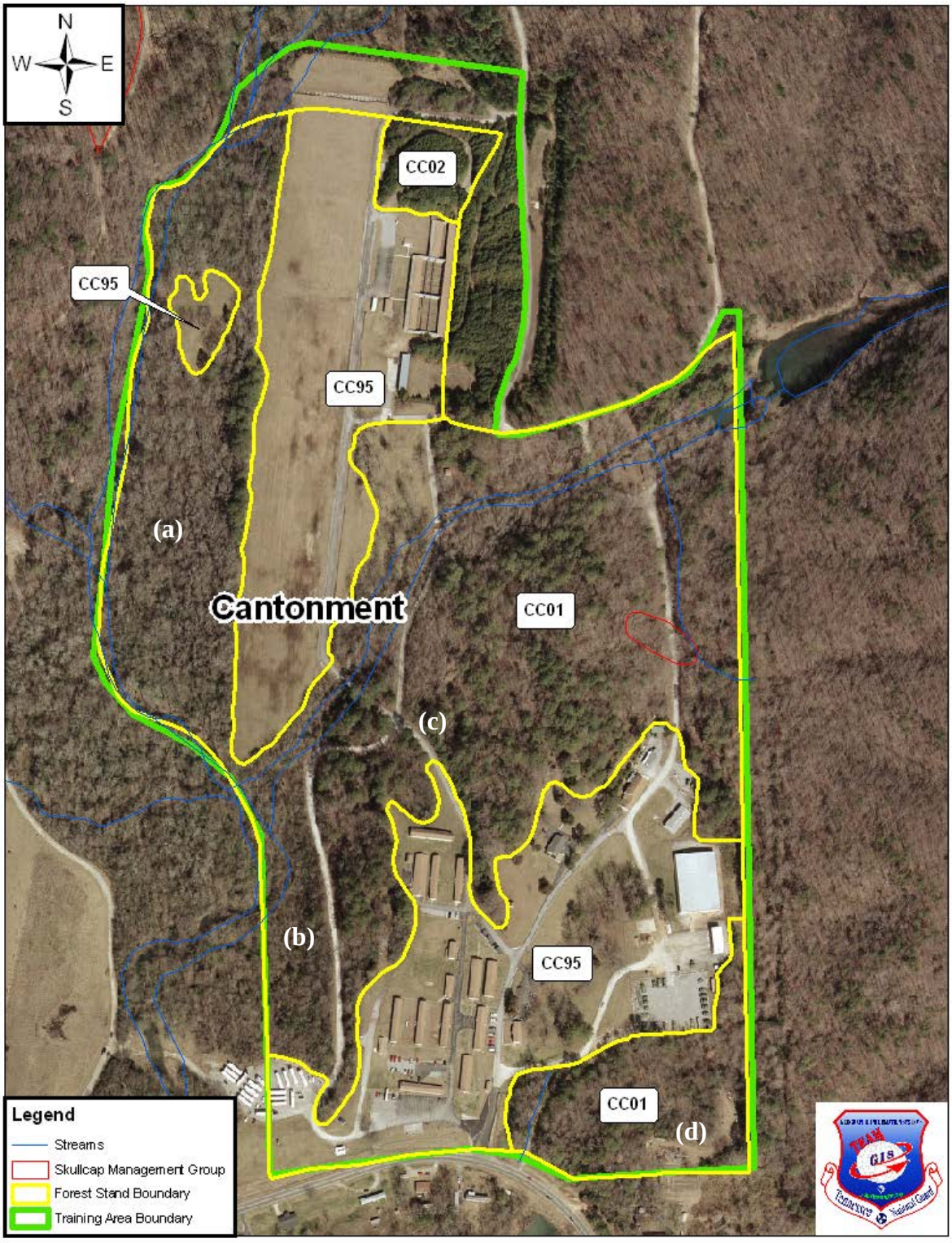


Figure A2.2: Forest stands in the Cantonment Area of VTS-Catoosa.

6.2 Training Area 1

Training Area 1 is a 57-acre tract located along the southern boundary of the installation and immediately to the west of the Cantonment Area. State Highway 2 parallels the southern border of this training area. Training Area 1 contains some of the installation's small arms firing ranges which are essentially located within a large central open area that is surrounded by the two forest stands occurring within this training area. Large portions of the training area fall into "stand" c0195 which identifies the non-forested areas which do not have stand prescriptions.

Stand Description

Stand c0101 is a 22.7-acre immature pine and hardwood forest. Unlike much of VTS-Catoosa, the stand occurs on flat land and is characterized by wet, heavy soils. The stand is dominated by poplar and pine, with a mix of hickory, walnut, and oaks. The trees range in age from 5 to 15 years old. Although the overall health of the stand is good, conditions are expected to decline within the next ten years without management.

Stand c0110 is a narrow 6-acre mature bottomland pine and hardwood forest that is located within the flood plain of Tiger Creek. The stand is dominated by red oak and white oak, with a mix of hickory, poplar, walnut, and a few large pines. The trees range in age from 30 to 70 year old. The overall health of the stand is good, but will decline without management.

Forest Management Prescription

Stand c0101. This stand will be thinned by removing all trees that are not in the dominant or co-dominant crown class. Some of the co-dominants may also be removed to allow more room for growth by the remaining trees. The goal will be for the tree crowns not to touch each other on at least 3 sides. This will allow room for the remaining trees to grow, plus aide in training. Prescribed burning can be done once every 4 years for fuel reduction. No burning will be undertaken before thinning is completed.

Stand c0110. This stand will be thinned by removing trees that are 20 inches DBH and larger and selectively releasing desirable hardwood trees if needed. This will allow room for the remaining trees to grow, plus aide in training. The 50-foot Stream Management Zone will be clearly demarcated in that portion of the stand that borders Tiger Creek and there will be no harvesting within the SMZ. Prescribed burning can be done once every 4 years for fuel reduction. No burning should be undertaken before thinning is completed.

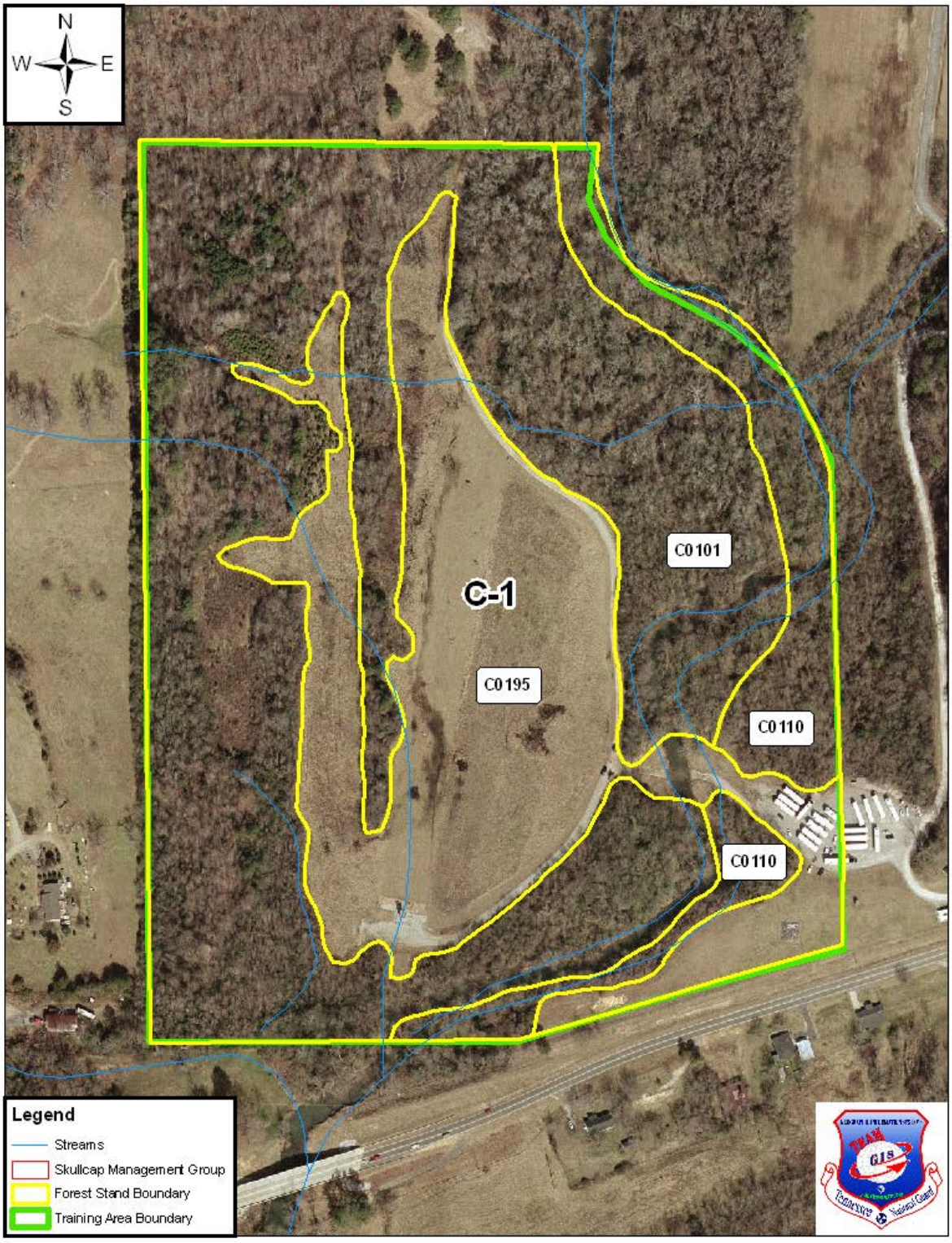


Figure A1.3: Forest stands in Training Area 1.

6.3 Training Area 2

Training Area 2 is a heavily forested elongated 256-acre tract. This is the second largest training area occurring on VTS-Catoosa. Tiger Creek flows along the entire eastern boundary of the training area. Two forest stands occur within the training area, along with three small scattered open areas.

Stand Descriptions

Stand c0201 is a 182.3-acre mature upland pine and hardwood forest characterized by steep, rolling hills. The stand is dominated by red oak and white oak, with a mix of hickory, ash, poplar, walnut, and a few pines. Most of pines were killed by southern pine beetles in the past. The trees range in age from 20 to 60 years old. The overall health of the stand is good. However, the health of the stand will decline in the next five years without management. A high percentage of the large-flowered skullcap population on the training site occurs within this stand.

Stand c0202 is a 66-acre immature upland pine and hardwood forest, located in the floodplain of Tiger Creek. The stand is dominated by red oak and poplar, with a mix of hickory, white oak, walnut, and a few large pines. The trees range in age from 20 to 50 year old. The overall health of the stand is excellent, but is expected to decline in the next ten years without management.

Forest Management Prescription

Stand c0201. Section (a) (90 ac west of the road and north of the tributary) will not be harvested due to the predominance of large-flowered skullcap in the area.

Sections (b) (35 ac west of the road and south of the tributary) and (c) (47 ac east of the road) will be subject to small group selections to create a patchwork of age classes. Areas to be harvested will be chosen on the basis of advance regeneration and seed tree quality. No more than 30% of the section acreage will be harvested in groups. The remainder of each section may be lightly thinned to release desirable hardwood trees. The two sections will not be harvested in the same year. There will be no harvesting in the 50 ft SMZs along the Tiger Creek and its tributaries.

Harvest activities will be limited in the vicinity of skullcap management groups. Harvest operations must be scheduled for the fall or winter when the plants are dormant. No vehicles, skidders included, may pass through a management group at any time, and soil disturbance must be minimized. There will be a 50’ buffer surrounding the skullcap group; no timber will be cut within the management groups or the buffer zone. Tops and limbs will not be left within a management group or buffer. There will be no prescribed burning in this stand until the susceptibility of large-flowered skullcap to fire is determined.

Stand c0202. Sections (a) (32 ac west of Tiger Creek) and (b) (34 ac east of Tiger Creek will be thinned by removing all trees that are not in the dominant or co-dominant crown class. Some of the co-dominants may be removed to allow more room to improve growing conditions for those trees that would not be removed during the thinning operation. The goal would be for the tree crowns not to touch each other on at least 3 sides. This will allow room for the remaining trees to grow, plus aid in training. There will be no harvesting within the SMZ along Tiger Creek.

Prescribed burning can be done once every 4 years for fuel reduction. No burning should be undertaken before thinning is completed.

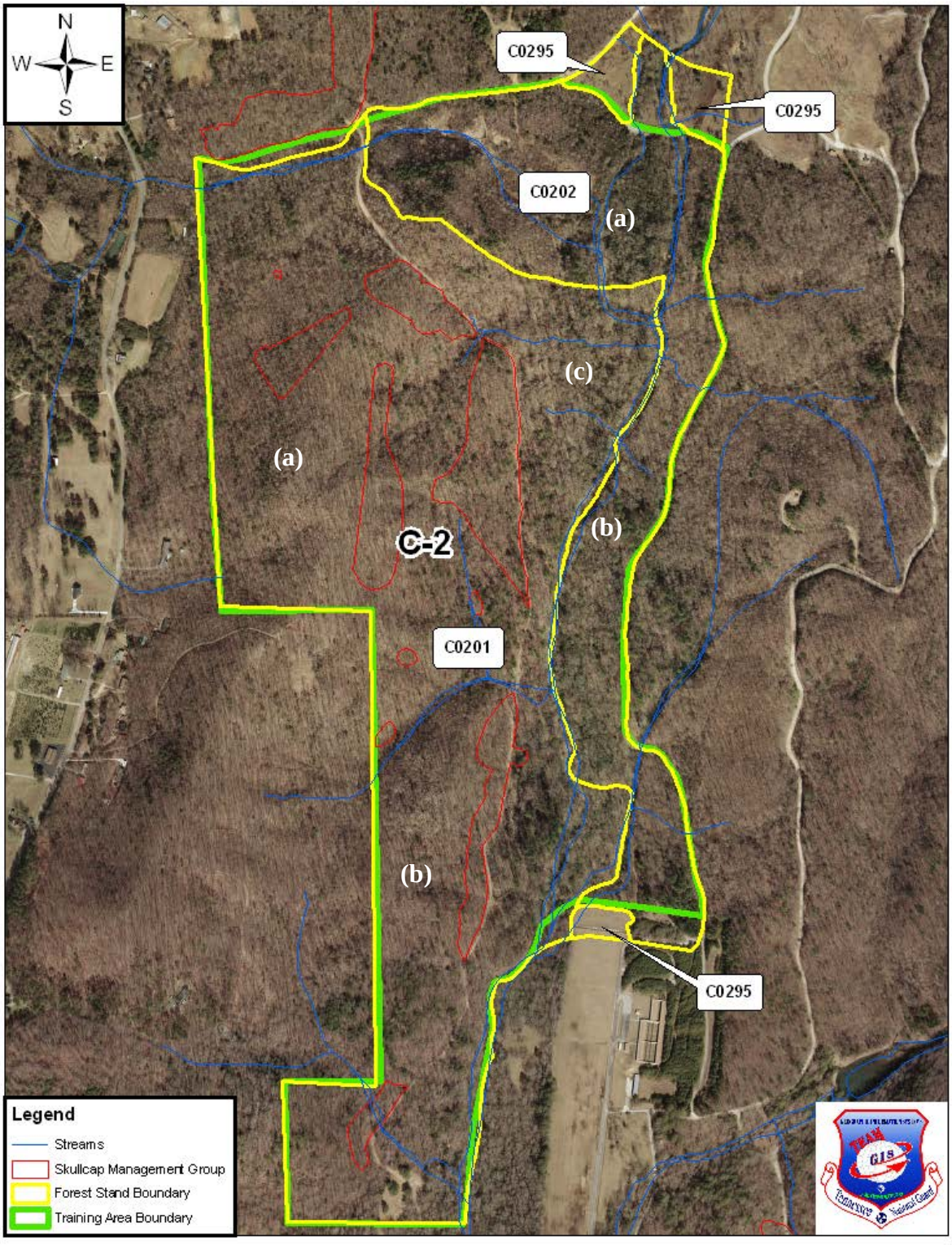


Figure A2.4: Forest stands in Training Area 2.

6.4 Training Area 3

The 277-acre Training Area 3 is the largest of the training areas comprising VTS-C. The training area is characterized by a diverse assemblage of habitat types. Training activities have greatly influenced the juxtaposition of the forest stands with open areas and an extensive internal road network. Four different forest stands are divided into various sub-units by the mixture of habitats.

Stand Description

Stand c0301 is an immature upland pine and hardwood forest that occurs on steep, rolling hills. Totaling 115.4 acres, the stand is broken into two large separated units, with the northernmost unit being somewhat larger. The stand is dominated by red oak and white oak, with a mix of hickory, poplar, walnut, and a few pines that still remain following a past problem with Southern pine beetles. The trees range from 20 to 50 years old. The overall health of the stand is excellent.

Stand c0302 is 42.5-acre immature upland pine and hardwood forest located in steep, rolling hills. The stand is divided into two units by a hardwood drain that flanks a tributary flowing into Tiger Creek. The stand is dominated by red oak and white oak, with a mix of hickory, poplar, walnut, and a few pines that remain from a past southern pine beetle infestation. The trees range from 10 to 20 years old.

Stand c0303 is 6.43-acre area of pre-merchantable pines that appear to have naturally regenerated within an open area that was formerly associated with the Cantonment Area and has since been abandoned. The stand is estimated to be 3 to 5 years old. The overall health of the stand is excellent.

Stand c0310 is a 12.8-acre immature upland pine and hardwood forest located within steep, rolling hills. The stand is associated with the lower elevations along and almost evenly divided between two tributary streams that drain into Tiger Creek. The stand is dominated by red oak and white oak, with a mix of hickory, poplar, walnut, and a few pines that remain from a past infestation by southern pine beetles. The trees range from 20 to 50 years old. The current overall health of the stand is excellent.

Forest Management Prescription

Stand c0301. This stand will require thinning in the future. This stand will be re-assessed in the next inventory and a thinning prescription developed at that time. No burning should be conducted before thinning is completed.

Stand c0302. No forestry actions will be taken in stand c0302 during the next 10 years. At the next inventory, the condition of the stand should be reconsidered and appropriate management measures identified at that time. Prescribed burning can be done once every 4 years for fuel reduction.

Stand c0303. This stand will be allowed to grow and self-thin for the immediate future. There will be no prescribed burning due to density of the young trees.

Stand c0310. This stand falls almost entirely within the SMZ; therefore, there will be no timber harvest or prescribed burning in this stand.

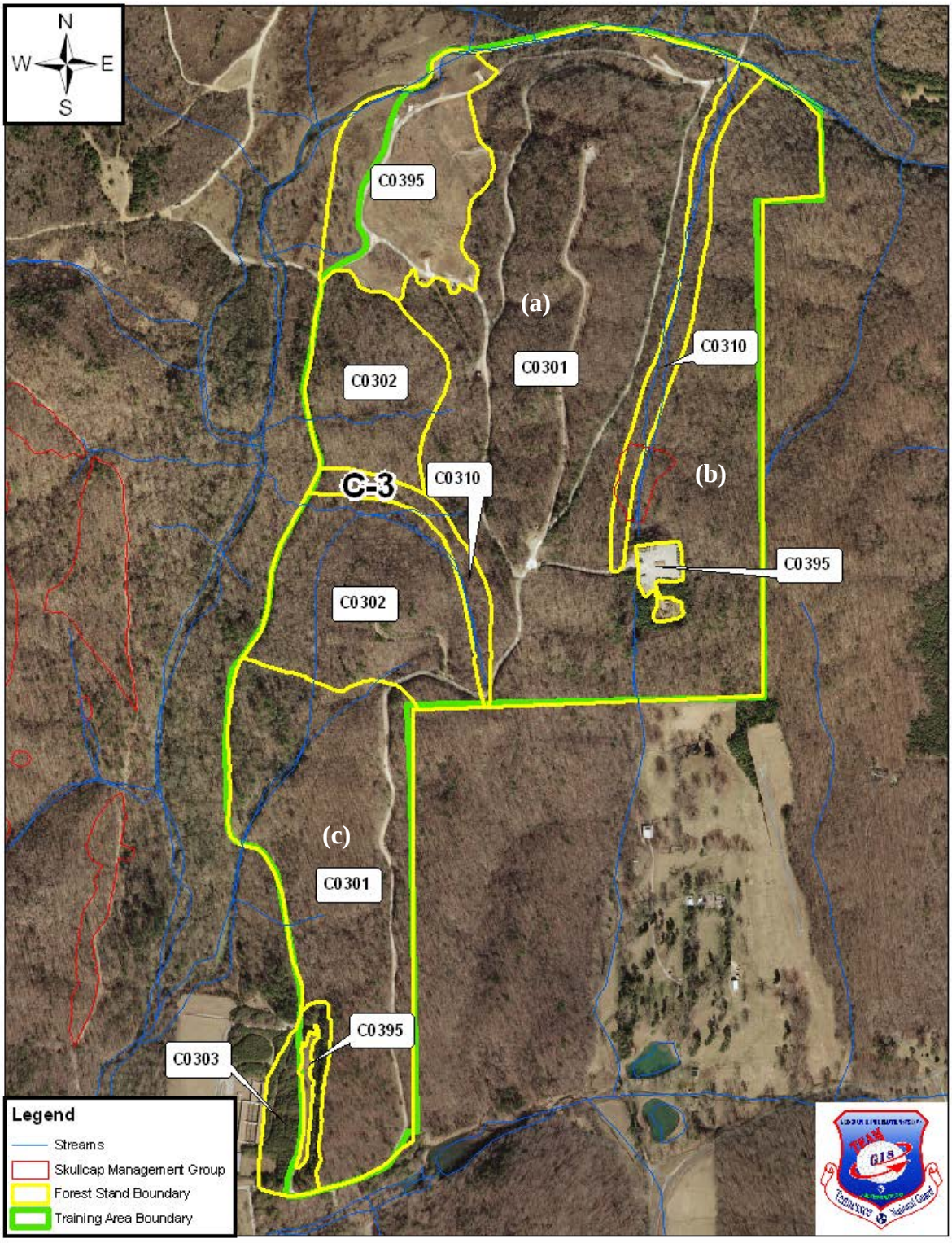


Figure A2.5: Forest stands in Training Area 3.

6.5 Training Area 4

The 173-acre Training Area 4 is also characterized by a mixture of forest conditions and habitat types. Tiger Creek flows along the southern boundary of the training area, while Broom Branch flows near the western boundary before joining Tiger Creek. In addition, an extensive open area is associated with the firing points, the installation Impact Area, and the line-of-sight in between. Three forest stands were identified in the training area.

Stand Description

Stand c0401 is an 88-acre immature pine and hardwood forest that contains very few pines. The stand is divided into eastern and western units by the presence of Broom Branch that flows through the training area. The stand is dominated by red oak and white oak, with a mix of hickory, poplar, walnut, and pine. The trees range in age from 20 to 50 years old. The overall health of the stand is considered to be excellent.

Stand c0402 is a 28.4 acre young oak and pine stand occurring on rolling hills. This stand has developed from past cuttings that removed most of the pines. There is some scattered pine regeneration in the stand. This stand is of excellent health, with trees ranging in age from 10 to 25 years old.

Stand c0410 is a narrow, elongated 10.3-acre immature pine and hardwood forest exhibiting similar characteristics as Stand c0401. However, since Stand c0410 is located at the lower elevations flanking Broom Branch, for the purposes of this Forest Management Plan it has been determined to be a Streamside Management Zone in which forestry measures should be pursued with extreme caution.

Forest Management Prescriptions

Stand c0401. Section (a) (45 ac west of the drainage) and (b) (33 ac east of the drainage) will be subject to small group selections to create a patchwork of age classes. Areas to be harvested will be chosen on the basis of advance regeneration and seed tree quality. No more than 30% of the section acreage will be harvested in groups. The remainder of each section may be lightly thinned to release desirable hardwood trees. The two sections will not be harvested in the same year.

Harvest activities will be limited in the vicinity of skullcap management groups. Harvest operations must be scheduled for the fall or winter when the plants are dormant. No vehicles, skidders included, may pass through a management group at any time, and soil disturbance must be minimized. There will be a 50’ buffer surrounding the skullcap group; no timber will be cut within the management groups or the buffer zone. Tops and limbs will not be left within a management group or buffer.

Prescribed burning can be done once every 6 years for fuel reduction. No burning should be undertaken before thinning is completed.

Stand c0402. Approximately 12 acres at the southern end of this stand may be cleared for mission related activities. The remainder of the stand will be left to develop and re-assessed after the next inventory.

Prescribed burning can be done once every 6 years for fuel reduction.

Stand c0410. This stand falls almost entirely within the SMZ; therefore, there will be no timber harvest or prescribed burning in this stand.

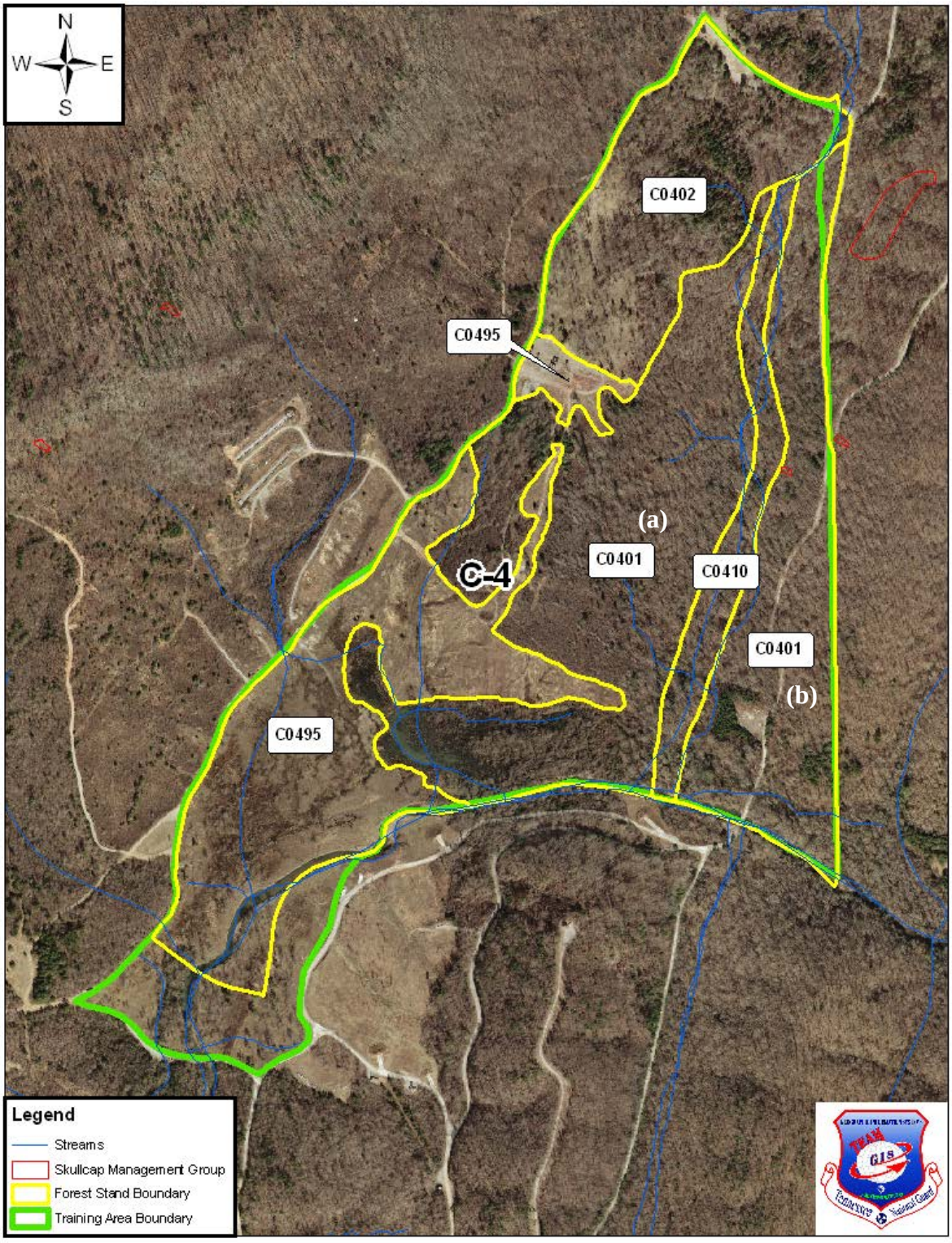


Figure A2.6: Forest stands in Training Area 4.

6.6 Training Area 5

Training Area 5 is 145 acres in size and is essentially completely covered in forest with the exception of a small open area along its southeastern margin. Three different forest stands have been identified in this training area. Some evidence of fire damage is shown in the forested areas occurring along the eastern boundary of the training area. The fires have originated from annual controlled burns and wildfires that have initiated from military firing operations.

Stand Descriptions

Stand c0501 is a 17.1-acre mature upland pine and hardwood forest. The stand is dominated by red oak, with a mix of hickory, white oak, poplar, walnut, and a few pines. The trees range in age from 30 to 70 years old. The overall health of the stand is good. A portion of a large-flowered skullcap management group occurs in this stand.

Stand c0502 is a 95.7-acre immature pine and hardwood forest. The stand is dominated by red oak and pine, with a mix of hickory, poplar, walnut, and white oak. The trees range from 10 to 40 years old. The overall health of the stand is excellent, but is expected to decline during the next ten years without any management. There is some evidence of fire damage along the eastern boundary of this stand.

Stand c0503 is a 31.6-acre mature upland pine and hardwood forest. The stand is dominated by pines and cedar, with a mix of hickory, white oak, and poplar. The trees range in age from 30 to 70 years old. The overall health of the stand is poor due to poor site index and rocky ground conditions. An extensive large-flowered skullcap management group occurs at the southern end of this stand.

Forest Management Prescriptions

Stand c0501. No harvest will be conducted at this time. Selective cutting will be considered after the next inventory. Prescribed burning can be conducted once every 6 years for fuel reduction purposes.

Stand c0502. Sections (a) (50 ac north of tank trail) and (b) (40 ac south of tank trail) will be thinned by removing all trees that are not in the dominant or co-dominant crown class. Some of the co-dominants may also be removed to allow more room for the remaining trees to grow, plus aide in training. The goal would be for the tree crowns not to touch each other on at least 3 sides.

Harvest activities will be limited in the vicinity of skullcap management groups. Harvest operations must be scheduled for the fall or winter when the plants are dormant. No vehicles, skidders included, may pass through a management group at any time, and soil disturbance must be minimized. There will be a 50’ buffer surrounding the skullcap group; no timber will be cut within the management groups or the buffer zone. Tops and limbs will not be left within a management group or buffer.

Prescribed burning can be done once every 6 years for fuel reduction. No burning should be undertaken before thinning is completed.

Stand c0503. Due to the rocky ground and poor site conditions, there are few viable forestry management options to improve the quality of the forest stand occurring on this site. No management actions will be taken at this time; the stand will be reconsidered after the next Forest Inventory is conducted. Prescribed burning can be conducted once every 6 years for fuel reduction purposes. The skullcap management group will be protected from prescribed fire with a temporary firebreak placed outside the 50’ buffer.

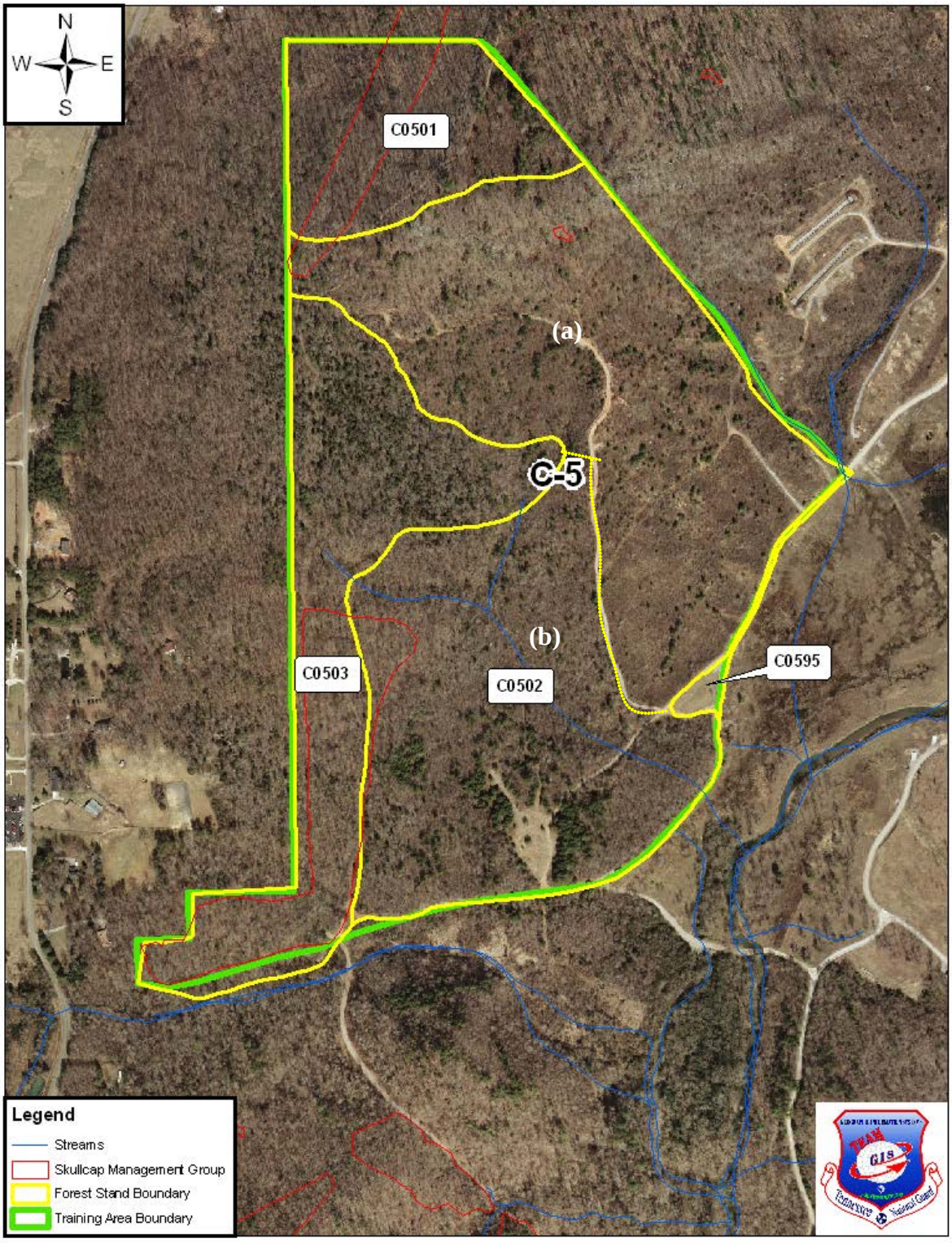


Figure A1.7: Forest stands in Training Area 5.

6.7 Training Area 6

Training Area 6 is a 129-acre tract located along the northwestern boundary of VTS-Catoosa. This training area includes the summit of Sand Mountain which represents the most rugged terrain occurring on the installation. The site is completely covered by a single forest stand.

Stand Description

Stand c0601 is a mature upland pine and hardwood forest that is dominated by red oak with a mix of hickory, white oak, poplar, walnut, and a few pines. The trees range in age from 30 to 70 years old. The overall health of the stand is good. A large skullcap management group is located on the west-facing slope of Sand Mountain, and a portion of another group occurs on the northeast edge of the stand.

Forest Management Prescription

Stand 0601 is divided into three sections (a: 50 ac to the west, b: 44 ac in the center, and c: 37 ac to the west). All three will be subject to small group selections to create a patchwork of age classes. Areas to be harvested will be chosen on the basis of advance regeneration and seed tree quality. No more than 30% of the section acreage will be harvested in groups. The remainder of each section may be lightly thinned to release desirable hardwood trees. The sections will not be harvested in the same year.

Harvest activities will be limited in the vicinity of skullcap management groups. Harvest operations must be scheduled for the fall or winter when the plants are dormant. No vehicles, skidders included, may pass through a management group at any time, and soil disturbance must be minimized. There will be a 50’ buffer surrounding the skullcap group; no timber will be cut within the management groups or the buffer zone. Tops and limbs will not be left within a management group or buffer.

Prescribed burning can be done once every 6 years for fuel reduction. The skullcap management group will be protected from prescribed fire with a temporary firebreak placed outside the 50’ buffer.

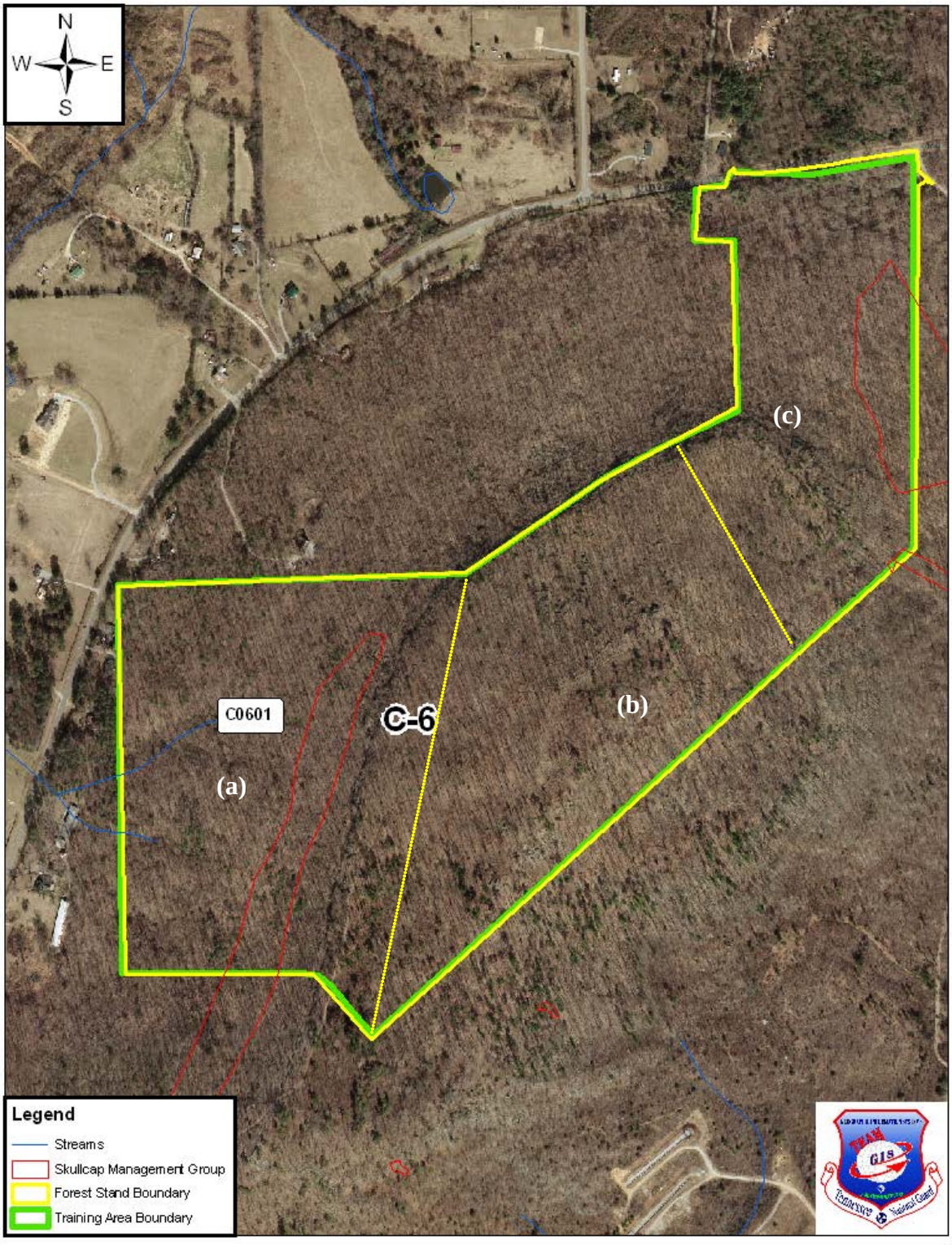


Figure A2.8: Forest stands in Training Area 6.

6.8 Training Area 7

Training Area 7 consists of 154 acres. This site contains most of the Impact Area for military firing exercises. Two forest stands occur within the training area, along with a small acreage of open lands occurring along the southeastern boundary of the area.

Stand Description

Stand c0701 is a mature upland pine and hardwood forest that is located on the very steep and rocky terrain of Sand Mountain. The stand exists as two separated units. The stand is dominated by red oak and white oak, with a mix of hickory, poplar, walnut, and a very few pines. The trees range in age from 20 to 60 years old. The overall health of the stand is excellent. The stand exhibits signs of fire damage resulting from wildfires ignited by military firing exercises and/or by controlled burns. The fire damage has resulted in major damage to the hardwood species and allowed erosion of the soil to occur. Two large-flowered skullcap management groups occur in the northeastern portion of this stand.

Stand c0702 is a contiguous 106.6-acre area of immature pine and hardwood forest, containing areas in which significant pine and hardwood regeneration has occurred. The trees range from 10 to 30 years old. The stand has experienced past hot fires and wind damage that has reduced the condition of the stand.

Forest Management Prescription

Stand c0701. Section (a) (8 ac) in the west will be subject to small group selections at the same time as Stand c0601 (b) to create a patchwork of age classes. Areas to be harvested will be chosen on the basis of advance regeneration and seed tree quality. No more than 30% of the section acreage will be harvested in groups. The remainder may be lightly thinned to release desirable trees. Due to the prevalence of fire in this portion of the training site, pine species will be maintained whenever possible

Section (b) (32 ac) in the east will be subject to small group selections. Areas to be harvested will be chosen on the basis of advance regeneration and seed tree quality. No more than 30% of the section acreage will be harvested in groups. The remainder may be lightly thinned to release desirable trees. Due to the prevalence of fire in this portion of the training site, pine species will be maintained whenever possible.

Harvest activities will be limited in the vicinity of skullcap management groups. Harvest operations must be scheduled for the fall or winter when the plants are dormant. No vehicles, skidders included, may pass through a management group at any time, and soil disturbance must be minimized. There will be a 50’ buffer surrounding the skullcap group; no timber will be cut within the management groups or the buffer zone. Tops and limbs will not be left within a management group or buffer.

Prescribed burning can be done once every 6 years for fuel reduction.

Stand c0702. This stand will be left alone for the immediate future. Fire, both accidental and intentional, will continue to influence the conditions. Following the next inventory the stand will be reassessed. If expansion of the target area is required, areas of the stand will be cleared of damaged forest vegetation and maintained in an open state..

Prescribed burning can be done once every 6 years for fuel reduction.

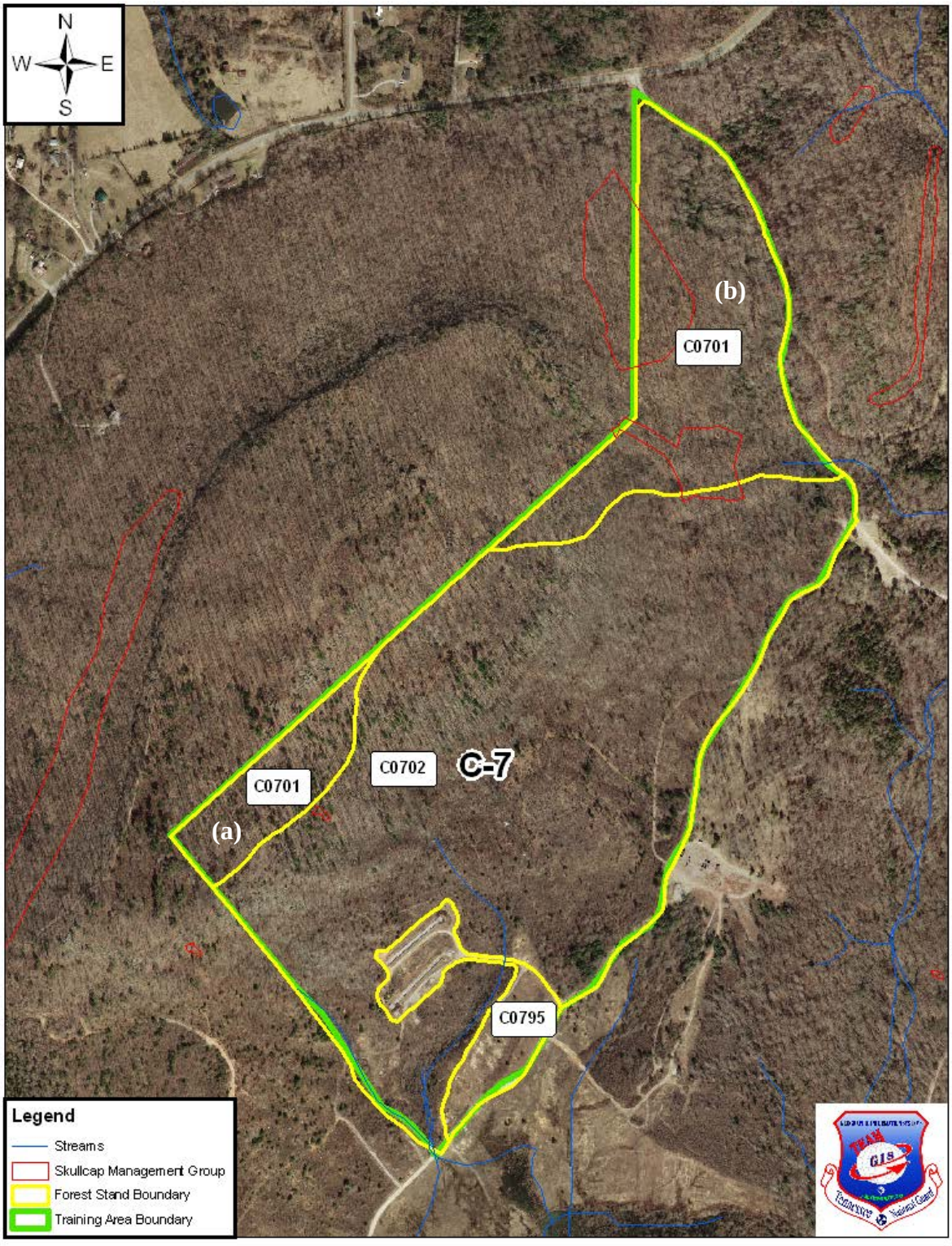


Figure A2.9: Forest stands in Training Area 7.

6.9 Training Area 8

Training Area 8 consists of a small 24.8-acre tract on the extreme northwestern boundary of the installation that is forested over its entire area. This area supports a single forest stand and a small cluster of large-flowered skullcap.

Stand Description

Stand c0801 is a mature upland pine and hardwood forest. The stand is dominated by white oak and hickory, with a mix of red oak, poplar, walnut, and a very few pines. The trees range in age from 30 to 60 years old. The overall health of the stand is excellent and there is good hardwood regeneration present.

Forest Management Prescriptions

Stand c0801 will be subject to small group selections. Areas to be harvested will be chosen on the basis of advance regeneration and seed tree quality. No more than 30% of the section acreage will be harvested in groups. The remainder of each section may be lightly thinned to release desirable hardwood trees.

Harvest activities will be limited in the vicinity of skullcap management groups. Harvest operations must be scheduled for the fall or winter when the plants are dormant. No vehicles, skidders included, may pass through a management group at any time, and soil disturbance must be minimized. There will be a 50' buffer surrounding the skullcap group; no timber will be cut within the management groups or the buffer zone. Tops and limbs will not be left within a management group or buffer zone.

Prescribed burning can be done once every 6 years for fuel reduction. The skullcap management group will be protected from prescribed fire with a temporary firebreak placed outside the 50' buffer.

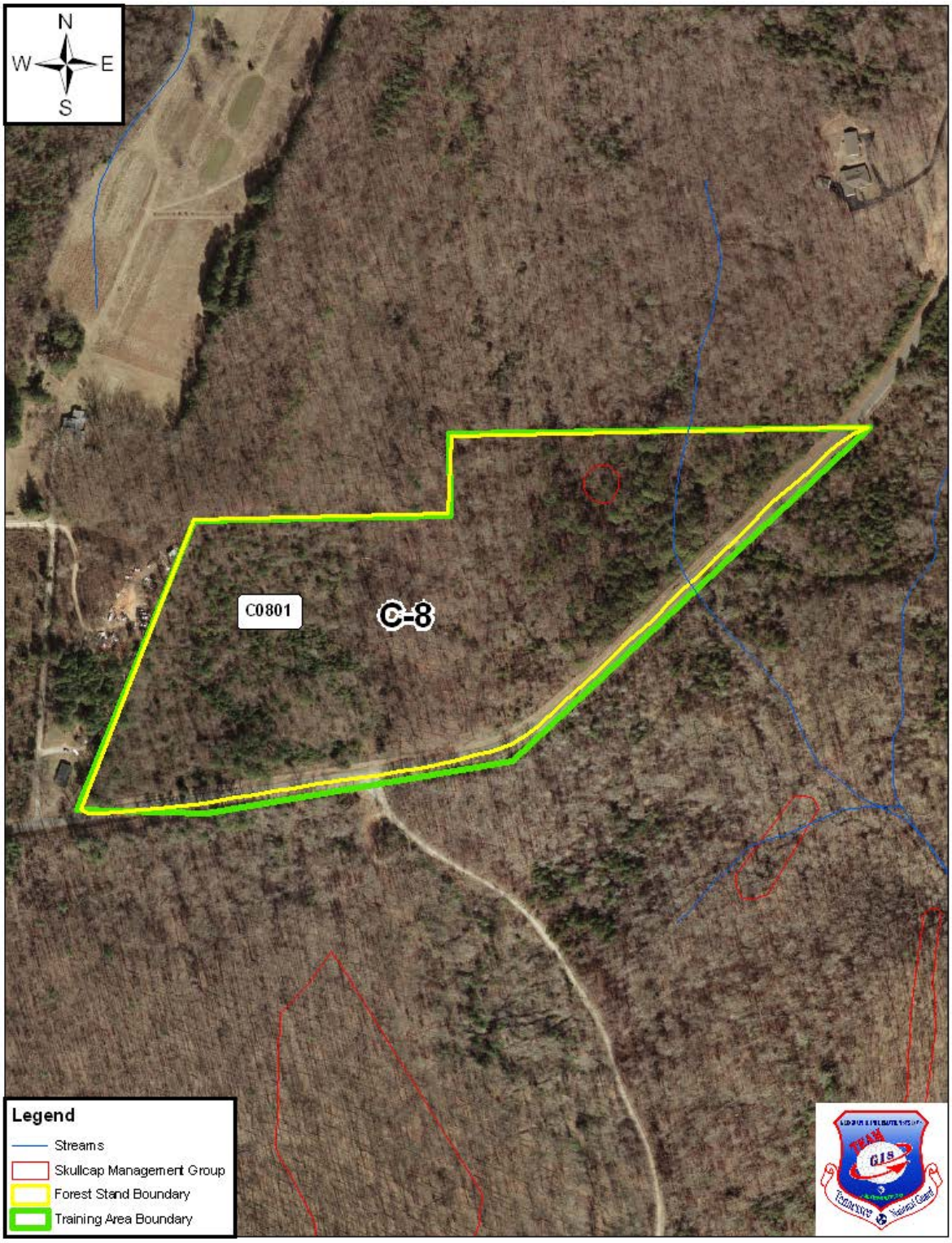


Figure A2.10: Forest stands in Training Area 8.

6.10 Training Area 9

Training Area 9 is a 112-acre tract located along the northern boundary of the installation. This training area is mostly forested, with Broom Branch (a major tributary to Tiger Creek) flowing along its eastern boundary. A beaver pond occurs within the stream. Two forest stands were identified in the training area.

Stand Description

Stand c0901 is a 96.3-acre contiguous area of immature sawtimber. The stand is dominated by poplar, oaks, hickory, pines, and miscellaneous hardwoods. Hardwood saplings and some mature pines and hardwood are scattered throughout the stand. This area was harvested during the past 20 years. The overall health of the stand is excellent, although evidence of damage from beaver-induced flooding is present at the lowermost elevations along Broom Branch. Large-flowered skullcap management groups are present in the southern portion of this stand.

Stand c0910 is a narrow 13.1-acre mature hardwood sawtimber stand stretched along either bank of the tributary streams occurring within the stand. This stand was not harvested when the adjacent Stand c0901 was. The overall health of the stand is judged to be excellent although evidence of beaver damage is present.

Forest Management Prescription

Stand c0901. The trees in this stand will be allowed to continue to grow for the immediate future. The stand will be reassessed following the next inventory when it may be due to be thinned of trees that are not in the dominant or co-dominant crown class in the next management cycle.

No prescribed burning should be pursued before the thinning is completed.

Stand c0910. Due to the intimate association of the tributary streams to Tiger Creek with Stand c0910, there are limited forest management options. No harvesting will be conducted in this stand.

No prescribed burning should be pursued before the thinning is completed.

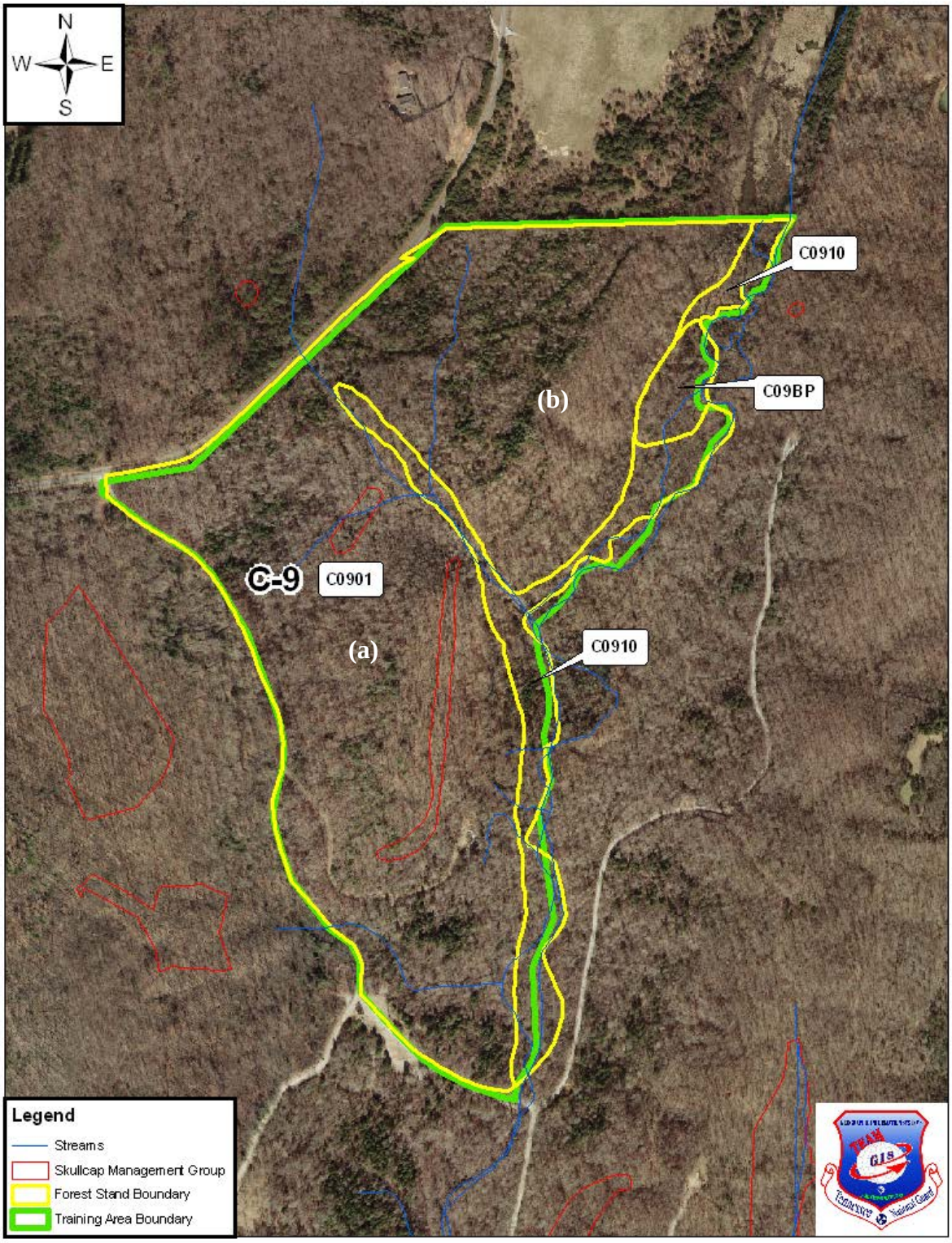


Figure A2.11: Forest stands in Training Area 9.

6.11 Training Area 10

Training Area 10 is located along the northeastern boundary of the installation. This 178-acre area also borders Broom Creek to the west. The site contains three forest stands and portions of streams that are tributaries to Tiger Creek.

Stand Description

Stand c1001 is a 123.8-acre mature upland pine and hardwood forest that occurs on steep rolling hills. The stand is predominantly red oak and white oak, with a mix of hickory, poplar, walnut, and a few pines that remain from a past infestation of southern pine beetles. The trees range in age range from 20 to 50 years old. The overall health of the stand is excellent. Several small skullcap management groups are located within this stand.

Stand c1002 is a 35.1-acre immature sawtimber stand of poplar, oaks, hickory, pines, and miscellaneous hardwoods. Hardwood saplings with some mature pines and hardwoods are scattered throughout the stand. This area was harvested within the past 20 years. The overall health is excellent for the stand.

Stand c1010 is a 15.2-acre mature hardwood sawtimber stand. The stand is relatively narrow and is divided between two units, both of which are associated with tributary streams. The overall health of the stand is excellent, with the age of the trees ranging from 25 to 50 years old. The southern unit of this stand is largely occupied by a large-flowered skullcap group.

Forest Management Prescription

Stand c1001. This stand will be left alone until the next inventory when it will be reassessed. This is the likely location for an experimental application of the shelterwood – burn method of hardwood regeneration, which will be addressed following the 2015 inventory.

No prescribed burning should be conducted at this time.

Stand c1002. This stand will be thinned by removing all trees that are not in the dominant or co-dominant crown class. Some of the co-dominants may also be removed to allow more room for the remaining trees to grow, plus aide in training. The goal would be for the tree crowns not to touch each other on at least 3 sides.

Prescribed burning can be done once every 6 years for fuel reduction. No burning should be undertaken before thinning is completed.

Stand c1010. Due to the close association of Stand c1010 with the tributary streams and the large-flowered skullcap management group, there will be no timber harvest activities or prescribed burning in this stand.

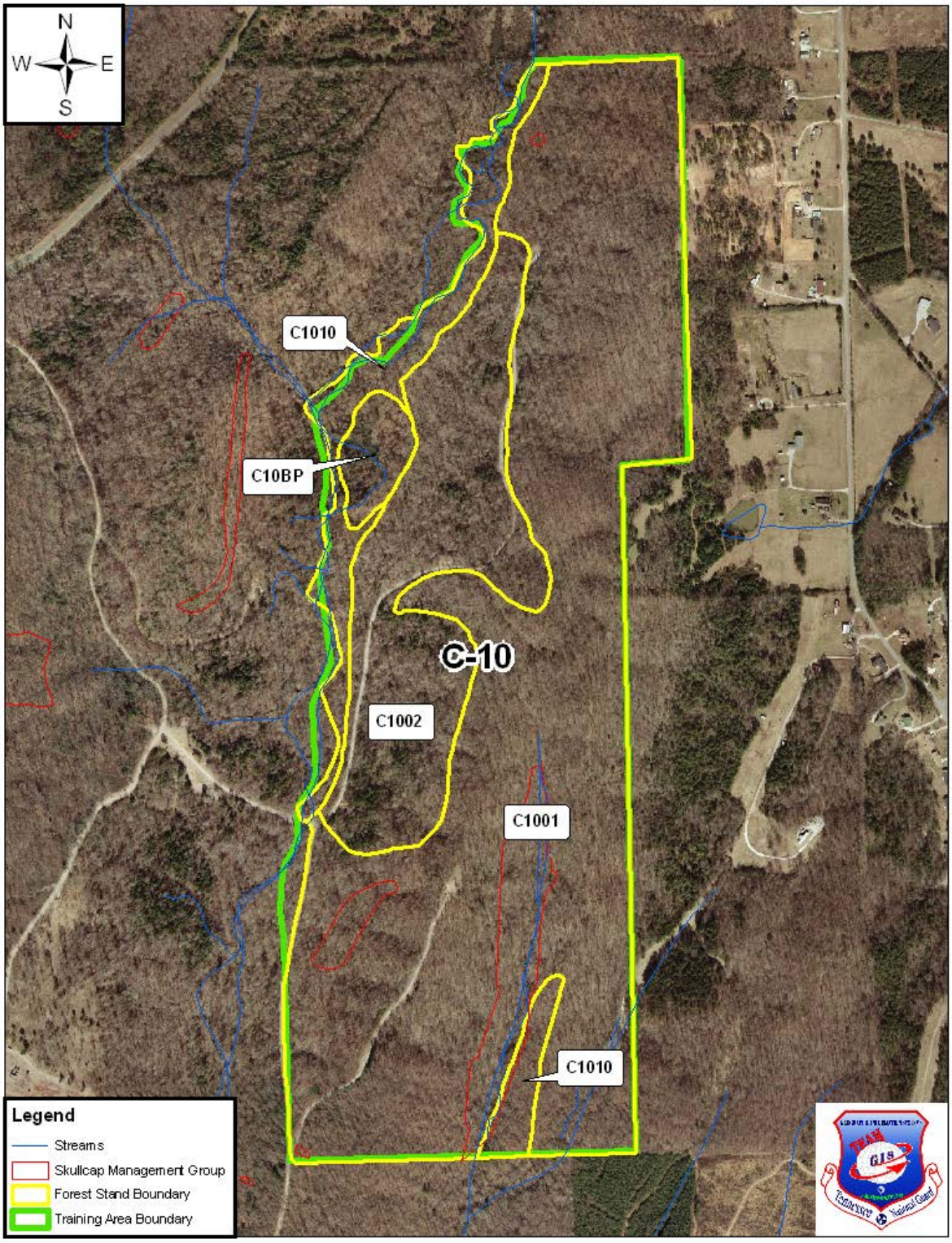


Figure A2.12: Forest stands in Training Area 10.

7.0 IMPLEMENTATION SCHEDULE

A total of 25 individual forest stands have been designated on VTS-Catoosa. Some stands have been further divided into management units of 50 acres or less. Stand designations indicate site (C), training area (05), stand (01), and unit (a): C0501(a).

In general, the overall health of the installation's forest resources is considered to be relatively good, with the exception of portions of Training Areas 5 and 7. These two areas contain the installation Impact Area that has experienced frequent periodic fires that have resulted in damage to the timber. Due to the age and density of trees occurring over most of the installation, it appears that a sizable timber harvest took place some time around 20+ years ago.

Generally, stands totaling less than 50 acres will be harvested in any one year. This figure indicates total stand acreage; actual cleared acres will be much lower for group selection cuts. In addition, many stands contain large-flowered skullcap management groups which are not subject to timber harvest, thereby further lowering the impacted acreage.

Table A2.3 lists stands in order of the priority of treatment for the next 12 years; stand-specific management actions are planned for 19 of the stands during this time period. The recommended order of work summarized in Table A2.3 would be scattered over the installation's training areas in any given year (Figure A2.13) to avoid concentrating forestry operations in a single portion of the installation, while contributing to the creation of a long term mosaic of differing habitat conditions.

This schedule is subject to change based on military mission needs and updated forest inventory data. A resurvey of the VTS-C forest stands is scheduled for 2015. This plan and the harvest priority will be revised as dictated by the results of the new inventory.

Table A2.3: Timber stand harvest priority for VTS-Catoosa.

Training Area	Stand &Section	Acres	Primary Management Action
01	C0101	23	Thin everything below dominant/co-dominant
02	C0202 (a)	32	Thin everything below dominant/co-dominant
08	C0801 *	25	Group selection and thin
Cantonment	CC01 (c) *	35	Group selection and thin
05	C0502 (a) *	50	Thin everything below dominant/co-dominant
07	C0701 (b) *	32	Group section and thin
02	C0202 (b)	31	Thin everything below dominant/co-dominant
06	C0601 (c) *	37	Group selection and thin
04	C0401 (b) *	31	Group selection and thin
Cantonment 01	CC01 (a) C0110 **	17 6	Selectively thin trees above 20” dbh Selectively thin trees above 20” dbh
05	C0502 (b) *	40	Thin everything below dominant/co-dominant
02	C0201 (b) *	35	Group selection and thin
06	C0601 (a) *	50	Group selection and thin
04	C0401 (a)	33	Group selection and thin
02	C0201 (c) *	47	Group selection and thin
10	C1002	35	Thin everything below dominant/co-dominant
06 07	C0601 (b) C0701 (a)	44 8	Group selection and thin Group selection and thin

* Harvesting will be limited to outside the large-flowered skullcap management groups and surrounding 50’ buffer. Acreages to be cut are overestimated in this table.
** Riparian stands will only be thinned outside the 50’ SMZ on each side of the stream.

Annex 3

Wildland Fire Management Plan

VTS-Catoosa

Tennessee Army National Guard

Prepared By

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Signature **Date**

TABLE OF CONTENTS

1.0 Introduction 3-4
1.1 Goals and Objectives 3-4
1.2 Key Definitions 3-4
1.3 Location and Physical Features 3-5
2.0 Program Overview 3-5
2.1 Organizational Structure and Responsibilities 3-5
2.2 Interagency Cooperation and Mutual Agreements 3-6
2.3 Personnel 3-6
2.4 Available Equipment 3-6
Table A3.1: Available Fire Equipment at VTS-Catoosa 3-6
2.5 Funding Requirements 3-7
2.6 Public Relations 3-7
2.7 Environmental Review 3-8
3.0 Safety and Emergency Operations 3-8
3.1 Risk Assessment Process 3-8
3.2 Personnel Training and Certification 3-10
Table A3.2: Fire Danger Rating 3-10
3.3 Physical Fitness Standards 3-11
4.0 Fire Factors and Constraints 3-11
4.1 Fire History 3-11
4.2 Mission Considerations 3-11
4.3 Natural and Cultural Resources Considerations 3-12
Figure A3.1: No-Plow Zones on VTS-Catoosa 3-13
4.4 Fire Regime 3-14
4.5 Fuel Types 3-14
Figure A3.2: Fuel Types on VTS-Catoosa 3-16
5.0 Wildland Fire Control 3-17
5.1 Suppression and Prevention 3-17
5.2 Detection 3-18
5.3 Dispatch Procedures 3-18
5.4 Communications Plan 3-18
5.5 Extended Attack Procedures 3-18
5.6 Rehabilitation Needs and Procedures 3-18
5.7 Records, Reports, and Monitoring 3-18
6.0 Prescribed Fire 3-19
6.1 Objectives 3-19
6.2 Constraints 3-21
6.3 Smoke Management and Air Quality 3-22
6.4 Use of Fire Breaks 3-23
6.5 Training and Crew Requirements 3-24
6.6 Burn Plans 3-24
6.7 Notification 3-24
6.8 Contingencies for an Escaped Burn 3-25
6.9 Monitoring 3-25
6.10 Prescriptions 3-26
Table A3.3: Prescription for Grasslands, Fields, and Forest Openings 3-26
Table A3.4: Prescription for Upland Hardwoods 3-27
6.11 Schedule 3-27
6.12 Test Application of Shelterwood-Burn Method 3-27

Table A3.5: Burn Schedule 3-28
Figure A3.3: Prescribed Burn Frequency 3-29
7.0 Attachments 3-30
7.1 Reference Materials 3-30
7.2 Burn Plan Format 3-31
7.3 Post Burn Evaluation Form 3-37
7.4 After-Action Review Format 3-39

1.0 INTRODUCTION

This Wildland Fire Management Plan (WFMP) has been developed in accordance with the 2002 Department of Army (DA) Wildland Fire Policy Guidance. It presents the standards by which the VTS-Catoosa wildland fire control and prescribed burning programs will be conducted. This plan is a component of the Integrated Natural Resources Management Plan (INRMP) for the training site and is especially linked to the Forest Management Plan annex to the INRMP.

This plan shall be in compliance with:

- Army Regulation (AR) 420-90, 10 Sep 97, Fire and Emergency Services
- AR 200-1, 28 Sep 2007, Environmental Protection and Enhancement
- DOD Instruction 6055.6, 10 Oct 00, DoD Fire and Emergency Services Program
- Army Memorandum, 04 Sep 2002, Army Wildland Fire Policy Guidance

1.1 Goals and Objectives

Fire management policy for VTS-Catoosa was developed to support the following goals:

- Provide for the safety of fire crews on every wildland fire management activity.
- Reduce wildfire potential on the training site and suppress undesired wildfires to protect lives, property, and natural and cultural resources in a cost-effective manner.
- Utilize prescribed fire to maintain and improve the usability of the training site to support all aspects of the military mission.
- Utilize prescribed fire to effectively protect and enhance valuable natural resources and to implement ecosystem management goals and objectives.

1.2 Key Definitions

Wildland. An area in which development is essentially nonexistent, except for roads, railroads, power lines and similar transportation facilities. Structures, if any, are widely scattered.

Wildland Fire. Any non-structure fire occurring in the wildland that is not meeting management objectives and thus requires a suppression response.

Wildland Fire Use. The application of the appropriate management response to naturally-ignited wildland fires to accomplish specific resource management objectives in pre-defined designated areas outlined in Fire Management Plans.

Wildfire. An unplanned, unwanted wildland fire, including unauthorized human caused fires, naturally occurring wildland fires, and escaped prescribed fires, where the objective is to put out the fire.

Prescribed Fire. Controlled, purposeful application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions which allow the fire to be confined to a predetermined area and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

1.3 Location and Physical Features

The VTS-Catoosa consists of 1,628 acres in the northwestern portion of Georgia in Catoosa County, approximately 5 miles south of the Tennessee-Georgia border. The VTS-Catoosa is located approximately 90 miles northwest of Atlanta, Georgia, and approximately 20 miles southeast of Chattanooga, Tennessee. Georgia State Highway 2 borders the installation on the south, and Salem Valley Road provides access to the northern boundary. The VTS-Catoosa is approximately 16,000 feet at its maximum length (north-south) and around 6,625 feet at its maximum width (east-west).

The closest town is Ringgold, Georgia, the county seat of Catoosa County, which is located approximately two miles west of the VTS-Catoosa along I-75 between Atlanta and Chattanooga. The VTS-Catoosa was originally used as the Fort Oglethorpe Rifle Range and Training Site between 1910 and 1946. Fort Oglethorpe was closed immediately after World War II and placed under the jurisdiction of the U.S. Army Corps of Engineers (USACE). Since 1960, the Tennessee Army National Guard (TNARNG) has operated the VTS-Catoosa under a license from the USACE.

The VTS-Catoosa is comprised of a relatively small Cantonment Area and 10 designated training areas. Topographic relief across the site is significant, with an elevation change from approximately 755 feet above mean sea level (msl) along the creek system that bisects the training site to over 1,200 feet above msl on the northeast-southwest running ridges on either side of the stream valley. Slopes on the training site range from 0% to 53%.

Approximately 1,300 acres of the VTS-Catoosa is forested, principally with mixed hardwood species. Managed grasslands cover about 80 acres on the small weapons ranges and tank range. There is no unexploded ordinance on the VTS-Catoosa.

2.0 PROGRAM OVERVIEW

2.1 Organizational Structure and Responsibilities

The wildland fire program on VTS-Catoosa will operate in accordance with DA Memo (4 Sep 2002), "Army Wildland Fire Policy Guidance," and the DA "Sustainable Range/Installation Environmental Activities Matrix" (2 Sep 2005) for funding. The Adjutant General (TAG) as commander of the TNARNG is directly responsible for the operation and maintenance of the Volunteer Training Sites, including implementation of this WFMP. TAG delegates fire-related duties among environmental and training site staffs.

The Wildland Fire Program Manager for the TNARNG is the Natural Resources Manager (NRM) in the Environmental Office. The NRM is responsible for preparing and maintaining this WFMP. The NRM also ensures that firefighters are trained to National Wildfire Coordinating Group (NWCG) Firefighter Type 2 standards, at a minimum, maintaining training records and scheduling training as needed.

VTS-Catoosa Range Control is responsible for immediate wildland fire control response on the training site. There is a verbal MOA for firefighting support in place with the Georgia Forestry Commission (GFC), which is located within a few miles of the training site. A unified command will be set up with the GFC and any qualified VTS-Catoosa personnel in the event that the GFC is called in to help control a wildland fire that is beyond the capabilities of the training site staff. Catoosa County also has six volunteer fire departments (VFDs). Ringgold VFD would respond to any structural fires on the training site.

Prescribed fire activities on the VTS-Catoosa are cooperative actions conducted by training site personnel and the Georgia Forestry Commission. A GFC forester acts as burn boss for all prescribed burns on the training site. Environmental personnel also participate in prescribed burns conducted for ecosystem management goals.

2.2 Interagency Cooperation and Mutual Aid Agreements

There is a verbal MOA in place with the Georgia Forestry Commission, which is located near VTS-Catoosa. The GFC conducts the prescribed burns and controls any wildland fires that are too large for the VTS-Catoosa personnel to handle.

2.3 Personnel

VTS-Catoosa currently has 4 trained wildland firefighters (FFT2). Additional firefighters may be requested from other TNARNG facilities to aid in prescribed burning. The GFC County Forester acts as the burn boss for all prescribed burns, as no training site personnel have yet received prescribed fire training.

2.4 Available Equipment

The VTS-Catoosa maintains a cache of fire equipment for wildland fire suppression and prescribed burning (Table A3.1). In addition, personal protective equipment (PPE) conforming to National Fire Protection Act (NFPA) 1977 (Standard on Protective Clothing and Equipment for Wildland Fire Fighting) is maintained for all trained personnel on site. Each firefighter is outfitted with:

- Nomex pants
- Nomex shirt
- Firefighting helmet
- Leather gloves
- Goggles
- Fire shelter
- Pack for gear
- Leather boots are required, but are provided by the individuals.

Table A3.1: Available fire equipment at VTS-Catoosa.

Fire rake	8
Pulaski axe	4
Shovels	5
Drip cans	2
5 gal Backpack sprayer - metal	1

Collapsible backpack sprayer	2
500 gal Fire Trailer + pump + 500’ hose	1
Hydro-seeder 800 gal water capacity + 100’ hose	1
Trailer-type pressure washer 300 gal + 25’ hose	1
D-7 dozer	1
120-G grader	2
Gyro-track with brush grinder	1
245 Massey tractor	1
6400 JD tractor	2
4720 JD tractor with dump bucket	1
New Holland back hoe	1
24-C skid loader	2
Track hoe	1
GMC 4WD diesel pickup truck	4
6’ scraper	1
6’ box blade	1
10’ bush hog	1
7’ bush hog	1
Disc harrow	1
100 gal spray tank	1

2.5 Funding Requirements

The funding responsibilities for wildland fire are defined in the DA Sustainable Range/ Installation Environmental Activities Matrix (2 Sep 2005). Wildland fire expenses are primarily the responsibility of the Facilities/Real Property Division. Funding for WFMP implementation, wildland fire prevention, fuels management for hazard reduction, wildland fire suppression, prescribed burning, firebreak construction and maintenance, and other wildland fire management is an installation operations and maintenance responsibility.

Integrated Training Area Management funds may be utilized for prescribed burning intended to improve training facilities/environments, as well as for construction and maintenance of fire breaks or other fuel removal directly associated with training-induced fire hazard on ranges and training areas.

Environmental funds may be utilized for prescribed burning that has a specific ecosystem management or rare, threatened, and endangered species management objective as presented in the INRMP and for wildland fire management activities conducted for the purpose of compliance with environmental laws and regulations. Forestry reserve account funds may be requested for fire-related projects that will improve forest health or timber management concerns on the facility.

The funds available will be used to continue the training of the on-site resources and maintain a cache of personal protective equipment and wildfire tools. The VTS-Catoosa personnel should use appropriate management response in all incidents which will maintain a cost efficient program.

2.6 Public Relations

When involved with any fire application, VTS-Catoosa personnel should always consult with the Georgia Forestry Commission and should also consider contacting the local VFDs. At the minimum the main

Ringgold VFD should be contacted. The surrounding public should be made aware of any smoke issues that may arise and could cause any health issues.

2.7 Environmental Review

Implementation of this Integrated Wildland Fire Management Plan requires an assessment of the environmental effects as required by AR 200-1, *Environmental Protection and Enhancement*, and the National Environmental Policy Act of 1969. This assessment will be completed before implementation of the plan, in conjunction with the Environmental Analysis (EA) for the Integrated Natural Resources Management Plan for the VTS-Catoosa.

3.0 SAFETY AND EMERGENCY OPERATIONS

All emergency operations go through Range Control and will be handled through the 911 dispatch. The Range Control Officer will function as the Incident Commander for small scale fire suppression. If a wildfire is beyond the capabilities of the on-site staff, Incident Command will be turned over to the Georgia Forestry Commission or Ringgold VFD representative, as appropriate to the nature of the outside aid required.

The on-site Incident Commander will ensure all firefighter and public safety precautions are taken and are the highest priority in all operations. Except in the event of a threat to human life, no wildland fire situation will require placing a firefighter or equipment in extreme danger.

Before fire suppression or prescribed fire activities are initiated, the Incident Commander (or burn boss, in the case of prescribed burning) will go over the plan of operation with all personnel directly participating and ensure all personnel have at least the minimum PPE required.

All TNARNG personnel involved in wildland fire activities will receive appropriate training for their tasks (see Section 3.2). Firefighters will be issued a Fireline Handbook NWCG Handbook (3 PMS-410/NFES 0065) and the Incident Response Pocket Guide (PMS-461/NFES 1077). Each firefighter will be knowledgeable and review the 10 Standard Fire Orders and the 18 Watchout situations. No emergency situation will be approached without the proper safety mitigations in place with the use of Lookouts, Communications, Escape Routes and Safety Zones (LCES).

All safety gear will comply with NFPA 1977 Standard on Protective Clothing and Equipment for Wildland Fire Fighting. This standard specifies the minimum design, performance, testing, and certification requirements for items of wildland fire fighting protective clothing and equipment, including protective garments, helmets, gloves, footwear, goggles, chain saw protectors, and load carrying equipment.
The VTS-Catoosa does not contain any unexploded ordinance.

3.1 Risk Assessment Process

Safety of TNARNG personnel, firefighters, civilians, and neighbors is of paramount importance in all wildland fire actions. Risk assessment for all emergency response situations will follow the five step process outlined below (from the Incident Response Pocket Guide PMS-461/NFES 1077). Situational awareness must be maintained throughout the changeable conditions of a wildland fire activity and re-assessment conducted whenever there is a significant alteration of circumstances.

3.1.1 The Risk Management Process

Step 1. Situational Awareness
- Gather information
  - Objective(s)
  - Previous fire behavior
  - Communication
  - Weather forecast
  - Who's in charge?
- Any local factors
  - Scout the fire/incident

Step 2. Hazard Assessment
- Estimate potential fire behavior hazards
  - Look Up / Down / Around indicators
- Identify tactical hazards
  - Watch Outs
- What other safety hazards exist?
- Consider severity vs. probability

Step 3. Hazard Control
- Firefighting Orders and LCES Checklist – MANDATORY
  - Anchor point
  - Downhill checklist (if applicable)
- What other controls are necessary?

Step 4. Decision Point
- Are controls in place for identified hazards?
  - NO: Reassess situation YES: Next question
- Are selected tactics based on expected fire behavior?
  - NO: Reassess situation YES: Next question
- Have instructions been given and understood?
  - NO: Reassess situation YES: Initiate action

Step 5: Evaluate
- Personnel: Low experience level with local factors?
  - Distracted from primary tasks?
  - Fatigue or stress reaction?
  - Hazardous attitude?
- The Situation: What is changing?
  - Are strategy and tactics working?

3.1.2 Prescribed Burning Risk Assessment

The above Risk Management Process will be applied during prescribed fire activities. Prescribed burning will not be conducted under any of the following conditions, as based on the Fire Weather information from the Georgia Forestry Commission (http://weather.gfc.state.ga.us):

- A predicted temperature greater than 85º F
- A predicted wind speed greater than 18 mph at the 20' level
- A predicted relative humidity less than 25%

- An atmosphere with Red Flag conditions issued by GFC or USDA-FS
- Inadequate personnel or equipment available to manage the prescribed burn

3.1.3 Fire Danger Rating and Burning Index

Fire danger (Table A3.2) rating is a classification based on the Burning Index and is available from the Georgia Forestry Commission fire weather system. Fire danger rating will be routinely checked during fire season, as it provides guidance of importance both for prescribed burn activities and also for military training. Prescribed burns will generally be conducted at low fire danger rating, or occasionally moderate. Pyrotechnic devices and live fire training will be limited in accordance with the recommendations in the table below:

Table A3.2: Fire Danger Rating.

Fire Danger Rating and Color Code	Burning Index (BI)	Description	Recommended Military Considerations
(1) Low (Green)	0-20	Fuels do not ignite readily from small firebrands. Most prescribed burns are conducted in this range.	None.
(2) Moderate (Blue)	21-40	Fires are not likely to become serious and control is relatively easy. Fires burning in these conditions generally represent the limit of control for direct attack methods.	None.
(3) High (Yellow)	41-60	Fires may become serious and their control difficult unless they are attacked successfully while small. Machine methods are usually necessary or indirect attack should be used.	Recommend firing pyrotechnics into open drums; altering firing times to hours with lower fire danger.
(4) Very High (Orange)	61-79	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. The prospects for direct control by any means are poor at this intensity.	No pyrotechnics or tracer rounds allowed, except with written authorization from Range Control.
(5) Extreme (Red)	80+	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. The heat load on people within 30 feet of the fire is dangerous.	No pyrotechnics or tracer rounds allowed.

3.2 Personnel Training and Certification

Training will adhere to the standards set by NWCG as described in PMS-310 (http://www.nwcg.gov/pms/docs/docs.htm). All firefighters need to obtain the basic Firefighter Type 2 (FFT2) qualifications (S130/190 classes) and will need to attend an annual fireline safety refresher provided on-site or off.

The Natural Resource Manager (NRM) for TNARNG, is responsible for maintaining and tracking the training records for VTS-Catoosa personnel. The NRM will keep track of the training being offered close to the installation and inform training site personnel of its availability. VTS-Catoosa should look for opportunities to train with the Georgia Forestry Commission.

3.3 Physical Fitness Standards

Based on the conditions and terrain encountered in wildland fire situations on the VTS-Catoosa, the moderate level fitness standard is considered sufficient for TNARNG wildland firefighters. The field test will be administered by the Natural Resources Manager and/or the Environmental Program Manager according to the standards in PMS-307/NFES 1109, Work Capacity Test Administrator's Guide (2003). All TNARNG personnel with current firefighter training will be required to pass the test prior to the end of FY2009. New personnel with fire suppression or prescribed fire duties will be tested prior to their first fire activities (unless they already have their Red Card).

4.0 FIRE FACTORS

4.1 Fire History

No significant wildfires have occurred on the training site. All wildfires have been associated with military activities such as firing blanks or tracer rounds. Each fire has been less than one acre in size and has been extinguished by on-site staff.

4.2 Mission Considerations

The mission of the VTS-Catoosa is to support unit requirements for maneuver, range operations, equipment use, and other combat readiness training. These training activities occur within the developed Cantonment Area, the small arms ranges, and throughout the maneuver areas which comprise 96% of the training site. The VTS-Catoosa facilities are used to conduct small arms range firing, maneuvering, and combined arms training including field bivouac; tracked and wheeled vehicle operations on all military roads and developed major trails; mounted and dismounted maneuvers; and weapons firing. Off-road maneuvers are performed within designated open terrain areas and in designated fringe areas (concealment parking sites) within 100 feet of specified roads and trails within the maneuver areas. Over 80% of training site utilization is by military users; use by non-military entities is generally restricted to the small arms firing ranges.

This WFMP supports the military mission of the VTS-Catoosa by providing for timely wildfire response, thus minimizing training downtime and facility loss to wildfires. The prescribed burn program provides a cost effect method of maintaining and expanding open training areas such as ranges and controls fuel buildup to minimize wildfire intensity.

Potential negative impacts of the wildland fire program include smoke impacts and interruption of training activities. Care in scheduling burns to accommodate the training calendar will minimize all effects on training activities. Wildfire control downrange will require a range shutdown, which could lead to loss of training time. Smoke management will be addressed through the guidelines provided in this plan.

4.3 Natural and Cultural Resources Considerations

Fire management may have beneficial or negative impacts on both the natural and cultural resources of a site, and both can represent constraints on the fire program, especially prescribed burning.

4.3.1 Cultural Resources

Development of firebreaks is the greatest fire-related threat to Cultural Resources on VTS-Catoosa. No new permanent firebreaks (off existing roads and trails) will be developed without consultation with the Georgia State Historic Preservation Officer (SHPO). Temporary plow line firebreaks may be constructed in those portions of the training site which have been surveyed and identified as free of significant archaeological or historical resources.

A Phase I survey of VTS-Catoosa conducted in 1997 identified 20 archaeological sites and 17 historic architectural resources on the installation. The historical architectural sites are located within the Cantonment Area; the archaeological sites are scattered across the training site. These sites are considered "no plow" zones, and are included on Figure A3.1 with the natural resource sites that are also protected from the fire plow. Fire control in "no plow" zones will depend on existing firebreaks or methods that do not disturb the soil.

One family cemetery is located on the VTS-Catoosa (the cultural zone in the northeast corner of the training site). It is fenced and will be protected from wildfire and prescribed burns.

4.3.2 Natural Resources

- One federally listed threatened plant species (large-flowered skullcap (*Scutellaria montana*)) occurs at multiple locations across VTS-Catoosa. The occurrences of this plant are identified as "management groups" and have been marked in the field and recorded on the installation GIS. The large-flowered skullcap areas are "no plow" zones, as indicated on Figure A3.1. Vehicles are not allowed within the management groups, and earth disturbance is prohibited. Large-flowered skullcap management groups will be protected from wildfire as possible using existing firebreaks, plowed breaks at least 50 feet outside of group boundaries, or control methods that do not disturb the soil.

  The impact of fire on large-flowered skullcap is relatively unknown. It is possible that a "cool" prescribed fire applied early in the spring could assist in reducing competition from other herbaceous ground cover plants and exotic invasive plant species without damaging the protected plant. The TNARNG has proposed a study to investigate the susceptibility of large-flowered skullcap to light burning. Formal consultation with the U.S. Fish and Wildlife Service (USFWS) must be completed prior to any experimental burning of the skullcap. Until that time, all known large-flowered skullcap occurrences will be protected from prescribed fire by a temporary fireline constructed at least 50 feet outside of the posted boundaries of the management group. Any research activities will impact only specific management groups (see Annex 1); all other groups will continue to be protected from prescribed fire, as well as from wildfire.

- The gray bat (*Myotis grisescens*) is the only federally listed animal species that has been observed on VTS-Catoosa. No roosting sites have been found on the training site, and the species has only been documented foraging over Tiger Creek. Appropriate care of streamside management zones in the development of firebreaks and limiting fire within the riparian areas should ensure minimal impact on the gray bat on VTS-Catoosa. If a roost site is ever found on the training site, the immediate area and a sufficient buffer surrounding it will be removed from the burn program.

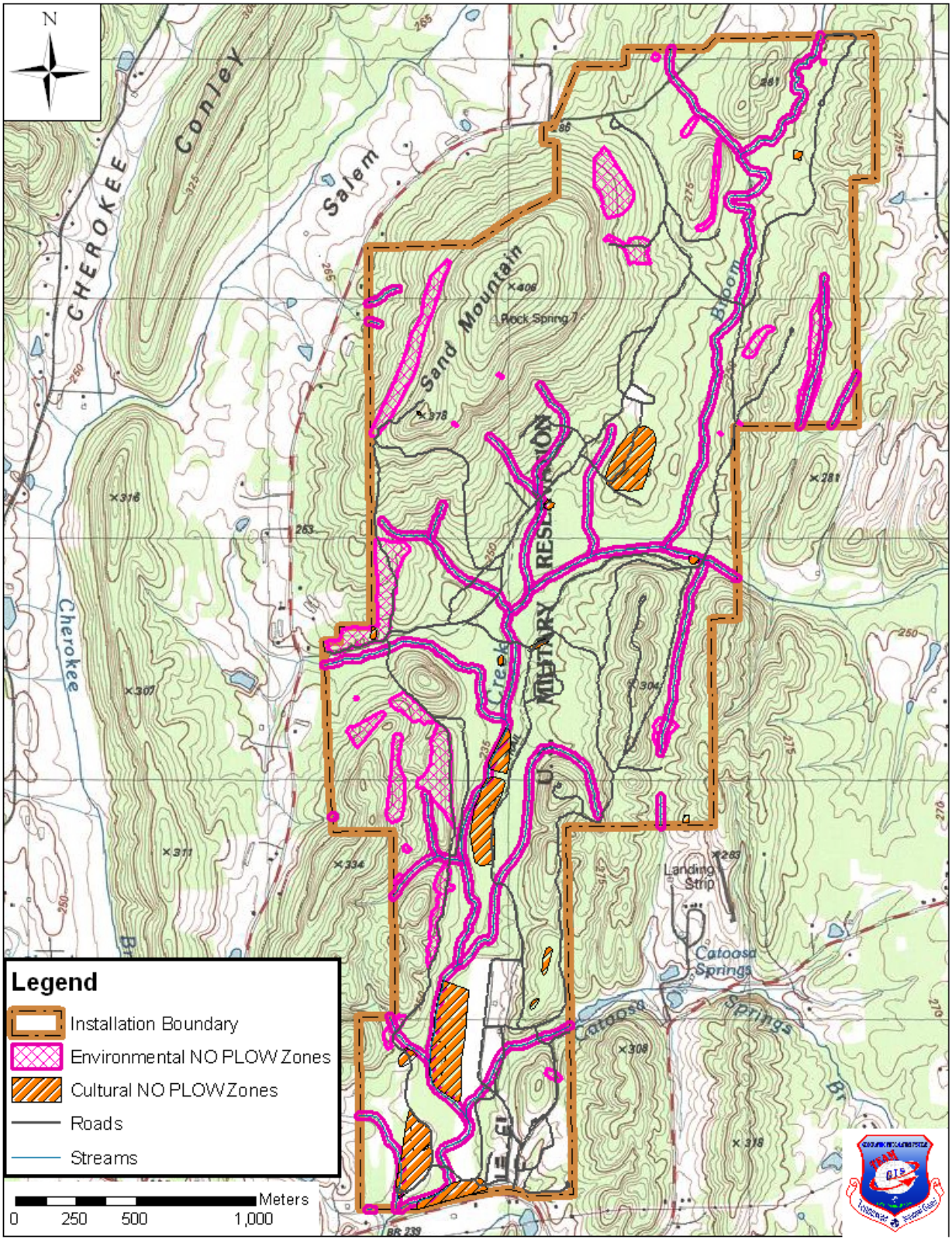


Figure A3.1: No-Plow Zones on VTS-Catoosa due to significant natural and/or cultural resources.

- The VTS-Catoosa contains 11.6 miles of intermittent or flowing streams. Two of these, Tiger Creek and Broom Branch, are recognized by the state of Georgia as secondary trout streams. To protect water quality, the 50 foot Streamside Management Zone on each side of the streams will be a no-plow zone. Firebreaks within riparian corridors must be designed in coordination with the NRM and will be outside of the 50 foot SMZ (Figure A3.1). Prescribed burning within riparian areas will be limited and subject to careful planning to ensure streambanks are not denuded of vegetation.

- The topography of the VTS-Catoosa makes the site prone to soil erosion. In order to minimize erosion problems on firebreaks, water control structures to manage surface water movement will be installed during firebreak construction. Permanent fire lines will have water control structures maintained. Temporary firelines will be rehabilitated as soon as practicable after any fire. Existing barriers such as roads and trails will be used whenever possible to reduce the need for fire line construction and to minimize resource impacts.

4.4 Fire Regime

The fire regime classification system is used to characterize the personality of a fire in a given vegetation type, including the frequency that the fire visits the landscape, the type of pattern created, and the ecological effects. The following natural fire regimes are arranged along a temporal gradient, from the most frequent to the least frequent fire return interval. The definitions below are from the General Technical Report, Rocky Mountain Research Station #87 (GTR-RMRS-87).

Fire Regime Frequency Effect to Dominant Vegetation:

Fire Regime I	0-35 years	Low Severity
Fire Regime II	0-35 years	Stand Replacement
Fire Regime III	35-100+ years	Mixed Severity
Fire Regime IV	35-100+ years	Stand Replacement
Fire Regime V	200+ years	Stand Replacement

Fire Regime I: Fires in the under-story fire regime generally do not kill the dominant vegetation or substantially change its structure. Approximately 80 percent or more of the above ground dominant vegetation survives fire. The under-story fire regime occurs primarily in southern pine and oak-hickory forests, including the upland hardwood forest types found at VTS-Catoosa. Fire is a natural maintenance disturbance for these types of stands, and is used to maintain and regenerate oak-hickory for timber stand improvement and wildlife stand improvement concerns.

4.5 Fuel Types

Wildland fuels are classified by diameter:

- less than 0.25” 1-hour fuel
- 0.25”-1” 10-hour fuel
- 1-3” 100-hour fuel
- 3-8” 1000 hour fuel

VTS-Catoosa is considered to be over 90% forested. The training site consists of the following fuel models (Figure A3-2). Each group has an approximate acreage that occurs on site and gives a general description of the fuel and the fire behavior typically seen with the given fuels.

4.5.1 Grass Group

These fuels are seen on approximately 80 acres on VTS-Catoosa. Grasses are generally associated with weeds, ferns and other seasonal plants. During the growing season, they are green with high moisture content. They act as barriers to fire when green rather than as a carrier of fire. As the season advances, they cure and when fully mature, all but the roots will die and dry out. When dry, they have the fastest rate of spread of any fuel. The loading, however, is low and the fire will not be as intense. The intensity of these fires will be closely associated with the rate of spread. Slow moving fires in grass fuel will have very low intensity but high winds can change it to a very fast moving fire of moderate intensity. Moisture content closely follows daily weather changes. It is very sensitive to changes in relative humidity and wind.

- **Fuel Model 1** (1-foot deep) Fire spread is governed by the fine herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area. Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations that meet the above area constraint. Annual and perennial grasses are included in this fuel model.

  => Regularly mowed ranges and lawns on the VTS-Catoosa.

- **Fuel Model 3** (2.5 feet deep) Fires in this fuel are the most intense of the grass group and display high rates of spread under the influence of wind. The fire may be driven into the upper heights of the grass stand by the wind and cross over standing water. Stands are tall, averaging about 3 feet, but considerable variation may occur. Approximately one-third or more of the stand is considered dead or cured and maintains the fire.

  => Range areas on the VTS-Catoosa that are maintained by occasional bush-hogging.

4.5.2 Shrub Group

These fuels are not seen very frequently on VTS-Catoosa and only make up approximately 200 acres. Red cedar can be a very volatile fuel, especially during a drought or given a significant amount of grasses under and between trees. The volume of available fuel will continue to increase until the crowns begin to close, shading out the weeds and grasses. As this occurs, a smaller percentage of the total fuel loading becomes available to most fires due to the height of the crowns and less “ladder” fuel to carry the fire into them. The fuel available to most fires will generally be the understory fuels that are on the surface.

- **Fuel Model 4** (6 feet deep) Fire intensity and fast spreading fires involve the foliage and live and dead fine woody materials in the crowns of a nearly continuous secondary over-story. Besides flammable foliage, there is dead woody material in the stand that significantly contributes to the fire intensity. Heights of stands, qualifying for this model, vary with local conditions. There may be also a deep litter layer that confounds suppression efforts. Red cedar is considered in this group.

  => One redcedar-dominated stand on the south slope of Sand Mountain.

- **Fuel Model 6** (2.5 feet deep) Fires carry through the shrub layer where the foliage is more flammable than Fuel Model 5, but require moderate winds (>8 mi/h) at mid-flame height. Fire will drop to the ground at low wind speeds or openings in the stand. Shrubs are older, but not as tall as shrub types of Model 4, nor do they contain as much fuel as Model 4. This model covers a broad range of shrub conditions. Typical examples include intermediate stands of chamise, chaparral, oak brush, low pocosins, Alaskan spruce taiga, and shrub tundra. Cured hardwood slash can be considered.

  => No typical stands present; timber harvest slash could result in similar fire activity.

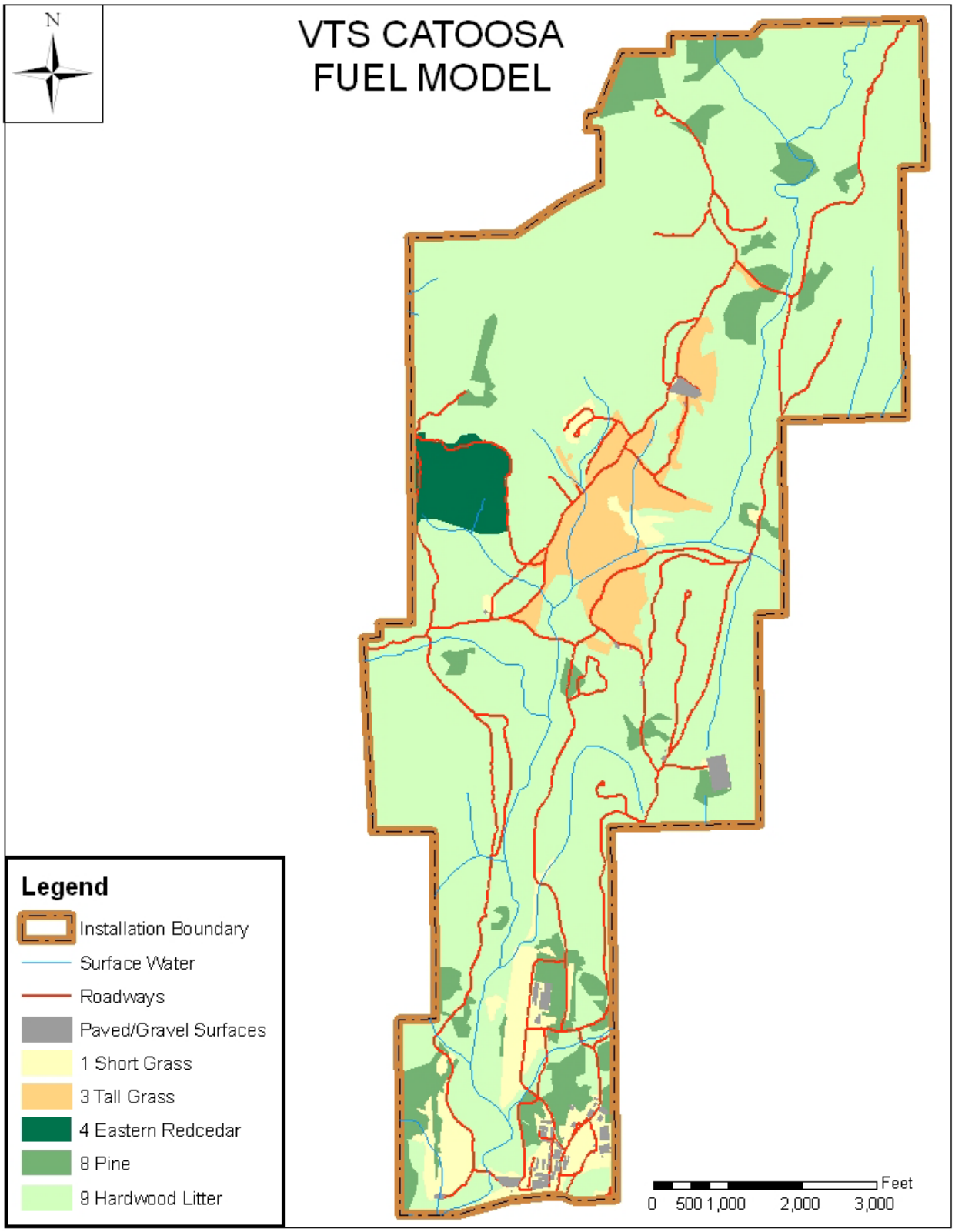


Figure A3.2: Fuel types on the VTS-Catoosa.

4.5.3 Timber Litter Group

These fuels are the majority of what will be seen on-site. Approximately 1,300 acres of VTS-Catoosa is in the timber litter group, and the majority of that falls in fuel model 9. The fuel under most forest stands consists of light to moderate loading of fuel, most of which is compacted on the ground. Fuels of this type are found throughout the Piedmont and Upper Coastal Plain regions of the Southeast. In dense pine stands, the predominant fuel is the matted pine needles. In upland hardwoods, it is compacted hardwood leaves. The amount of brush will vary from almost non-existent to almost solid brush, especially if there is little over-story. This type fuel will generally consist of grasses, pine needles, deciduous shrubs, small saplings, pinecones, twigs and branches. Fires in this type fuel will generally be of low intensity and slow spreading. The surface fuel is compacted and dries out very slowly. Consequently, much of it will not be available. Shrubs and small saplings tend to be more readily available and will add to the intensity where they are present. Most fires will be of rather low intensity and easy to control except during droughts when a larger percent of the fuel will be available. Firefighters can be surprised when this happens if they are not alert because of the increased intensity and rapid spread of the fire.

- **Fuel Model 8** (0.2-foot deep) slow burning ground fires with low flame heights are generally the case, although an occasional "jackpot" or heavy fuel concentration may cause a flare up. Only under severe weather conditions do these fuels pose fire problems. Closed-canopy stands of short needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and some twigs since little undergrowth is present in the stand.
  => Pine-dominated stands scattered across the training site

- **Fuel Model 9** (0.2 foot deep) Fires run through the surface litter faster than model 8 and have higher flame height. Both long-needle conifer and hardwood stands, especially the oak-hickory types, are typical. Fall fires in hardwoods are representative, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling blowing leaves. Closed stands of long-needled pine like ponderosa, Jeffrey, and red pines or southern pine plantations are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning activity.
  => The hardwood forests that occur throughout the VTS-Catoosa.

5.0 WILDLAND FIRE CONTROL

Due to its small size, the VTS-Catoosa is not subdivided into fire management zones. Wildfire in all areas outside the Cantonment (where structural firefighters would almost always be needed) will be addressed similarly with the objectives of:

- preserving firefighter and other human safety
- protecting real property
- containing all fires within the training site boundaries
- protecting significant natural and cultural resources
- suppressing or using wildland fire in accordance with military and environmental needs

5.1 Suppression and Prevention

Qualified VTS-Catoosa firefighters respond to all wildland fires on the training site. At no time will the firefighting assets be used for fighting vehicle, fuel, or structure fires without approval from the Installation Commander or the Range Officer. The Catoosa County VFD's will be contacted through 911.

Under normal circumstances, immediate suppression will be the goal of wildland fire response on VTS-Catoosa. Occasionally, an accidental fire within an open grassland area may be allowed to burn the entirety of a range or fire unit which is due for prescribed burning in that FY.

Wildfire prevention on the VTS-Catoosa encompasses the involvement of the following activities. First, all units will be briefed prior to the start of any exercises on what the fire potential for that day will be and any restrictions on use of pyrotechnics and/or tracers. All personnel will understand how fires are reported through range control and who will be responding that day. All firebreaks will be maintained in a functional manner. The use of prescribed burning will keep fuels loads down.

5.2 Detection

All personnel using or working on VTS-Catoosa are responsible for detecting and reporting wildfires. All wildfires must be reported to Range Control.

5.3 Dispatch Procedures

VTS-Catoosa Range Control is responsible for wildland firefighting activities on the training site. There is a verbal MOA in place with the Georgia Forestry Commission, which is located within miles of the training site. Catoosa County has six volunteer fire departments (VFD's) on-site. A unified command will be set up with the VFD's and any qualified VTS-Catoosa personnel.

5.4 Communications Plan

All dispatch runs through range control; the following radio channels will be used.

- Channel 1-Repeater channel
- Channel 2- Car to Car channel (Tactical Channel)

There is cellular phone signal throughout most of VTS-Catoosa that can be used if radio traffic is heavy.

5.5 Extended Attack Procedures

If a fire cannot be contained in the first operational period, the Georgia Forestry Commission will be requested to manage the incident.

5.6 Rehabilitation Needs and Procedures

The Natural Resource Manager (NRM) for TNARNG should evaluate all burned locations and suggest any site rehabilitation measures that may be needed. Rehabilitation costs will be the responsibility of facility maintenance or ITAM budgets

5.7 Records, Reports, and Monitoring

Firefighters call in a fire report to Range Control after every fire. These fire reports should include:

- Incident name
- Date and Time
- Incident Commander
- Location

- Size in Acres
- Fuel Type
- Brief description of the events
- Documented After-Action-Review:
    - What did we set out to do (what was planned)?
    - What actually happened?
    - Why did it happen that way?
    - What should be sustained? What can be improved?

The Range Control Officer will forward copies of these wildfire reports to the Natural Resource Manager for TNARNG who is responsible for maintaining fire records for all wildfires. The NRM will conduct a basic post-burn evaluation of the site to determine the need for rehabilitation and/or further monitoring of fire impact on natural resources.

6.0 PRESCRIBED FIRE MANAGEMENT

Prescribed fire can be used as a land management tool at VTS-Catoosa. However, because of the dominance of hardwood forests throughout much of the installation, prescribed fire should be used selectively and under a limited set of circumstances. The sensitivity of hardwoods to fire necessitates that the burner be experienced in conducting prescribed burns in hardwood forest communities. In view of the preponderance of hardwoods, the following overall burning guidelines were considered in developing the prescribed fire objectives and the recommended prescribed burn program for VTS-Catoosa.

- If burning is done in hardwood stands, the fire should be done 2-6 days after good rainfall and when relative humidity is 40 to 50%.

- Prescribed burns should be directed at reducing excessive fuel loads and should consume only the top layer of litter matter when burning under any type timber.

- Open fields should be burned clean to topsoil, but not so hot as to burn the grass roots.

6.1 Objectives

The following are the primary objectives for the prescribed burning program at VTS-C which are described in more detail below:

- Reduce fuel load and wildfire threat.
- Utilize prescribed fire, as appropriate, to create and maintain conditions as required by the military mission.
- Utilize prescribed fire, as appropriate, to aid in control of invasive plant species.
- Test the use of shelterwood harvest/burn method to regenerate mixed oak-pine forest.

6.1.1 Reduce fuel load and wildfire threat. Fire management activities should concentrate on preventing, managing, and controlling wildfires that originate on the installation, as well as fires that may encroach onto the installation from neighboring properties.

The upland hardwood forests should be burned on a 5- to 7-year interval to reduce fuel loads while minimizing damage to the timber. Burns should be conducted in mid-winter (December – February) under conditions that will produce the coolest fires possible. More frequent burning could damage or

stress the trees. Forests on VTS-Catoosa will be monitored for degradation due to burning, and the burn frequency will be adjusted as necessary to maintain a healthy forest ecosystem.

6.1.2 Create and maintain conditions required by the military mission. Some aspects of the military mission demand conditions other than the closed canopy, mixed hardwood forests native to the training site. Open areas and grasslands may be effectively managed by prescribed burning to control woody species encroachment and to rejuvenate herbaceous and graminoid species. Areas subject to higher fire danger (target sites, ranges) also require more thorough control of fuel loads to minimize wildfire threat.

- The southeast-facing slope of Sand Mountain functions as an impact area and has been routinely burned on a 2-3 year rotation to maintain a clear line-of-sight and to control fuel load in an area subject to training-sparked wildfire. The open nature of the woodland and shrubland of this area is conducive to dense understory growth, which demands on-going prescribed burning to control. Prescribed burns should be conducted every two years in late spring (April) immediately prior to green-up. That timeframe will provide the best opportunity to remove the accumulated vegetative material produced by the previous growing season, while minimizing the period of time the area would be without vegetative cover and thus exposed to erosive forces.

- Grassland areas constitute less than 5% of the total installation area, with the most significant areas occurring in portions of the Cantonment Area and Training Areas 1, 2, 3, 4, and 7. For the most part, the grassland areas are restricted to the firing ranges and are crucial to providing the required line-of-sight for effective military training. Although the open areas have historically been maintained by bushhogging, use of prescribed fire could minimize the frequency of bushhogging required, while promoting the growth of the grasses and other herbaceous plants and better controlling woody successional vegetation.

  The application of prescribed fire will be tested in Training Areas 1, 3, and 4 to determine if its use is practical and efficient in contributing to meeting the training needs. These areas will be burned during March and/or April 2010 (before the spring green-up of grasses and woody plants) to remove the accumulated dead organic litter produced during the prior growing season and killed by the preceding winter. The test should evaluate the compatibility of the burns with military activities and also their influence on the timing and frequency of subsequent bushhogging events for the growing season following conduct of the controlled burn. Controlled burns will be conducted at 2-year intervals for at least two cycles and the effects evaluated thereafter.

- Prescribed fire will be applied in established openings within upland hardwood forests at 3-year intervals. The installation desires additional 2- to 4-acre openings for training within the upland forests of Training Area 4 and in the lower, level areas within Training Areas 9 and 10 to better satisfy the training mission needs for bivouac training, camouflage set-ups, and dismounted infantry tactics.

  The use of fire alone will not create the openings. However, once the areas are mechanically cleared, fire will be applied to eliminate the slash materials produced by the initial clearing activities, and then periodically applied to prevent the encroachment of woody plants and vines and to maintain the openings in a desired condition. Prescribed fire will be applied on at 3-year intervals and will be performed during late spring. The openings will also be bushhogged periodically during the remainder of the growing season in order to maintain the areas.

6.1.3 Aid in the control of invasive species. Prescribed fire may be used in combination with mechanical and herbicidal methods to control two of the invasive species that are problematic on VTS-C: common privet and Japanese honeysuckle. Care will be taken to avoid the use of prescribed fire in those locations where fire could stimulate the spread of other invasive plant species.

6.1.4 Regenerate native mixed oak-pine forest through shelterwood harvest/burn methods. The results of recent research indicate that low intensity backing fire in mature hardwood stands would probably have little adverse affect on the existing timber and could be used in combination with established forestry management methods to favor regeneration of oaks and oak-pine mixtures over less desirable hardwood species that are particularly sensitive to the effects of fire. Under this approach, an initial shelterwood harvest is made to remove roughly half of the basal area of the overstory in a hardwood stand near the end of its rotation. Logging slash must be kept away from the bases of the residual oaks that are not harvested to minimize damage from fires.

The initial partial harvest is followed by a 3- to 5-year waiting period during which time undesirable species such as yellow-poplar will dominate the advance regeneration pool of young trees. At the end of the waiting period, a relatively hot growing-season prescribed fire is conducted that topkills the seedlings and frees the oaks to replace the fire-sensitive species that are killed. The 3- to 5-year waiting period provides the shelterwood overstory trees that remain from the initial harvest sufficient time to recover from the shock of the logging operations before they are shocked again by the burn. If compatible with mission needs, an experimental application of this method will be applied to an appropriate stand in training area 10.

6.2 Constraints

In addition to minimizing damage to the hardwood timber, prescribed fire on VTS-C must be conducted cautiously with concern for two other major limitations on burning on the training site:

6.2.1 Protection of the waterways. Tiger Creek is designated as a “Secondary Trout Water” because it is capable of supporting trout populations throughout the year. Accordingly, the Georgia Environmental Protection Division regulations require a buffer of 50 horizontal feet be provided on each bank of the stream between the stream bank and any ground disturbing activity. Although controlled burns typically would not be considered to represent a ground disturbing activity, it is recommended that all efforts possible be made to refrain from intentionally burning within 50 feet of the top of the stream bank for both Tiger Creek and Broom Branch so as to maintain the protective vegetative buffer flanking the streams. This 50 foot buffer is also a “no-plow zone” (Figure A3.1); firebreaks should be established further than 50 feet from the stream bank as needed.

6.2.2 Protection of sensitive species. All prescribed fire applications should be conducted with maximum sensitivity to the biological requirements and behavioral patterns of species of special concern that have the potential to occur on VTS-Catoosa.

One federally listed threatened plant species (large-flowered skullcap (*Scutellaria montana*)) occurs at numerous locations across VTS-Catoosa. The occurrences of this plant are identified as “management groups” and have been marked in the field and recorded on the installation GIS. The large-flowered skullcap areas are “no plow” zones, as indicated on Figure A3.1. Vehicles are not allowed within the management groups, and earth disturbance is prohibited. Large-flowered skullcap management groups will be protected from wildfire as possible using existing firebreaks, plowed breaks at least 50 feet outside of group boundaries, or control methods that do not disturb the soil.

The impact of fire on large-flowered skullcap is relatively unknown. It is possible that a "cool" prescribed fire applied early in the spring could assist in reducing competition from other herbaceous ground cover plants and exotic invasive plant species without damaging the protected plant. The TNARNG has proposed a study to investigate the susceptibility of large-flowered skullcap to light burning. Formal consultation with the U.S. Fish and Wildlife Service must be completed prior to any experimental burning of the skullcap. Until that time, all known large-flowered skullcap occurrences will be protected from prescribed fire by a temporary fireline constructed at least 50 feet outside of the posted boundaries of the management group. Training Area 2 will not be subjected to prescribed burning due to the abundance of large-flowered skullcap. Any research activities will impact only specific management groups (see Annex 1 of the INRMP); all other groups will continue to be protected from prescribed fire, as well as from wildfire.

The endangered species gray bat (*Myotis grisescens*) is the only federally listed animal species that has been observed on VTS-C. The gray bat has been captured feeding over Tiger Creek. At this time, no caves or other suitable hibernacula have been located on the training site. Foraging habitat for this species will be protected through the SMZ system – there will be no prescribed fire within 50 feet of either side of any perennial stream on VTS-C. If a roost site is ever found, the immediate area and a sufficient buffer surrounding it will be removed from the burn program.

6.3 Smoke Management and Air Quality

The U.S. Environmental Protection Agency (EPA) monitors specific air quality parameters to determine if a particular area is in attainment with the National Ambient Air Quality Standards (NAAQS). The parameters of interest are ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen oxides, and lead. Smoke produced by wildfires contains a number of these pollutants.

Catoosa County experiences air quality problems because of its proximity to Chattanooga, Tennessee. The EPA has designated the region surrounding Chattanooga, including Catoosa County, as a non-attainment area for ground-level ozone and particulate matter. At the time this Plan was prepared, Catoosa County failed to meet the 8-hour ozone standard which requires that the three-year average of the annual fourth-highest daily maximum 8-hour ozone concentration in an area must be less than or equal to 84 ppb. Catoosa County also failed to meet the fine particulate matter standard of 2.5 microns (PM2.5). EPA has adopted two PM2.5 standards, known as the 24-hour and annual standards. The 24-hour standard is met in an area when, as averaged over a consecutive three-year period, at least 98 percent of the of the 24-hour average PM2.5 concentrations per year at each monitor are less than or equal to 65 micrograms per cubic meter of air. The annual standard is met in an area when, averaged over a consecutive three-year period, the annual PM2.5 average concentration is less than or equal to 15 micrograms per cubic meter of air. Fuels, paints, solvents, vegetation, and industrial combustion processes contribute to elevated ozone concentrations. Fine particulate matter (PM2.5) is emitted from vehicle engine combustion and burning of various materials, including prescribed burns and wildfires.

The Georgia Environmental Protection Division (EPD) is responsible for protecting Georgia's air quality. The EPD has developed regulations governing open burning and has issued an annual ban on open burning between May 1 and September 30. This timeframe corresponds to the traditional annual smog season in Georgia. Citizens and businesses are not allowed to burn yard and land-clearing debris during the burn ban season. Although prescribed burns are considered a type of open burning, EPD regulations exempt prescribed burning of forestlands from the EPD permitting requirements and from the burn ban. The EPD places no special requirements on the conduct of prescribed burns, other than directing burners to obtain Burn Permits from the Georgia Forestry Commission and complying with applicable local burn regulations and ordinances. Despite the open burning ban from May through September, prescribed

burning is allowed during that period provided the Georgia Forestry Commission determines that conditions are not conducive to the formation of ozone.

Although the conduct of prescribed burns are not regulated by the EPD, to avoid potential air quality compliance problems, the area to be burned should be visually inspected prior to the burn to assure that no items that are prohibited from open burning have been abandoned within the site (i.e., tires, oils, paints, vinyl siding, treated woods, etc.). Should such materials be present, they should be removed prior to burning. Further, in light of the air quality problems affecting Catoosa County, current air quality conditions near the training site will be taken into consideration when planning a prescribed burn. Information on air quality, the status of burn bans, and the existence of any other emergency measures that may be in effect to protect air quality can be obtained from the Georgia EPD by calling 404/675-6210 or at http://www.air.dnr.state.ga.us/airpermit/openburning. If any special air quality protection measures are in effect, the prescribed burn will be postponed until conditions improve.

Atmospheric conditions should be favorable for smoke to rise into the upper air and away from smoke-sensitive areas such as highways, airports, and urban areas. There are several smoke-sensitive areas at VTS-Catoosa that will warrant consideration during the conduct of every prescribed burn:

- Roads – Highway 2 parallels the southern boundary of VTS-Catoosa. Crossing Tiger Creek, this road passes through the floor of the lower valley within which the installation is located. To the east and west of the installation are County Roads 1286 and 224 (Salem Valley Road), respectively. Both of these roads are located on the floor of their respective valleys and downslope from the boundary of VTS-Catoosa. To the north, Rifle Range Road parallels a portion of the installation's northern boundary. These roads could be affected if atmospheric conditions, particularly in the evening following a burn, resulted in the smoke settling to the lowest elevations of their valleys. Local law enforcement personnel should be informed of an impending prescribed burn so a determination can be made as to whether an officer(s) should be assigned to the area to aid in directing traffic movement should smoke impede visibility on the roads. Consideration should also be given to placing temporary signage during prescribed burns to inform motorists of potential smoke hazard issues.

- Tiger Creek Elementary School is located less than a mile west of the training site on Highway 2.

- Scattered along the roads surrounding the VTS-Catoosa are a number of rural residences. The heaviest Wildland Urban Interface is on the west-northwest and north sides of the training site. All burn activities should consider the potential effects of smoke dispersion on the residents located within these areas.

6.4 Use of Fire Breaks

Fire breaks can consist of established roads, logging trails, cleared lanes used for the sole purpose of controlled burns, utility rights-of-way, and watercourses. Ideally, fire breaks should be capable of supporting groundcover to guard against erosion when not being used to contain fires. Prior to the conduct of a prescribed burn, the fire breaks should be inspected to ensure that they are in the proper condition to contain the fire. Following the burn, the fire breaks should be inspected again to determine if any remedial measures are needed to prevent erosion and other problems from developing.

To ensure that fire breaks are available when needed, a regular maintenance program must be pursued to maintain the fire breaks in a cleared and open condition, with a minimum of undergrowth and low hanging limbs. The best maintenance scenario exists when the fire breaks serve dual or multiple purposes

(i.e., roads, utility rights-of-way, etc.). In such situations, it is possible to distribute maintenance costs to other installation activities instead of having to assign the total costs to the prescribed fire program.

The existing road system provides the basis of the fire break network on the VTS-Catoosa. A perimeter fire break should be developed in conjunction with the security line-of-sight clearing along the boundary fence, as funds are available. Additional fire breaks will be developed to subdivide large areas (e.g., Sand Mountain in training areas 6 and 7); where possible, these fire breaks will function as and be maintained as tank trails. Temporary fire breaks will be cut, as needed, prior to prescribed burns or during wildfire control, in accordance with the no-plow zones (Figure A3.1). These fire breaks will be reclaimed and revegetated as soon as possible following the fire.

6.5 Training and Crew Requirements

Prescribed fire personnel will follow the training set forth in the PMS-310-1 (http://www.nwcg.gov/pms/docs/docs.htm). The following positions should be filled during operations:

- Prescribed Fire Crew Members (VTS-Catoosa personnel with FFT2 training)
- Prescribed Fire Burn Boss (1, 2, or 3) depending on complexity (GFC Forester)

6.6 Burn Plans

A site specific burn plan is developed for each prescribed burn on the VTS-Catoosa, containing the elements listed below. The prescribed burn plan format for the TNARNG is located in Section 7.3.

- Burn Objectives
- Acceptable weather and fuel moisture parameters – Spot and General Forecast
- Required personnel and equipment resources
- Burn area map
- Smoke management plan
- Safety considerations
- Pre-burn authorization/notification checklist
- Coordination procedures
- Contingency Plan
- Evaluation and Monitoring plan

6.7 Notification

Agencies and individuals who may play a role in the prescribed burn or may be affected by the burn will be notified prior to the ignition of a prescribed fire.

- The Georgia Forestry Commission, Catoosa County office, will be contacted well in advance to arrange the assistance of a forester to function as a burn boss. In addition, a burn permit will be requested from the GFC county office: 706-935-3162.
- The Catoosa County Volunteer Fire Department will be contacted at 706-935-2001 or fire_fight1070@hotmail.com
- Local law enforcement agencies will be notified so that they can plan for smoke-induced traffic duties, as needed.
    - Catoosa County Sheriff Department 706-935-2323
    - Ringgold Police Department 706-935-3061
    - Georgia State Patrol 706-271-2825

- Temporary signs may be placed along Highway 2 to inform motorists of potential visibility hazards from smoke resulting from the burn.
- A news release may be utilized to inform the public if the planned burn is extensive or located close to the property line.

6.8 Contingencies for an Escaped Burn

Prior to any prescribed burn, a small test fire will be ignited to confirm that the fire will behave in the desired manner. However, if after conducting a successful test fire and igniting the main burn any of the following conditions develop, burning will be stopped and the fire will be plowed under:

- Fire behavior is erratic
- Fire is difficult to control
- Wind shifts or other unforeseen weather conditions develop
- Weather conditions move outside the prescription range
- Smoke is not dispersing as predicted
- Public road or other sensitive area becomes smoked-in
- Burn does not comply with all laws, regulations, and standards
- Large fuels are igniting and burning
- There are not enough personnel to mop-up before dark and the likelihood exists that smoke will settle in a smoke-sensitive area overnight

Under any of these conditions, Range Control will be notified that contingency actions are being taken. If the contingency actions are successful at bringing the project back within the scope of the Prescribed Fire Plan, the project may continue. If contingency actions are not successful by the end of the next burning period, then the prescribed fire will be converted to a wildfire, and TNARNG will request assistance from the Georgia Forestry Commission.

6.9 Monitoring

Three types of post fire monitoring should be conducted to determine if fire management activities are reaching the stated objectives: post operational report, post fire effects monitoring, and burn program objective monitoring.

6.9.1 Post operational reports are an important written record of the burn, enabling future staff to learn from previous activities. They will be completed during and immediately following a prescribed fire activity to address the effectiveness of the overall burn process – the plan, implementation, personnel, and effectiveness at meeting objectives. The post-operational report will include:

- Burn unit information
- Burn dates
- Forecasted weather conditions
- On-site burn day weather conditions
- Crew assignments
- Burn schedule
- Fire narrative
- Immediate post burn effects
- Comparison of post burn effects with unit fire management objective
- Notes and recommendations.

Within this report, several questions should be answered:

- Were the fuel conditions within plan guidelines and were guidelines appropriate?
- Did the burn stay within planned parameters?
- Were the fire lines installed as planned and were they adequate?
- Was the equipment in the plan available and appropriate?
- Did the equipment work?
- Was the crew number, training, and assignments appropriate?
- Did the crew understand what they were doing?
- Were the rate of spread and flame length as predicted in the plan?
- Were public interactions satisfactory?

To answer some of these questions, during the burn, a designated crewmember should be assigned to estimate behavior, establish benchmarks (height and distance), record rate of spread for back, flank, and head fires, record flame heights for back, flank, and head fires stratify for fuel type and topography. Post fire estimates of fire intensity (scorch height and class, char, understory burn severity, and litter consumption), should be recorded after each burn to determine if unit-specific fire management objectives were met. Permanent transacts with photo points may be established to monitor and measure tree densities and plant composition. Observations of rare species reaction to fire management will be noted.

6.9.2 Fire effects monitoring will be conducted via a post-burn evaluation of the physical effects of the fire. This monitoring should include data collected during and immediately following the fire, as well as during the first growing season following the fire. Parameters to be evaluated will include tree mortality, midstory kill, pine bark beetle or other pest infestation, erosion problems, and whether overall burn objectives were met. These evaluations are completed and filed with the burn plan.

6.9.3 Burn program objective monitoring will be conducted over a longer time scale in conjunction with the review of INRMP objectives and achievements.

6.10 Prescriptions

The prescriptions below describe the preferred environmental conditions for a burn. Some deviation from these prescriptions in response to specific objectives will be possible on the recommendation of an experienced burn boss, such as the GFC District Forester. The general prescription for prescribed burning in the open grassland areas of VTS-Catoosa is presented in Table A3.3, and the prescription for burning the hardwood forest habitat of the training site is presented in Table A3.4.

Table A3.3. Prescription for controlled burns in grasslands, fields, and forest openings.

Stand Description:	Overstory	None to scattered trees
	Understory	Grasses and low shrubs
	Fuels	1, 3, 6
	Topography	Gentle rolling hills to flat
Weather Range	Surface wind (dir/speed)	North, West, South at 5 – 8 mph
	Transport wind (dir/speed)	Greater than 5 mph
	Mixing height	Greater than 500 m
	Stagnation index	0 – 3 daytime
	Relative humidity	35 – 55 %
	Temperature	High 70°F
		Low 30°F
	Start time	9:30 am (or as soon as permit allows)

Table A3.4. Prescription for controlled burns in upland hardwoods.

Stand Description:	Overstory	Closed canopy mature hardwood stands
	Understory	Open, small areas of brush
	Fuels	8, 9
	Topography	Gentle rolling hills
Weather Range	Surface wind (dir/speed)	North, West, South at 5 – 10 mph
	Transport wind (dir/speed)	Greater than 5 mph
	Mixing height	Greater than 500 m
	Stagnation index	0 – 3 daytime
	Relative humidity	40 – 55 %
	Temperature	High 70°F
		Low 30°F
	Start time	9:30 am (or as soon as permit allows)

6.11 Schedule

The planned prescribed fire management actions for VTS-Catoosa are presented in Table A3.5. Recommended fire frequency is depicted for all burn units in Figure A3.3. The prescribed fire management measures and their recommended frequency of occurrence are based on the objectives identified in Section 6.1 and correlate to the forest management prescriptions described in the forest management plan (Annex 2 of the INRMP).

The open grasslands of the small weapons ranges and the tank range will be subject to a 2 year fire rotation. Forest stands that are dominated by pine species will be burned on a 3 year rotation, while hardwood stands will only be burned approximately every 6 years. Table A3.6 is subject to minor changes because certain stands will not be burned until a thinning harvest can be completed. Areas with a substantial large-flowered skullcap presence (e.g., most of training area 2) will not be subject to prescribed fire at this time. Select skullcap management groups will be subject to light burning for the purposes of investigating fire impact on this protected species in accordance with the research project discussed in Annex 1 of the INRMP, subject to USFWS approval.

6.12 Test application of shelterwood-burn method to regenerate mixed oak-pine forest

Over 90% of the forest occurring on VTS-Catoosa is classified as hardwood forest. Traditionally, fire has not been used as a management tool in hardwood stands due to the perceived danger to timber quality and value. Recent research, however, has indicated that frequent burning may create an environment in which oaks can have a competitive advantage over other hardwood species. The shelterwood-burn method described by Van Lear et al. (2000) will be applied to a hardwood stand in training area 10 to test whether this technique will encourage greater oak regeneration in place of the dominant yellow poplar. A small stand will be subject to a shelterwood harvest, followed by a prescribed burn, in accordance with the forestland burn prescription, 3-5 years after the timber is cut. When the exact location and timing of this project is determined, Table A3.5 and Figure A3.3 will be modified to include the proposed burn. For more information, see the Forest Management Plan in Annex 2 of the INRMP.

Table A3.5: Burn schedule.

Year	Burn Units						Total Acreage
	2 yr rotation		3 yr rotation		6 yr rotation		
2012	KD Rge (C-3) 4-1	19 37	3-2	41			97
2013	M203 Rge(1-2) 3-8 4-7 7-1	18 26 21 4	7-3 ^*	105			174
2014	KD Range 4-1	19 37	3-3 3-10	21 31	6-2	63	171
2015	M203 range 3-8 4-7 7-1	18 26 21 4	3-2	41	8-1 ^	24	134
2016	KD Range 4-1	19 37	5-2 ^ 7-3 ^*	43 105	6-3 * 7-5 ^*	26 26	256
2017	M203 range 3-8 4-7 7-1	18 26 21 4	3-3 3-10	21 31	5-1 *	83	204
2018	KD Range 4-1	19 37	C-6 3-1 3-2	2 7 41	5-3 * 6-1 * 7-4 ^	18 38 14	176
2019	M203 range 3-8 4-7 7-1	18 26 21 4	5-2 ^ 7-3 ^*	43 105	C-2 ^	21	238
2020	KD Range 4-1	19 37	3-3 3-10	21 31	6-2	63	171
2021	M203 range 3-8 4-7 7-1	18 26 21 4	C-6 3-1 3-2 3-6	2 4 41 51	4-2 8-1 ^	61 24	252
2022	KD Range 4-1	19 37	3-4 3-7 5-2 ^ 7-3 ^*	24 32 43 105	4-4 ^ 4-5	16 11	287

* Significant large-flowered skullcap management group will be protected from fire.
^ Small large-flowered skullcap management group will be subjected to fire for purposes of research.

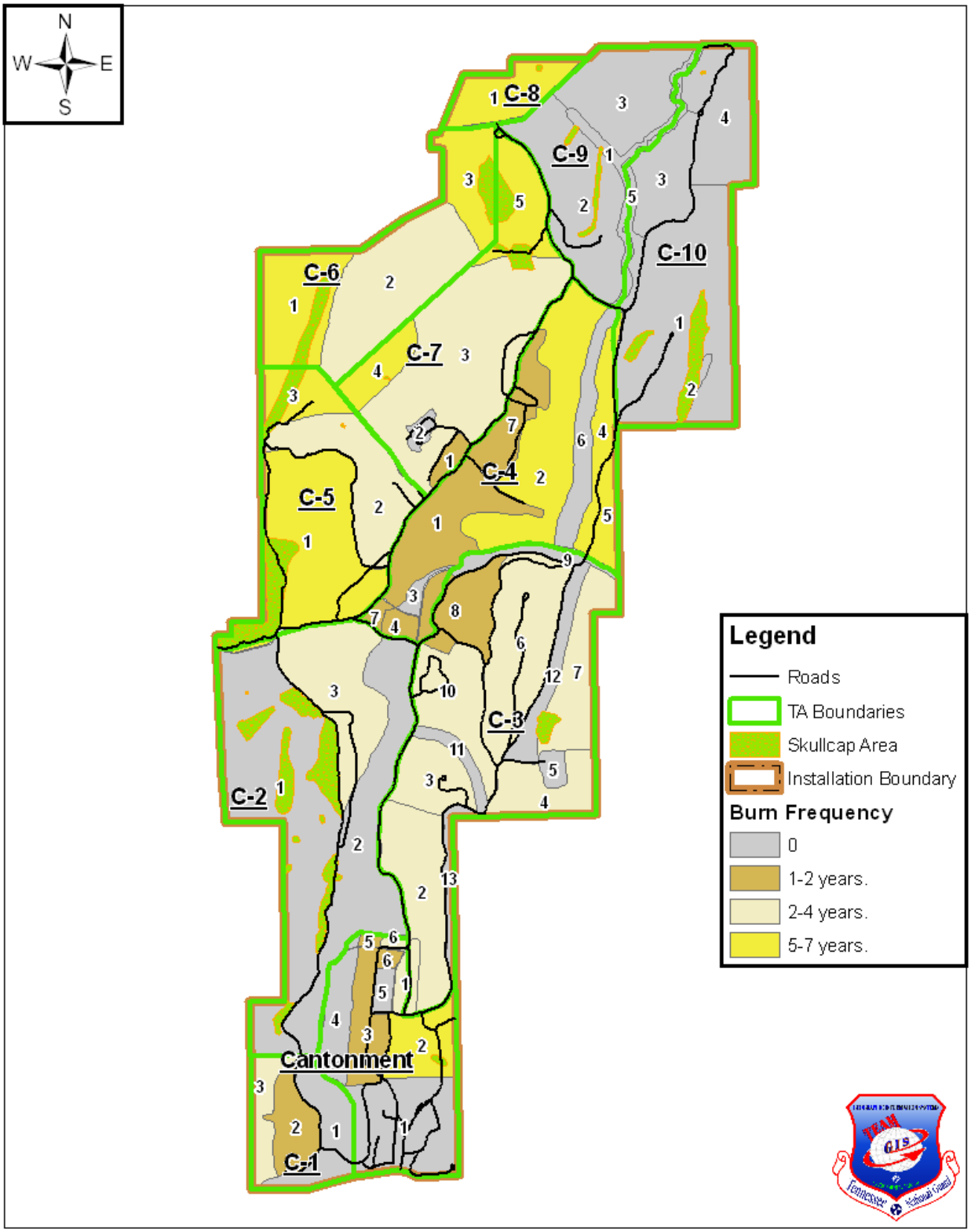


Figure A3.3: Prescribed burn frequency for burn units on VTS-Catoosa.

7.0 ATTACHMENTS

7.1 Reference Materials

Department of Army
Memorandum 4 Sep 2002, Army Wildland Fire Policy Guidance.
2 Sep 2005, Sustainable Range/Installation Environmental Activities Matrix.

Interagency Prescribed Fire – Planning and Implementation Procedures Guide (July 2008)
Available at http://www.nifc.gov/fire_policy/rx/rxfireguide.pdf

NFPA 1977: Standard on Protective Clothing and Equipment for Wildland Fire Fighting (2005 edition)

NWCG Publications – available at http://www.nwcg.gov/pms/pms.htm
PMS 307, Work Capacity Test Administrator's Guide (March 2003)
PMS 310-1, Wildland Fire Qualification System Guide (January 2006)
PMS 410-1, Fireline Handbook (March 2004)
PMS 410-1, Appendix B, Fire Behavior (April 2006)
PMS 424, Prescribed Fire Complexity Rating System Guide (January 2004)
PM 461, Incident Response Pocket Guide (January 2006)

Schmidt, K.M., J.P. Menakis, C.C. Hardy, W.J. Hann, and D.L. Bunnell. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. USDA Forest Service, Rocky Mountain Research Station.

Thompson Engineering, Forest Management Group, and Aerostar Environmental Services. 2006. Volunteer Training Site – Catoosa Forest Management Plan. Prepared for the TNARNG.

TRC Garrow and Science Applications International Corporation. 2002. Integrated Cultural Resources Management Plan and Environmental Assessment of the Implementation of the Plan, Catoosa Training Center, TNARNG, 2002-2006. Prepared for the TNARNG.

Van Lear, D.H., P.H. Brose, and P.D. Keyser. 2000. Using prescribed fire to regenerate oaks. In: Workshop Proceedings of Fire, People, and the Central Hardwoods Landscape.

Weather Information
Spot Weather Forecast, http://spot.nws.noaa.gov/cgi-bin/spot/spotmon?site=ffc
General Forecast, http://www.srh.noaa.gov/ffc/html/firewx.shtml
Georgia Fire Weather, http://weather.gfc.state.ga.us

7.2 Burn Plan Format

TNARNG PRESCRIBED FIRE PLAN

Facility:_____

Training Area:_____ Burn Unit Number/Name:_____

Fuel Type:_____ Acres:_____

Burn Permit #: _____

Fire Planner(s):

Name:_____

Title:_____

Signature: _____ Date:_____

Name:_____

Title:_____

Signature: _____ Date:_____

Burn Boss:

Name:_____

Title:_____

Signature: _____ Date:_____

Complexity Rating:_____(Low, Moderate, High)

Approved By:

Signature: _____ Date:_____

A. Pre-Burn Go/No Go Checklist

Has the area (inside and outside the unit) experience unusual drought conditions or does it contain above-normal fuel loadings which were not considered in the prescription development? If YES, go to question below. If NO, continue with Section B.	**YES**	**NO**
If YES, have appropriate changes been made to plans for ignition, holding, mop-up, and patrol? If YES, continue with Section B. If NO, **stop** and consult Fire Manager.		

B. Prior to Crew Briefing:

- ☐ Fire Unit is as described in plan
- ☐ Copy of burn plan is on site
- ☐ Certified Burn Boss present; Permit obtained (#_____)
- ☐ Required number personnel present, with required PPE
- ☐ Weather forecast obtained & within prescription; Long-range forecast checked for chance of severe weather
- ☐ Official & neighbor notifications complete
- ☐ Required equipment for holding, weather monitoring, ignition, & suppression is on-site & functioning
- ☐ Crew has reviewed equipment
- ☐ Planned ignition & containment methods are appropriate for current & predicted conditions
- ☐ Planned contingencies & mop-ups are appropriate for current & predicted conditions
- ☐ List of emergency phone numbers are in each vehicle
- ☐ Off-site contingency resources are operational and available

C. Crew Briefing:

- ☐ Prescribed Fire Objectives
- ☐ Burn Unit size & boundaries
- ☐ Burn unit hazards & safety issues
- ☐ Expected weather & fire behavior
- ☐ Organization of crew & assignments
- ☐ Methods of ignition, holding, mop-up, communications
- ☐ Contact with the public; Traffic concerns
- ☐ Safety & medical plan
- ☐ Location of back-up equipment, supplies, & water
- ☐ Contingencies for escaped prescribed fire
- ☐ Contingencies for medical emergency

D. Prior to Ignition:

- ☐ On-site weather and fuel conditions are within prescription & consistent with forecast
- ☐ Test burn conducted; fire & smoke behavior within prescribed parameters.

Burn Boss:_____ **Date:**_____

1. Burn Objectives

_____

_____

2. Location and Physical Description (Attach map)

A. Site_____ **Training Area**_____

B. Size_____

C. Topography / Slope_____

D. Project Boundary_____

E. Complexity_____

3. Vegetation / Fuels Description

A. On-site Fuels

Vegetation Types	Fuel Models	% of Unit Area	% Slope	Aspect

B. Adjacent Fuels

Vegetation Types	Fuel Models	% of Unit Area	% Slope	Aspect

4. Description of Unique Features

A. Natural:_____

B. Cultural:_____

5. Special considerations (fences, power poles, …)**:**

_____

_____

_____

_____

6. Prescription

A. Environmental Prescription:_____

_____

B. Fire Behavior Prescription:_____

_____

7. Fuel and Weather Prescription (acceptable ranges)

Fuel Parameters	**Prescription MIN/MAX**	**Forecast* MIN/MAX**	**Test Fire**	**Rx Burn**
1-Hour Fuel Moisture (%)				
10-Hour Fuel Moisture (%)				
100-Hour Fuel Moisture (%)				
Live Fuel Moisture (%)				
Other (e.g., KBDI, live/dead ratio,…)				
Weather Parameters				
Air Temperature (ºF)				
Relative Humidity (%)				
Days Since Rain				
20 ft Wind Speed (mph)				
Wind Direction(s)				
Midflame Windspeed (mph)				
Atmospheric Mixing Height (ft)				
Atmospheric Stability				
Rate of Spread				
Flame Length (ft)				
Scorch Height (ft)				
Probability of Ignition				

*Attach weather forecast.

8. Scheduling

A. Ignition Timeframe / Season(s):_____

B. Projected Duration:_____

C. Constraints:_____

9. Pre-burn Considerations and Weather

A. On-site Considerations:_____

_____

B. Off-site Considerations:_____

_____

C. Method & Frequency for Obtaining Weather and Smoke Management Information:

_____

_____

D. Notifications (List all agencies and neighbors):

Name	Date	Method	Contact Information
Public		Press Release	
Public		Road Signs	
Georgia Forestry Commission		Telephone	706-935-3162
Catoosa County VFD		Telephone	706-935-2001
Catoosa County Sheriff		Telephone	706-935-2323
Ringgold Police Department		Telephone	706-271-2825
Georgia State Patrol		Telepone	706-271-2825

10. Ignition Plan

A. Firing Methods (including Techniques, Sequences, and Patterns)**:**_____

_____

B. Devices:_____

C. Ignition Staffing:_____

_____

11. Holding Plan

A. General Procedures:_____

_____

B. Critical Holding Points:_____

_____

C. Minimum Organization or Capabilities Needed:_____

_____

12. Contingency Plan

A. Trigger Points:_____

_____

B. Actions Needed:_____

_____

C. Additional Resources and Maximum Response Time:_____

_____

D. Secondary Control Lines:_____

_____

E. Backup Water Supply:_____

13. Crew Organization

- **Burn Boss:**
- **Ignition Boss:**
  - **Ignition:**
  - **Ignition:**
- **Holding Boss:**
  - **Holding:**
  - **Holding:**
  - **Holding:**
- **Monitor:**

14. Equipment

Equipment Item	Quantity	Source

15. Fire Details

Ignition Time_____ **Fire Declared Out**_____

Narrative_____

_____

_____

_____

7.3 Post Burn Evaluation

1. **Site**_____ **Training Area**_____
   Burn Date_____
   Evaluation Date_____(immediately following burn)
   Re-evaluation Date_____(follow-up as needed)

2. **Amount litter left** (immediately after burn)_____**(inches)**

3. **Understory vegetation consumed**_____**(%)**

4. **Scorch: % of Area with Crown Scorch**
   <1/3_____ **1/3 – 2/3**_____ **2/3+**_____

5. **Any spotting / jumpovers?** (immediately after burn)

_____

_____

_____

6. **Tree Damage (insects, disease, mortality)?**_____

_____

7. **Understory kill of undesired vegetation (% top-killed)**_____

8. **Any smoke management violations?** (immediately after burn)

_____

_____

_____

9. **Any escapes?** (immediately after burn)

_____

_____

_____

10. Any complaints? (immediately after burn)

_____

_____

_____

11. Adverse effects?

_____

_____

_____

12. Any restoration needed?

_____

_____

_____

13. Were objectives met (results)?

_____

_____

_____

_____

Immediate Evaluation By:_____ **Date:**_____

Recommendations for future evaluation:

_____

_____

_____

_____

Follow-up Evaluation By:_____ **Date:**_____

7.4 After-Action Review

What did we set out to do?

What actually happened?

Why did it happen?

What are we going to do next time?

Which activities should be sustained?

What can be improved?

Annex 4

INVASIVE PEST PLANT CONTROL

TABLE OF CONTENTS

Page

1.0 Introduction....4-3
1.1 Background....4-3
Figure A4.1: Invasive pest plant occurrences on VTS-Catoosa....4-4
1.2 Objectives....4-5
1.3 Species Targeted for Suppression....4-5
Table A4.1: Invasive exotic pest plants observed on VTS-Catoosa....4-6
2.0 Control Plan....4-7
2.1 Small Infestations....4-7
2.2 Extensive Infestations....4-7
2.3 Environmental Precautions....4-9
2.4 Personal Protective Equipment....4-9
2.5 Treatment Methods....4-10
2.6 Herbicides....4-11
Table A4.2: Herbicide concentrations for use on VTS-C invasive pest plants....4-11
3.0 Invasive Species Details....4-12
3.1 *Ailanthus altissima* (tree of heaven)....4-12
3.2 *Albizia julibrissin* (mimosa)....4-13
3.3 *Cirsium arvense* (Canada thistle)....4-14
3.4 *Euonymus fortunei* (wintercreeper)....4-15
3.5 *Lespedeza cuneata* (sericea lespedeza)....4-16
3.6 *Ligustrum sinense* and *L. vulgare* (privet)....4-17
3.7 *Lonicera japonica* (Japanese honeysuckle)....4-18
3.8 *Microstegium vimineum* (Nepalese browntop)....4-19
3.9 *Paulownia tomentosa* (princess tree)....4-20
3.10 *Rosa multiflora* (multiflora rose)....4-21
3.11 *Sorghum halepense* (Johnson grass)....4-22
3.12 *Verbascum thapsus* (wooly mullein)....4-23

1.0 INTRODUCTION

1.1 Background

Like most regions of the world today, the VTS-C suffers from infestations of invasive exotic pest plants. The primary problem species on the training site are privet, Japanese honeysuckle, multiflora rose, wintercreeper, princess tree, Nepalese browntop, sericea lespedeza, mimosa, and tree-of-heaven. These problem species are found throughout the training site, but the most significant problems generally occur along the banks of Tiger Creek and its tributaries. Figure A4.1 shows locations of small invasive occurrences; the extensive presence of privet along the creek banks is not depicted. The infestation information included here is based on the 2006 invasive plant species survey by Dynamic Solutions.

This annex provides more detailed information on each of these problem species, including recommended methods of control. It also outlines the plan of attack for controlling these species on the training site, to be implemented as funding allows. It is important to note that complete eradication of widespread invasive plant species is nearly impossible and is cost-prohibitive. Small, confined occurrences may be completely eliminated by prompt, decisive action; however, with well-established populations (e.g., the privet on VTS-C) the only feasible goal is to contain and thin the infestation and hopefully prevent it from spreading further. Both eradication and control will take multiple years of repeated treatment to achieve.

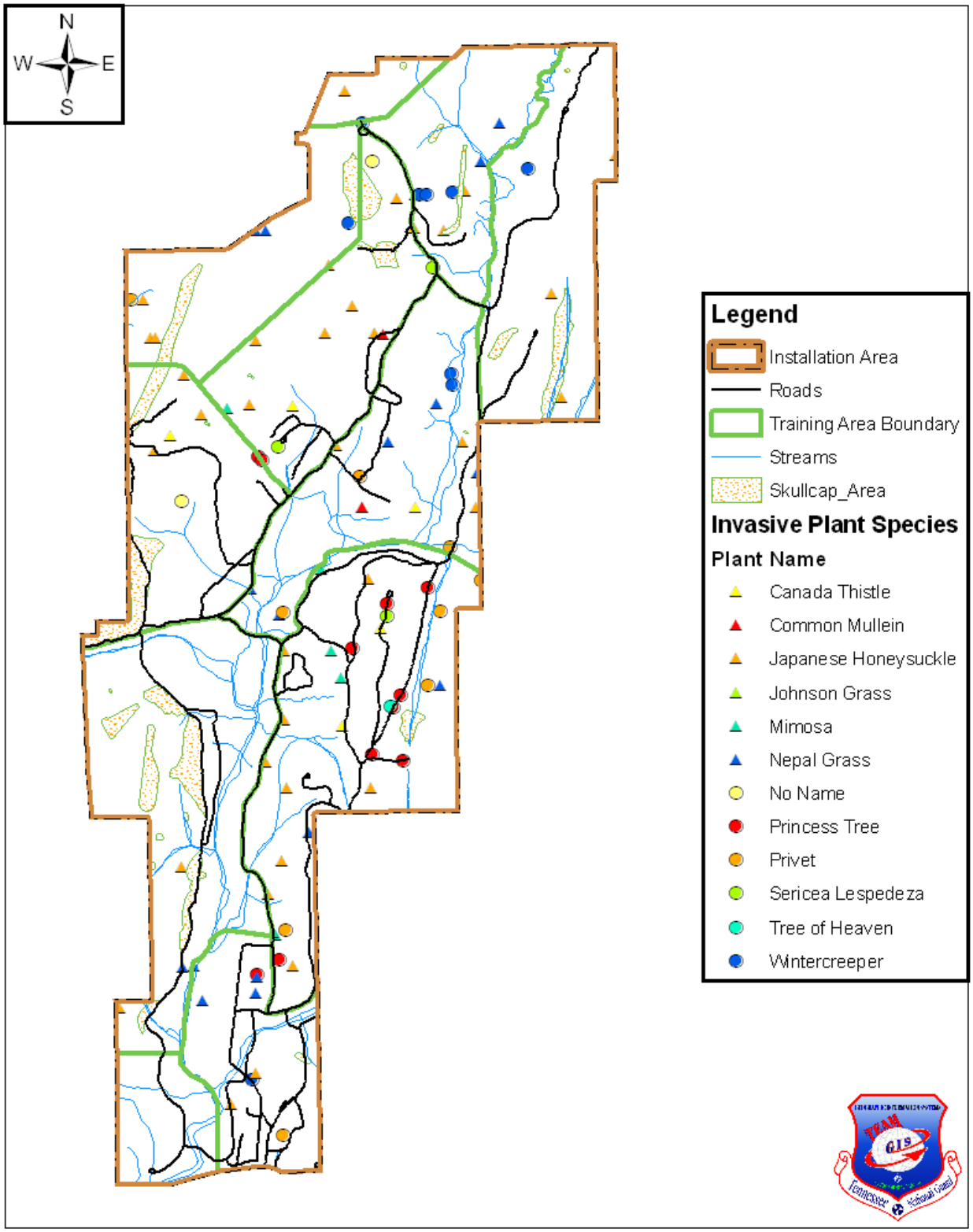


Figure A4.1: Invasive exotic plant occurrences on VTS-Catoosa (small groups and individual plants). From Dynamic Solutions (2006).

The control plan on VTS-C will be a two-tiered approach: first, small occurrences (tree-of-heaven, mimosa, princess tree, wintercreeper, wooly mullein) will be identified and treated on a training area-by-training area basis, and second, the larger infestations (privet, honeysuckle, Nepalese browntop) will be treated on a species basis in manageable sections. The spatial occurrence of the invasive species is described in more detail below. Control methods will typically be a combination of mechanical (cutting, mowing) and chemical (herbicide) and will follow US Forest Service and TN Exotic Pest Plant Council (TN-EPPC) control recommendations (Miller 2003; TN-EPPC 1997).

The presence of the federally listed large-flowered skullcap (*Scutellaria montana*) requires extra caution with the use of herbicides. The 26 management groups in which it occurs are located throughout the training site, though typically not in the areas of heaviest non-native infestation. Care must be taken at all times to ensure this protected species is not harmed by the process of invasive pest plant control. Restrictions on the use of chemicals around the large-flowered skullcap groups are detailed in Section 2.3.

1.2 Objectives

The objective of this plan is to provide effective control of invasive exotic pest plants on the VTS-C, limiting the areas infected by exotics and allowing the native vegetation communities to reestablish themselves.

Important guidelines for the control program:

- The large-flowered skullcap should not be stressed or damaged during any phase of these control efforts;
- Eradication and suppression efforts will be coordinated and scheduled to avoid interference with training events;
- There should be no detrimental environmental impact resulting from this control effort.

1.3 Species Targeted for Suppression

Invasive plant species are successful invaders because they generally grow rapidly, create large amounts of seed, and are thus positioned ecologically to exploit the greater amount of light found on the edges of man-made and natural openings as well as all disturbed areas. The roads and openings of the forested and woodland portion of the VTS-C have provided many places for invasive plant species to seed into and dominate.

The Georgia Exotic Pest Plant Council (GA-EPPC) has developed a List of Non-native Invasive Plants in Georgia (GA-EPPC 2006). This list categorizes plants that pose threats to natural areas in Georgia, but does not include plants that are only problems in agricultural or pastoral systems. The list groups exotic species as:

- Category 1: exotic plants that are a serious problem in Georgia natural areas because they are extensively invading native plant communities and displacing native species;
- Category 1 Alert: exotic plants that are not yet a serious problem but have significant potential to become such;
- Category 2: exotic plants that are a moderate problem through invading native plant communities and displacing native species to a lesser degree than category 1 species;
- Category 3: exotic plants that are a minor problem in Georgia or are not yet known to be a problem in Georgia but are a problem in adjacent states; or
- Category 4: exotic plants that are naturalized in Georgia and generally do not pose a problem in natural areas; also, species that are potentially invasive but in need of further information to make a determination.

The classification of each invasive plant species observed at VTS-C is noted in the list below. The Tennessee Exotic Pest Plant Council (TN-EPPC) has also developed a list of invasive plants and ranked them according to the threat that they pose. The TN-EPPC ranking is included in the table below for consistency with other TNARNG training sites. TN-EPPC recommends that Rank 1 and Rank 2 species be controlled and managed in the early stages of detection when possible.

Table A4.1 is a summary of the invasive species observed at the VTS-C site during the 2006 invasive species survey. It is organized alphabetically by species observed. Abundance of the invasive species in the aggregation was coded Dominant, greater than 50%, Present, 10 to 50 %, and Sparse, less than 10%.

Table A4.1: Invasive exotic plant species observed on VTS-Catoosa (from Dynamic Solutions 2006).

Scientific Name	Common Name	GA-EPPC Category	TN-EPPC Ranking	Abundance at VTS-C
Ailanthus altissima	tree of heaven	1	Rank 1: Severe Threat	Sparse with an isolated location in TA-3
Albizia julibrissin	mimosa	1	Rank 1: Severe Threat	Present in clusters in TA-2, 3, 7 9, and the Cantonment.
Cirsium arvense	Canada thistle	4	Rank 2: Significant Threat	Present along edges and in openings in TA-3, 4, 5, 7
Euonymus fortunei	wintercreeper	3	Rank 1: Severe Threat	Sparse at several isolated location in TA-5, 9, 10, and the Cantonment. Where observed generally formed 1/3 acre and larger stands dominated by wintercreeper.
Lespedeza cuneata	sericea lespedeza	1	Rank 1: Severe Threat	Present in roads road edges, and openings in TA-2, 3, 5, 7, and the Cantonment
Ligustrum sinense &/or Ligustrum vulgare	privet	1	Rank 1: Severe Threat	Present to dominant in every training area and the Cantonment. Privet population increases as you move south along Broom Branch to Tiger Creek with dense stand along the banks and flood plain of the southern part of Tiger Creek in TA-1, 2, 3, and the Cantonment.
Lonicera japonica	Japanese honeysuckle	1	Rank 1: Severe Threat	Present pervasively in all training areas. Dominant in sunny edges of roads and openings.
Microstegium vimineum	Nepalese browntop; microstegium	1	Rank 1: Severe Threat	Present in all low lying and moist shaded areas in all training areas and the Cantonment.
Paulownia tomentosa	princess tree, royal paulownia	1	Rank 1: Severe Threat	Sparse at isolated locations in TA-3, 7, and the Cantonment.
Rosa multiflora	multiflora rose	1	Rank 1: Severe Threat	Sparsely present in TA-2, 3, 4, and the Cantonment. Multiflora rose is a part of the invasives mix, but generally a minor one at VTS-C.
Sorghum halepense	Johnson Grass	3	Rank 1: Severe Threat	Sparsely present along roads and in openings in TA-1, 2, 3, 5, 9, and 10.
Verbascum thapsus	wooly mullein	4	Rank 2: Significant Threat	Isolated and sparse in TA-7 near tank target pits and one location in TA-4.

2.0 CONTROL PLAN

2.1 Small Infestations

The several small occurrences of tree-of-heaven, mimosa, princess tree, wintercreeper, and wooly mullein will be treated first, with the goal of completely eradicating these species on VTS-C.

Tree-of-heaven and mimosa will be treated at the same time. A crew will travel the road system and trails of the training site during the late summer or mid-winter and treat all individuals of these species that they encounter. Tree-of-heaven has previously been found only in training area 3, but mimosa occurs in clusters in training areas 2, 3, 7, and 9 as well as the cantonment. Large trees will be stem-injected or felled and the stump treated with Garlon 3A. Saplings will be basal-bark treated with Garlon 4. The following summer, a crew will return to treat all sprouts and seedling with a foliar spray of Garlon 4.

Princess tree occurrences may be treated at the same time as the previous two trees. However, the recommended herbicides differ for this species, and so the crew will have to maintain an additional herbicide preparation or else mark the trees and return at another time to treat the princess tree. This species has been noted in training areas 3 and 7 and in the cantonment. Large trees will be stem injected or cut-stump treated with a glyphosate herbicide. Saplings will be basal bark treated with Garlon 4. The following summer, the crew will treat all sprouts and seedlings with a foliar spray of Garlon 4.

Wintercreeper occurs in several patches in the cantonment and training areas 5, 9, and 10. Two of the patches are located very close to large-flowered skullcap groups. The wintercreeper will be treated in late summer to fall with a foliar application of Garlon 4. This will be repeated annually for several years. In August, prior to spraying, the patch should be inspected and all vertical climbing stems and any visible flowering stems will be cut to minimize fruit development.

Wooly mullein was found in a few places in training areas 4 and 7. It will be treated by hand pulling in May-June. Plants will be bagged for disposal, and the areas in which it is occurring will be sown with an appropriate native grass and forb seed mixture. These areas will be scouted and treated annually for several years until the seed bank is exhausted.

2.2 Extensive Infestations

A number of invasive species have become thoroughly established on the VTS-C and are unlikely to ever be completely removed. The goal of this program is to bring those infestations under control, reducing the numbers of exotic plants, rehabilitating native communities that have been affected, and limiting further spread of the invasives. The principle species are privet, Japanese honeysuckle, Nepalese browntop and an open-areas conglomeration of sericea lespedeza, Canada thistle, and Johnson grass.

For each of these species, the control effort will be intensive and require several years of effort. It would be most efficient to have a firm commitment of manpower and funding for at least 3 years' work prior to initiating any control efforts. A single year of effort without follow-up will have little long-term impact on the invasive species and will represent wasted effort and money.

In addition to the control efforts, it will be necessary to be prepared with a plan for reestablishing native vegetation once the invasives have been cleared. Native species restoration plans will be developed individually for areas requiring such. Restoration efforts will utilize all native species and will involve a minimum of soil disturbance.

2.2.1 Privet

Privet occurs in every training area on VTS-C and the cantonment. It is generally most common along the creek banks and becomes more dense as you move south through the training site. Control, therefore, will begin at the northern end of the site. Roadsides, forest openings, and the Broom Branch shoreline will be treated. Individuals less than 5" dbh will be treated with a basal bark spray of Garlon 4. Larger stems will be cut and immediately stump treated with Arsenal AC. This process will be repeated in manageable chunks moving south to take in Tiger Creek and the remainder of the training site. This effort should be conducted in winter. The following late summer, a return visit will be made to treated areas to foliar spray sprouts with Arsenal.

The same program will need to be repeated each winter for several years.

If there are areas of infestation in which little to no desirable vegetation remains, at least 50 feet beyond any creek banks and more than 50 feet from any skullcap management group boundary, a brush cutter or similar equipment may be used to mow down the privet while leaving any other trees and shrubs standing, as possible. This should be conducted in summer when the ground is dry but before seed set. This will be followed up in the fall with broadcast foliar application of Arsenal AC to the sprouts.

2.2.2 Japanese honeysuckle

Japanese honeysuckle is also present throughout the training site. It is typically less overpowering on VTS-C than the privet, but honeysuckle is the species most commonly threatening large-flowered skullcap groups. The first stage of control will be to treat infestations along roads and near skullcap groups. Foliar spray with Garlon 3A will be conducted in the late fall. Care will be taken when spraying near skullcap management groups to ensure that drift is minimized and directed away from the protected species. Areas will be checked the following summer to determine the need for retreatment. Additional infestations of honeysuckle that are documented during the course of other work will be treated the following winter.

2.2.3 Nepalese browntop

Nepalese browntop occurs in low-lying and moist, shaded areas throughout VTS-C. Management will be concentrated along the creeks and drainages, beginning, as with privet, at the northern end of the training site where conditions are somewhat less impacted.

Treatment will consist of foliar application of herbicide: glyphosate where there is little desirable vegetation mixed with the Nepalese browntop. Vantage or Select 2EC (grass-specific post emergent herbicide) will be applied in locations where native herbaceous vegetation is still present. Treatment will be made in early June, with a second application in late July to ensure complete kill. Care will be taken to avoid drift onto the waterways. Infestations on shorelines will be treated with a glyphosate herbicide labeled for aquatic use. Sites will be inspected the following June for new germination. Complete removal will require several years to exhaust the seedbank.

Areas that are accessible and also sufficiently dry may be treated without chemicals by mowing in August. This method requires careful timing to remove the flowers before seed set but late enough to negate the possibility of new flower development. This method will also require several years of repeat treatments to exhaust the seedbank.

Areas that were heavily infested with Nepalese browntop will need to be reseeded or planted with native species to minimize the available space for re-invasion.

2.2.4 Open areas complex

Most open fields and roadsides around the training site are infested with some combination of sericea lespedeza, Johnson grass, and Canada thistle. Control of these species will be undertaken in combination with an effort to restore native grasses where feasible on the training site. Small arms ranges and lawns are typically not appropriate locations for native warm season grasses, due to their tall growth form. Such areas will be maintained with the existing mixtures of fescue, bermudagrass, crabgrass, and similar species. Canada thistle will be spot treated with Garlon 3A when found in these areas. Johnsongrass clumps will be spot treated with glyphosate or Arsenal when found.

Less manicured open areas such as the tank range impact area may be treated for invasive pest plants in preparation for reseeding native warm season grasses (NWSG). The standard site preparation for conversion to NWSG involves a combination of herbicide treatments, mowing, and burning prior to sowing the NWSG seed. Glyphosate or triclopyr herbicides in conjunction with Plateau herbicide are used to control fescue and should control the other exotic species in these areas. Establishment of native grasses requires several years of effort before a good stand is present. Repeated area treatments and spot treatments may be required during this time to control the exotic plant species.

2.3 Environmental Precautions

As noted above, the federally protected large-flowered skullcap occurs in 26 management groups scattered around the training site. This perennial wildflower begins shoot growth in March, blooms in May-June and maintains its aboveground vegetation until late summer. Herbicide use during this active growing season will be carefully controlled in the vicinity of known large-flowered skullcap groups: only stem treatments (basal bark, stem-injection, or cut stump) of invasive plants will be allowed within 50 feet of a skullcap group from March to September. Foliar applications of herbicides within 50 feet of a group may only be made during the fall and winter to minimize the risk of spray reaching an active large-flowered skullcap. No soil active herbicides will be used at anytime within 50 feet of a large-flowered skullcap group.

VTS-C also contains significant waterways in the trout streams Tiger Creek, Broom Branch, and Catoosa Springs Branch. Protecting stream habitat from both chemical pollutants and sedimentation is of utmost importance.

- There will be no herbicide applications to water unless the chemical is labeled for aquatic use
- Within 25 feet of water, only stem treatments will be used to minimize risk of drift
- Foliar treatments will be avoided in any situation where the spray would be carried toward water
- Where possible, dead vegetation will be left standing on the creek banks
- There will be no stump removal on creek banks
- Where creek banks are more than 50% invasive species, revegetation and bank stabilization will be conducted immediately following IPP control

All label requirements will be followed, as will state and DoD pesticide regulations. Only state or DoD certified applicators will apply herbicides for IPP control. Non-certified personnel may help with non-chemical aspects of control, but will be briefed on pesticide safety prior to initiating work.

2.4 Personal Protective Equipment (PPE)

Personnel who handle and/or apply pesticides are required to wear personal protective equipment and clothing designated on the herbicide label IAW the Federal Insecticide, Fungicide, and Rodenticide Act (40 CFR 162), Occupational Safety and Health Standards (29 CFR 1910), and DOD Directive 4150.7.

Such protective devices include masks, respirators, gloves, goggles, and protective clothing necessary for the pest management operations being conducted and the pesticides used. All personnel involved in pesticide operations will utilize, at minimum, the PPE required by the product label.

2.5 Treatment Methods

2.5.1 Cut stump

The cut stump method is a method used for trees and woody shrubs greater than 5" dbh. The tree is cut down, leaving a stump 2 to 6 inches high (excessive stump height can limit the effectiveness of this method). The appropriate herbicide solution is applied to the outer 20% of the freshly cut surface within a few minutes, if possible. (After 2 hours, a basal bark treatment with penetrant will have to be applied.) All stems coming from the base or roots of the plant should be cut and treated at the same time.

The cut stump method is most effective when the plant is actively growing but not during the first flush of spring growth. Therefore, cut stump treatments may be initiated in May and continue through the summer. Cut stump can also be applied during the dormant season.

2.5.2 Stem injection

Stem injection is another method for use on large trees and shrubs. Incision cuts are made downward into the stem, and herbicide is applied into the cut. With hard to control species, the cuts should completely frill the stem. There is less physical effort required for this method as opposed to completely cutting down the tree, but it leaves a dead snag standing, which may or may not be acceptable, depending on the situation.

Like cut stump, stem injection is most effective in late winter or throughout the summer. It should not be utilized during the heavy spring sap flow.

2.5.3 Basal bark spray

The basal bark method is a recommended method for controlling young trees with smooth bark (generally individuals under 5" dbh). A 6 to 12 inch band of herbicide is applied around the circumference of the tree trunk approximately one foot above ground level. The width of the sprayed band depends on the size of the tree and the species' susceptibility to the herbicide. Ester formulations of pesticides are most effective due to their ability to readily pass through tree bark. Esters are volatile and care must be taken to follow the label – avoid ester formulations on hot days because vapor drift can injure nontarget plants. A chemical penetrant should be included in the herbicide mixture.

Basal bark applications are usually made in late winter and early spring, when leaves do not interfere with trunk access. This method is effective during the summer, but much more difficult.

2.5.4 Foliar spray

The foliar spray method can be used for all target species not in close proximity to environmentally sensitive areas. This method is most effective in areas where there is a low density of desirable vegetation. Care must be taken to use appropriate spray equipment with sufficient droplet size to minimize drift to nontarget plants. Handheld sprayers can only treat plants up to about 6' in height. Leaves should be wet thoroughly but not to the point that herbicide runs off and impacts non-target species. Air temperature should be above 65ºF to ensure absorption of herbicides.

Foliar sprays should not be used on windy days. Care must be taken to minimize threat to surrounding nontarget vegetation and other sensitive sites (riparian areas).

The foliar spray method only works when the plant has full or near full leaf cover and is most effective from mid-summer to late fall, depending on the target species' life cycle. Evergreen or semi-evergreen species like privet and honeysuckle can be treated in the late fall to winter as long as they retain a significant portion of their leaf cover.

2.6 Herbicides

Table A4.2 reflects the recommended herbicide and standard concentration to use per plant species and the primary method of control. These recommendations must be corroborated with the concentrations approved on each product label. **The label is the law.**

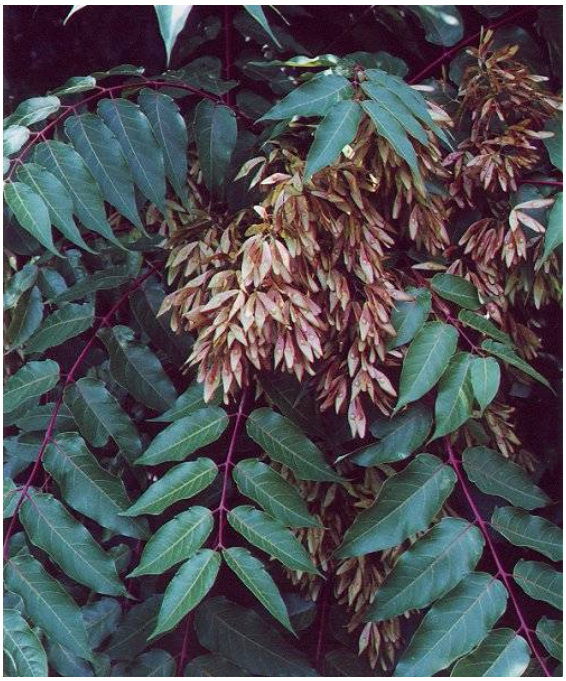
Table A4.2: Herbicide concentrations for use on VTS-C invasive pest plants.

Species	Season	Method	Chemical	Concentration	Additive
Canada thistle	Summer (pre-flower)	Foliar	Garlon 3a	2%	Surfactant
Johnsongrass	Summer	Foliar	Arsenal	Label	Surfactant
Japanese honeysuckle	Late fall	Foliar	Garlon 3A	5%	Surfactant
Nepalese browntop	June & July	Foliar	Glyphosate	2%	Surfactant
	June & July	Foliar	Select	12 oz/ac	Surfactant
Mimosa	Fall/winter	Cut stump	Garlon 3A	Label	
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Garlon 4	2%	Surfactant
Multiflora rose	April-June	Foliar	Arsenal AC	1%	surfactant
	Fall/winter	Cut stump	Arsenal AC	10%	
	Summer/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
Princess tree	Fall/winter	Cut stump	Glyphosate	Label	
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Garlon 4	2%	Surfactant
Privet	Fall/winter	Cut stump	Arsenal AC	10%	Surfactant
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Arsenal AC	1%	Surfactant
Sericea lespedeza	Summer	Foliar	Garlon 4 or Glyphosate	2% 2%	Surfactant
Tree-of-heaven	Fall/winter	Cut stump	Garlon 3A	Label	
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Garlon 4	2%	Surfactant
Wintercreeper	August	Hand cut	N/A	N/A	N/A
	Summer/fall	Foliar	Garlon 4	4%	Surfactant
Wooly mullein	May-June	Hand pull	N/A	N/A	N/A

3.0 INVASIVE SPECIES DETAILS

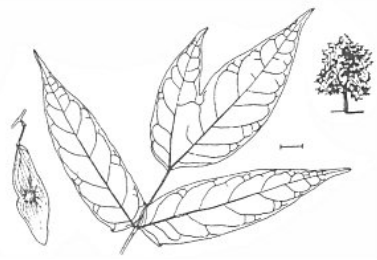
Ailanthus altissima (tree of heaven)

- Description: Tree of heaven is a rapidly growing small tree but can reach up to 80 feet in height and 6 feet in diameter. It has pinnately compound leaves that are 1-4 feet in length with 10-41 leaflets. Tree of heaven resembles the sumacs and hickories, but is easily recognized by the glandular, notched base on each leaflet. It is extremely tolerant of poor soil conditions and has been known to grow even in cement cracks. It cannot grow in shaded conditions but thrives in disturbed forests or edges. Dense clonal thickets displace native species and can rapidly take over fields and meadows.



- Specific Control Prescription: Small trees may be effectively controlled by hand pulling. Pulling may be done any season. Moist soil facilitates pulling. During growing season, re-inspect pulled sites in 30 days for regrowth from unpulled roots.

  Larger trees should be cut at the stump during the growing season. Treat the cut stump immediately with Garlon 3A. As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.



Present in Training Area	
3	

Albizia julibrissin (mimosa)

- Description: Mimosa is a small tree that is 10 to 50 feet in height, often having multiple trunks. It has delicate looking bi-pinnately compound leaves that resemble ferns. Mimosa has very showy, pink flowers that are fragrant, giving way to small, flat bean-pod like fruits. Mimosa invades any type of disturbed habitat. It is commonly found in old fields, stream banks, and roadsides. Once established, mimosa is difficult to control due to the long-lived seeds and its ability to re-sprout vigorously.

- Specific Control Prescription: Small trees may be effectively controlled by hand pulling any time of year. Areas where pulling has been done should be re-inspected during the growing season after 30 days to look for sprouts.

  Larger trees should be cut at the stump. Treat the cut stump immediately with Garlon 3A, mixed in accordance with the label.

  As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

Present in Training Area	
2	**3**
7	**9**
Cantonment	

C*irsium arvense (*Canada thistle)

- Description: Canada thistle is a tall, erect, spiny herbaceous plant that grows to 4 feet tall. It has an extensive creeping rootstock. The leaves are lance-shaped, irregularly lobed with very prickly margins. The stems are ridged and hairy. The flowers are purple to white and can be up to .5 inch in diameter. The small seeds, called achenes, are 1 to 1.5 inches long and have a feathery structure attached to the base, which lets them float through the air. Canada thistle can invade a variety of open habitats including prairies, savannas, fields, pastures, wet meadows, and open forests. It forms dense stands, which can shade out and displace native vegetation. Once established it spreads rapidly and is difficult to remove.

- Specific Control Prescription: Canada thistle control can be achieved through hand cutting, mowing, and controlled burning, and chemical means, depending on the level of infestation and the type of area being managed. Due to its perennial nature, entire plants must be killed in order to prevent regrowth from rootstock. Hand cutting of individual plants or mowing of larger infestations should be conducted prior to seed set and must be repeated until the starch reserves in the roots are exhausted. Because early season burning of Canada thistle can stimulate its growth and flowering, controlled burns should be carried out late in the growing season for best effect.

In natural areas where Canada thistle is interspersed with desirable native plants, utilize a targeted application of a 2% solution of Garlon 3A with surfactant. For extensive infestations in disturbed areas with little desirable vegetation, broad application of this type herbicide may be the most effective method. Repeated applications are usually necessary due to the long life of seeds stored in the soil.

Present in Training Area	
3	**4**
5	**7**

Euonymus fortunei (wintercreeper)

- Description: Wintercreeper, also known as climbing euonymus, is an evergreen, clinging vine. It can form a dense groundcover or shrub to 3 feet in height, or climb 40-70 foot high vertical surfaces with the aid of aerial roots. Dark green, shiny, egg-shaped leaves, from 1 - 2 1/2 inches long, with toothed margins and silvery veins, occur in pairs along the stems. Stems are narrow, minutely warty, and have abundant rootlets or trailing roots. Clusters of inconspicuous green-white flowers are produced on a long stalk from June to July and are followed in the autumn by pinkish to red capsules that split open to expose seeds adorned with a fleshy orange seed coat, or aril.

- Specific Control Prescription: For small populations, like those observed in TA-A1, individual vines should be pulled up by the roots or cut off at ground level and removed from the area. Follow-up with a foliar application to resprouts; a 4% concentration of Garlon 4 with a surfactant is reported to be effective. Treatment should be in late winter when most native vegetation is dormant and prior to the emergence of spring wildflowers.

Present in Training Area	
3	**5**
9	**10**
Cantonment	

***Lespedeza cuneata* (sericea lespedeza)**

- Description: Sericea lespedeza is an upright semi-woody forb, 3 to 6 feet in height with one to many slender stems. It has thin, alternate, abundant, three-parted leaves. Flowers are small and whitish-yellow. It is an extremely aggressive invader of open areas, out competing native vegetation. Once it is established is very difficult to remove due to the seed bank, which can remain viable for decades. Native to Asia and introduced into the Unites States in the late 1800s, sericea lespedeza has been widely planted for wildlife habitat, erosion control, and mine reclamation.

- Specific Control Prescription: The best control of lespedeza combines both mechanical and chemical treatments. Hand pulling is impractical due to its extensive perennial root system, but mowing plants at the flower bud stage for two to three consecutive years can significantly reduce the vigor of stands as well as control further spread. Mowing followed by an herbicide treatment is likely the most effective option for the successful control.

  Herbicide should be applied in mid- to late-summer, July through September. Apply Garlon 4 as a 2% solution. Note that lespedeza and Johnson grass were observed to be growing together and any treatment of one will harm or benefit the other, so plan accordingly.

Present in Training Area	
2	**3**
5	**7**
Cantonment	

***Ligustrum sinense &/or Ligustrum vulgare* (privet)**

- Description: Privet is a thick, semi-evergreen shrub to 30 feet in height. Trunks usually occur as multiple stems with many long, leafy branches attached at near right angles. Leaves are opposite, oval and .5 to 1.5 inches long. White flowers are very abundant and occur at the end of branches in clusters. Fruits ripen to a dark purple to black color and persist into winter. Although several species occur, they are hard to distinguish. It commonly forms dense thickets in the fields or in the understory of forests. It shades and out-competes many native species and, once established, is very difficult to remove.

- Specific Control Prescription: Privet has leaves throughout the year in Tennessee and thus can be identified and treated at any time during the year. Small plants may be may be effectively controlled by hand pulling. Plants should be pulled as soon as they are large enough to grasp, but before they produce seeds. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may re-sprout. Smaller shrubs are usually easy to pull; larger individuals are likely to require mechanical assistance in pulling.

  Mowing or other mechanical reduction of plant mass is effective for providing safer spraying access but is not an effective control by itself**.** Foliar Spraying can be effective for large thickets of privet where risk to non-target species is minimal. Timing applications for late fall or early spring when many native species are dormant will help minimize damage to non-target species. Generally foliar herbicides offer better control in warmer weather, as plants are growing faster, but privet keeps its leaves which can make it easier to locate when most other plants don not have leaves. To spray, apply a 1% solution of Arsenal AC plus a surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray-drift damage to non-target species.

Present in Training Area	
1	**2**
3	**4**
5	**6**
7	**8**
9	**10**
Cantonment	

  Larger or un-pullable plants require cutting at ground level with saws. Cutting is most effective when plants have begun to flower to prevent seed production. Re-sprouting is common after treatment. Cutting is an initial control measure, and success will require either an herbicidal control or repeated cutting of re-sprouts.

  Treat the cut stump immediately with Arsenal AC applying a 10% solution of herbicide and water to the cut stump. As a follow-up when and if stump sprouting occurs, apply a 1% solution of Arsenal AC plus a surfactant as a foliar spray.

***Lonicera japonica* (Japanese honeysuckle)**

- Description: Japanese honeysuckle is a perennial vine that climbs by twisting its stems around vertical structures, including limbs and trunks of shrubs and small trees. Leaves are oblong to oval, sometimes lobed, have short stalks, and occur in pairs along the stem. In Tennessee, Japanese honeysuckle leaves often remain attached through the winter. Flowers are tubular, with five fused petals, white to pink, turning yellow with age, very fragrant, and occur in pairs along the stem at leaf junctures. Stems and leaves are sometimes covered with fine, soft hairs. Japanese honeysuckle blooms from late April through July and sometimes into October. Small black fruits are produced in autumn, each containing 2-3 oval to oblong, dark brown seeds about 1/4 inch across.

- Specific Control Prescription: Mowing and fire are effective at reducing the aboveground mass of plant material, but require herbicide follow-up for effective control of honeysuckle.

  Foliar spraying with a 5% solution of Garlon 3A is may be effective for controlling Japanese honeysuckle. Timing applications for late fall or early spring when many native species are dormant will help minimize damage to non-target species. Generally foliar herbicides offer better control in warmer weather, as plants are growing faster, but honeysuckle keeps its leaves, which can make it easier to locate when most other plants do not have leaves.

Present in Training Area	
1	**2**
3	**4**
5	**6**
7	**8**
9	**10**
Cantonment	

***Microstegium vimineum* (Japanese grass, Nepalese browntop)**

- Description: Japanese grass, also known as Nepalese browntop and other names is an annual plant. It has a sprawling habit and grows slowly through the summer months, ultimately reaching heights of 2 to 3 1/2 ft. (6-10 dm.). The leaves are pale green, lance-shaped, asymmetrical, 1-3 in. (3-8 cm.) long, and have a distinctive shiny midrib. Slender stalks of tiny flowers are produced in late summer (August - September). The fruits or achenes mature soon after flowering and the plant dies back completely by late fall.

- Specific Control Prescription: Mow plants as close to the ground as possible using a weedeater or similar grass-cutting tool. Treatments should be made when plants are in flower and before seeds are produced. Treatments made earlier may result in plants producing new seed heads in the axils of lower leaves.

  Herbicide treatments should be made late in the growing season (June-July) but before the plants set seed. Treatments made earlier in the growing season may allow a second cohort of plants to produce seeds. Apply a 2% solution of glyphosate and water plus a 0.5% non-ionic surfactant to thoroughly wet all foliage. Do not spray to the point of runoff. Ambient air temperature should be above 65°F to ensure translocation of the herbicide to the roots. Do not apply if rainfall is expected within two hours following application. Additional treatments are likely to be necessary to exhaust the supply of seed in the soil.

Present in Training Area	
1	**2**
3	**4**
5	**6**
7	**8**
9	**10**
Cantonment	

An alternative chemical treatment is to use the grass killer clethodim (Select). Apply 12 oz/ac of Select plus a crop oil concentrate according to the label. Do not spray to the point of runoff. Ambient air temperature should be above 65°F. Do not apply if rainfall is expected within one hour following application.

***Paulownia tomentosa* (Princess tree, royal paulownia)**

- Description: Princess tree, also known as royal paulownia or empress tree, is a small to medium sized tree that may reach 30-60 feet in height. The bark is rough, gray-brown, and interlaced with shiny, smooth areas. Stems are olive-brown to dark brown, hairy and markedly flattened at the nodes (where stems and branches meet). Leaves are large, broadly oval to heart-shaped, or sometimes shallowly three-lobed, and noticeably hairy on the lower leaf surfaces. They are arranged in pairs along the stem. Conspicuous upright clusters of showy, pale violet, fragrant flowers open in the spring. The fruit is a dry brown capsule with four compartments that may contain several thousand tiny winged seeds. Capsules mature in autumn when they open to release the seeds and then remain attached all winter, providing a handy identification aid.

- Specific Control Prescription: Princess tree can be controlled using a variety of mechanical and chemical controls. Hand pulling may be effective for young seedlings. Plants should be pulled as soon as they are large enough to grasp. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may resprout. Trees can be cut at ground level with power or manual saws. Cutting is most effective when trees have begun to flower to prevent seed production. Because Princess tree spreads by suckering, resprouts are common after cutting. Cutting should be considered an initial control measure that will require either repeated cutting of resprouts or an herbicide treatment.

Princess tree seedlings and small trees can be controlled by applying a 2% solution of Garlon 4 and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce damage from spray drift on non-target species.

Present in Training Area	
3	**7**
9	**10**
Cantonment	

The cut stump method can be used with a glyphosate herbicide; see label for concentration. Basal bark applications are also effective on small saplings; utilize Garlon 4 in a 20% solution plus basal oil and penetrant. Girdling is effective on large trees where the use of herbicides is impractical. Using a hatchet, make a cut through the bark encircling the base of the tree, approximately six inches above the ground. Be sure that the cut goes well below the bark. This method will kill the top of the tree but resprouts are common and may require a follow-up treatment with a foliar herbicide.

***Rosa multiflora* (multiflora rose)**

- Description: Multiflora rose is a thorny, perennial shrub with arching stems (canes), and leaves divided into five to eleven sharply toothed leaflets. The base of each leaf stalk bears a pair of fringed bracts. Beginning in May or June, clusters of showy, fragrant, white to pink flowers appear, each about an inch across. Small bright red fruits, or rose hips, develop during the summer, becoming leathery, and remain on the plant through the winter.

- Specific Control Prescription:
  Mowing/Cutting is appropriate for small initial populations or environmentally sensitive areas where herbicides cannot be used. Repeated mowing or cutting will control the spread of multiflora rose but will not eradicate it. Stems should be cut at least once per growing season as close to ground level as possible. Hand cutting of established clumps is difficult and time consuming due to the long arching stems and prolific thorns.

Three methods using herbicides are practical for different plant situations. Foliar spray is appropriate for large thickets of multi-flora rose where risk to non-target species is minimal. It is most effective during April to June, around the flowering period. Apply a 1% solution of Arsenal AC thoroughly wetting all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

If non-target plants are in close proximity, a 4% solution of glyphosate can be applied May through October to avoid soil contamination.

The cut stump method should be considered when treating individual bushes or where the presence of desirable species precludes foliar application. This treatment remains effective at low temperatures as long as the ground is not frozen. Horizontally cut multiflora rose stems at or near ground level. Immediately apply a 10% solution of Arsenal AC to the cut stump making sure to cover the entire surface.

Present in Training Area	
	2
3	4
Cantonment	

The basal bark method is effective throughout the year as long as the ground is not frozen. Apply a mixture of 20% Garlon 4 plus basal oil to the bark of the shrub to a height of 30-38 cm (12-15 in) from the ground. Thorough wetting is necessary for good control; spray until run-off is noticeable at the ground line.

***Sorghum halepense* (Johnson grass)**

- Description: Johnson grass grows as tall as six feet and is a rhizomatous perennial grass that invades open areas throughout the United States. The two-foot long, lanceolate leaves are arranged alternately along a stout, hairless, somewhat upward branching stem. Flowers occur in a loose, spreading, purplish panicle. Johnson grass is adapted to a wide variety of habitats including open forests, old fields, ditches, and wetlands. It spreads aggressively and can form dense colonies, displacing native vegetation and restricting tree seedling establishment.

- Specific Control Prescription: Johnson grass reproduces through rhizomes and seeds. It cannot be controlled simply by mowing or cutting. It is recommended that mowing followed by herbicide treatment, several times during the growing season for several seasons, utilizing Arsenal and a surfactant as directed on the label.

Present in Training Area	
1	**2**
3	**5**
9	**10**

***Verbascum thapsus (*wooly mullein)**

- Description: Wooly or common mullein is an erect herb. First year mullein plants are low-growing rosettes of bluish gray-green, feltlike leaves that range from 4-12 inches in length and 1-5 inches in width. Mature flowering plants are produced the second year, and grow to 5 to 10 feet in height, including the conspicuous flowering stalk. The five-petaled yellow flowers are arranged in a leafy spike and bloom a few at a time from June-August. Leaves alternate along the flowering stalks and are much larger toward the base of the plant. The tiny seeds are pitted and rough with wavy ridges and deep grooves and can germinate after lying dormant in the soil for several decades.

- Specific Control Prescription: Common mullein can be very difficult to eradicate. There are a variety of management methods available, depending on the particular situation. Because mullein seedling emergence is dependent on the presence of bare ground, sowing sites with early successional native grasses or other plants may decrease seed germination and the chance of successful emergence of mullein seedlings.

  Mullein plants are easily hand pulled on loose soils due to relatively shallow tap roots. This is an extremely effective method of reducing populations and seed productivity, especially if plant is pulled before seed set. If blooms or seed capsules are present, reproductive structures should be removed, bagged, and properly disposed of in a sanitary landfill. Care should be taken, however, to minimize soil disturbance since loose soil will facilitate mullein seed germination.

Present in Training Area	
4	**7**

Annex 5

GROUNDS MAINTENANCE – HERBICIDE SPRAY PLAN

TABLE OF CONTENTS

Page

1.0 General Information **5-3**
Figure A5.1: Large-flowered skullcap management groups on VTS-Catoosa 5-4
2.0 Limited Herbicide Use Areas **5-5**
2.1 ASP 5-5
2.2 Back gate fence-line 5-5
2.3 Roads 5-5
3.0 Acceptable Chemicals **5-5**
Table A5.1: Pesticides for use on TNARNG Properties 5-6
4.0 Prescription by Area **5-7**

1.0 General Information

Herbicide use for weed control is a necessary part of grounds maintenance on VTS-Catoosa. In order to meet federal and DoD regulations and effectively protect sensitive features of the training site, certain restrictions must be followed:

- Catoosa has a large population of a federally listed threatened plant, the large-flowered skullcap (see Figure A5.1). All herbicide applications will be designed to avoid damage to this protected plant. Skullcap management groups are located within mixed oak forests and are marked with signs. There will be no contract application of herbicide for weed control within **100 feet** of a known large-flowered skullcap group. There will be no application of soil active herbicides within **100 yards** of a skullcap group.

- Only herbicides labeled for aquatic use may be utilized within **50 feet** of creeks, wetlands, or other bodies of water. Roadside spraying of other herbicides must stop **50 feet** prior to all creek crossings and may not be reinitiated until beyond the 50 foot restricted zone.

- The contractor must be licensed with the state of Georgia as a pesticide contractor, and all applicators must have a Georgia commercial applicator license.

- All applications must be recorded on the pesticide control treatment record (see Appendix H) and turned in to the training site personnel. Training site personnel will turn this information in to the TNARNG Pest Management Coordinator. Complete information is necessary; one herbicide per page.

- One goal of management at Catoosa is to minimize chemical pesticide use. Treatments should be made using the minimum application of active ingredient which will **effectively** control the weeds.

- Instructions on the pesticide label will be followed at all times.

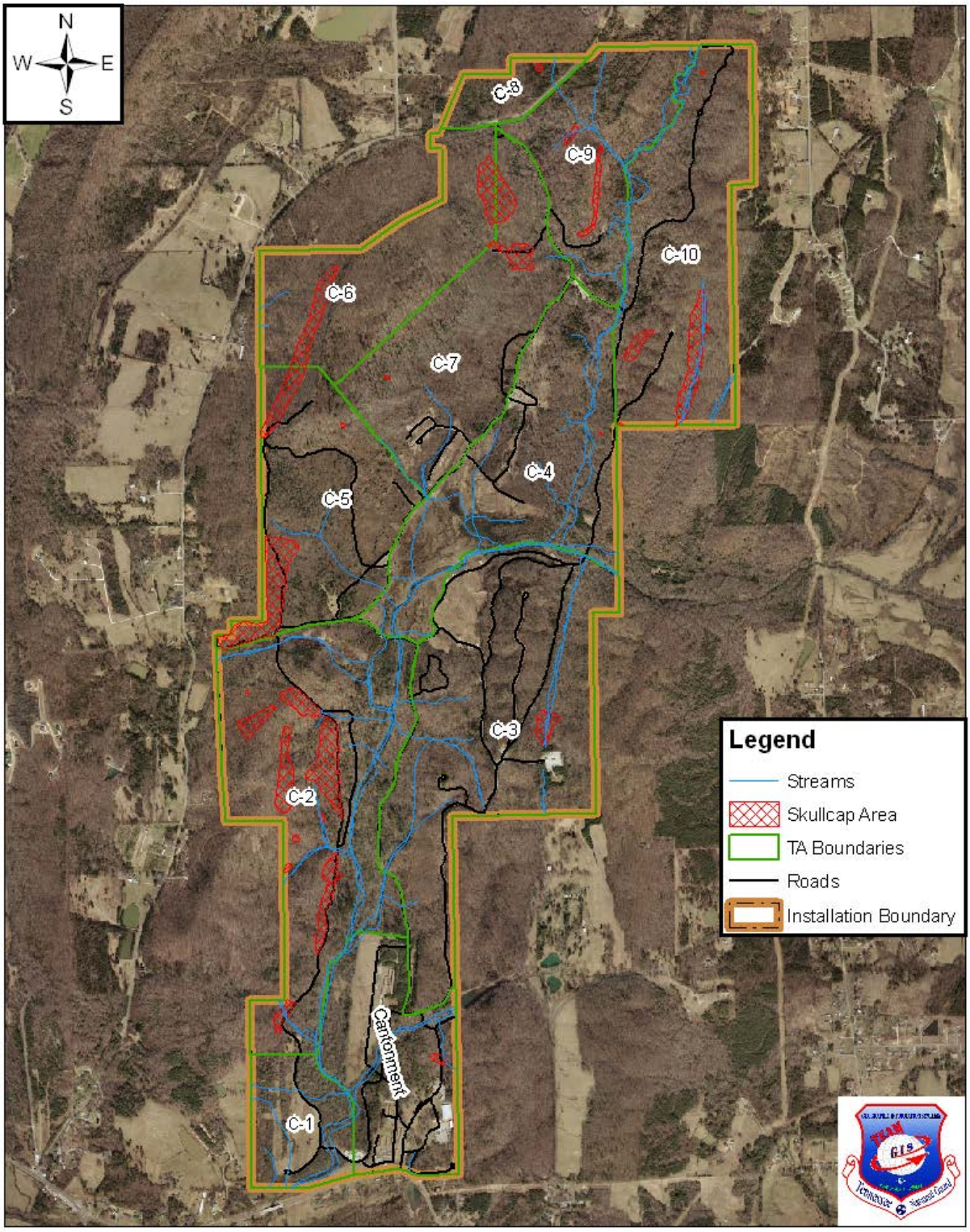


Figure A5.1: Large-flowered skullcap management groups on VTS-Catoosa.

2.0 Limited Herbicide Use Areas

These areas can have only restricted use of herbicides due to their proximity to large-flowered skullcap management groups. The contractor must be made aware of these locations on the ground to ensure that no herbicide is applied too close to the protected plants.

2.1 ASP (Ammunition Storage Point)

There will be NO use of soil-active herbicides in or around the ASP. Roundup or similar glyphosate herbicide may be used to control weeds around the fenceline and around buildings in the ASP. Care will be taken that there is no spray drift downhill to the nearby skullcap population.

2.2 Back gate fence-line

There will be no foliar application of soil-active herbicides along the back fence-line of the training site. Roundup or similar glyphosate herbicide may be used to control herbaceous weeds and vines on the fence. Woody plants encroaching on the fence can be treated with a broadleaf-selective herbicide using a cut-stump or stem injection treatment to minimize transport of the chemical to the soil.

2.3 Roads

Certain stretches of road throughout the training site will be marked with signs indicating proximity of a skullcap patch to the road. There will be NO use of herbicides within those sections of road. All weed control there must be non-chemical (mowing, pulling, or cutting brush).

3.0 Acceptable Chemicals

A list is included (Table A5.1) of the herbicides approved for use on the training site. Contract bids should be based on use of approved chemicals only.

Basic weed control at VTS-C should include:

- A bareground residual herbicide such as Krovar IDF or Oust to be applied once in the early spring as a pre-emergent for vegetation control on parking lots, motorpools, and other graveled areas. The application rate should be appropriate to noncrop areas for broadleaf weed and grass control. If weeds reappear in the treated areas later in the summer, an additional treatment can be scheduled.

- A non-residual contact herbicide such as Roundup or similar glyphosate formulation should be used along fencelines, roads, and edges where minimal mobility in soils is important. Multiple applications may be needed through the growing season

- A broadleaf-specific chemical such as Garlon 3A may be used for brush control along roads or fencelines. Preferred method of application is cut stump or stem injection, but other methods may be acceptable in certain circumstances.

- Garlon 4 or similar product may be used to control brush and sprouts in areas that cannot be easily bushhogged.

- Growth regulators may be used for grasses on the ranges.

Table A5.1: Herbicides for use on Tennessee Army National Guard Properties.

Product Name	Chemical Name	% of A.I.	EPA #
All Vegetation – Bare Ground			
Arsenal	Imazapyr	27.6	241-273
Escort	Metsulfuron	60	352-439
Hyvar XL	Bromacil	21.9	352-346
Krovar IDF	Bromacil Diuron	40 40	352-505
Oust XP	Sulfometuron	75	352-601
Outrider	Sulfosulfuron	75	524-500
Reward Aquatic Herbicide	Diquat dibromide	37.3	100-1091
Round-up Pro	Glyphosate	41	524-475
Round-up Ultra	Glyphosate	41	524-475
Round-up UltraDry	Glyphosate	71.4	524-504
Sahara DG	Imazapyr Diuron	7.78 62.22	241-372
Pre-emergent Herbicide			
Balan 2.5G	Benfluralin	2.5	62179-96
Banvel + 2,4-D	Dicamba 2,4-D	12.4 35.7	66330-287
Gordon's Pro Turf & Ornamental Barrier	Dychlobenil	4	2217-675
Surflan A.S.	Oryzalin	40.4	70506-44
MSMA	Monosodium methanearsonate	47.6	19713-42
Pennant (grasses)	S-Metolachor	83.7	100-950
Selective Post-emergent			
MSMA (grasses)	Monosodium methanearsonate	47.6	19713-42
Poast (grasses)	Sethoxydim	18	7969-58
Gordon's Pro Trimec Plus (broadleaf)	Dicamba MSMA 2,4 D Mecoprop-p	1.46 18 5.83 2.93	2217-808
Cool Season Grasses			
Plateau	Imazipic-ammonium	23.6	241-365
Plant Growth Regulator			
Cutless 50W	Flurprimidol	50	67690-15
Embark	Mefluidide	28	2217-759
Primo	Cimectacarb	12	100-729

Product Name	Chemical Name	% of A.I.	EPA #
Brush & Forestry			
Accord Site Prep	Glyphosate	41	62719-322
Arsenal	Imazapyr	27.6	241-273
Garlon 3A	Triethylamin triclopyr	44.4	62719-37
Garlon 4	Butoxyethyl triclopyr	61.6	62719-40
Escort	Metsulfuron	60	352-439
Oust XP	Sulfometuron	75	352-601
Round-up Pro	Glyphosate	41	524-475
Tordon K	Picloram	24.4	62719-17
Velpar L	Hexazinone	25	352-392
Velpar ULW	Hexazinone	75	352-450
Aquatic Weeds & Algae			
Aquashade	Acid Blue 9 Acid Yellow 23	23.63 2.39	33068-1
Cutrine Ultra Algaecide	Copper	9	8959-53
Reward	Diquat dibromide	37.3	100-1091
Rodeo	Glyphosate	53.8	62719-324
Sonar AS	Fluoridone	41.7	67690-4
2,4-D amine 4	2,4-D	47.3	1381-103

4.0 Prescription by Area

The following guidelines should direct all commercial weed control efforts on the training site. If an area that is not listed requires weed control, contact the Pest Management Coordinator to discuss appropriate actions.

Area 5/Bradley Motor Pool

- Gravel parking lot and around the fence
- Pre-emergent on the gravel lot, careful to avoid drift beyond the edges
- May need to use a contact herbicide to eliminate already established weeds in the gravel
- Glyphosate on the fenceline; broadleaf-selective for persistent vines and brush

ASP

- Around the fence, around the buildings, and gravel area as needed (two applications)
- There will be NO use of soil active herbicides in or around the ASP.
- Glyphosate herbicide may be used to control weeds around the fenceline and buildings and in spot treatments in the gravel in the ASP.
- Care will be taken that there is no spray drift downhill to the nearby skullcap population.

Bradley Firing Points

- Gravel area at each firing point (multiple applications)
- Due to proximity of Tiger Creek, no use of soil-active herbicide
- Apply glyphosate to weeds as they encroach on gravel areas

Cantonment

- Around buildings and along road shoulders
- Glyphosate to control weed encroaching on buildings or road shoulders
- Pre-emergent under gravel in parking areas
- Growth regulator on lawns to minimize mowing requirements

Cemetery

- Gravel area and around the fence
- Pre-emergent on the gravel lot, if needed, careful to avoid drift beyond the edges
- Glyphosate on the fenceline

Front Fence

- Along the road and around the front gate
- Approx. 2 acres
- Glyphosate or broadleaf-selective herbicide as appropriate for control of existing weeds
- Do not apply herbicides within 25 feet of creeks or other surface water

KD Range (gravel)

- Along the roadside around all posts and pit area behind the concrete wall
- Approx. 0.25 acre
- Pre-emergent on graveled areas including the pop-up target pit (behind and below the concrete wall), take care to avoid drift beyond the edge of the gravel

KD Range (turf)

- Entire KD Range
- 8 acres
- Apply growth regulator after first mowing to minimize mowing needs over growing season
- Embark or Primo are acceptable growth regulators

MK 19 Range

- Throughout the cleared zone providing line of sight from the firing point
- Approx. 0.5 acre
- Garlon 4 or similar applied to the sprouts and other brush in the recently cleared area
- Do not spray low-growing ground cover
- Avoid drift to surrounding vegetation

MLRS Staging Area

- Around the edge of the staging area and spot treat the rest of the area as needed
- Pre-emergent for the outer 5-10 feet of the large graveled area, careful to avoid drift beyond edges
- If weeds become problem later in summer, spot treat with contact herbicide

Observation Tower and Tower Road

- Gravel parking area at the tower, around the base of the tower, and center two feet of tower road
- Approx. 0.25 acre + 4000 sq.ft. on road
- Pre-emergent for the gravel parking area and base of tower and also down the center two feet of the road leading to tower
- Broadleaf selective herbicide on road shoulders to minimize brush encroachment

Rear Fence

- Along the road and around the rear gate
- Approx. 4 acres
- There will be no foliar application of soil active herbicides along the back fence-line of the training site. Roundup or similar glyphosate herbicide may be used to control herbaceous weeds and vines on the fence.
- Woody plants encroaching on the fence can be treated with Tordon or Garlon as a cut-stump treatment or a stem injection treatment to minimize transport of the chemical to the soil.
- The 3-6 foot buffer strip should be maintained with broadleaf-selective herbicide to ensure grass cover for soil protection

Roadways

- Approximately 10 miles along the sides of the gravel roads (3 applications)
- Broadleaf selective herbicide on the brush up to 4 feet on either side of the road, except where identified as close to skullcap

Tank Firing Points (Four)

- Around and on top of the firing point
- Approx. 0.5 acre each
- Should be burned in early spring
- Growth regulator on grasses on the mound
- Broadleaf selective herbicide (Tordon or Garlon) may be applied to individual woody plants that germinate on mound (preferably as cut-stump treatment)

Tank Laser Target Pits

- In and around 13 target pits
- 225 sq ft each
- Pre-emergent in gravel of the target pits
- Glyphosate on weeds invading at edges as summer progresses

Tank Target RR Tracks

- All of the gravel area, around both buildings, around both retaining walls, and all of the area in between the two targets
- Pre-emergent in gravel areas along tracks, buildings, and walls, careful to avoid drift beyond edges
- Glyphosate on weeds invading at edges as summer progresses

Two Loading Ramps

- Around both loading ramps in the training area
- Pre-emergent on the gravel, careful to avoid drift beyond edges
- Glyphosate at the edges as vegetation intrudes
- May need to use a contact herbicide to eliminate already established weeds

Urban Assault Course (UAC)

- Gravel parking areas, roads, and training structures
- Pre-emergent on the gravel of parking areas, roads, and training points, no closer than 8” to the edge
- Glyphosate as needed at the edges as vegetation intrudes
- Glyphosate to control weeds around structures as needed

- Broadleaf selective as needed on mowed areas to minimize brush encroachment
- Take care to avoid drift onto skullcap group north of UAC near northern entrance road

50 Cal Range

- 4 pits and gravel area
- Approx. 160 sq ft total
- Pre-emergent under the center gravel, no closer than 8” to the edge
- Glyphosate may be needed at the edges as vegetation intrudes

203 Range

- Gravel parking area, around the observation tower, and all firing points
- Approx. 0.5 acre
- Pre-emergent on the gravel areas, up to edges
- Glyphosate on weeds invading at edges as summer progresses

Point of Contact for pest control questions is:

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