

Annex 1

FOREST MANAGEMENT PLAN

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1.0 INTRODUCTION

The forestlands of VTS-S were inventoried in 2005, and this management plan was developed based on military needs and forest health goals. It presents the recommended forest management prescriptions for the forest stands occurring within the Cantonment Area and each of the 6 training areas that comprise VTS-S (see Figure A1.1). Details of timber volumes and other stand characteristics are available in the Forest Inventory (Thompson Engineering 2006).

Individual forestry management prescriptions are provided for the forest stands occurring within each training area. The forest management prescriptions are generally focused on actions that would improve training facilities or enhance the habitat quality and health of the forestry resources on VTS-S. The use of prescribed fire is also addressed for each forest stand. Recommendations for prescribed burning

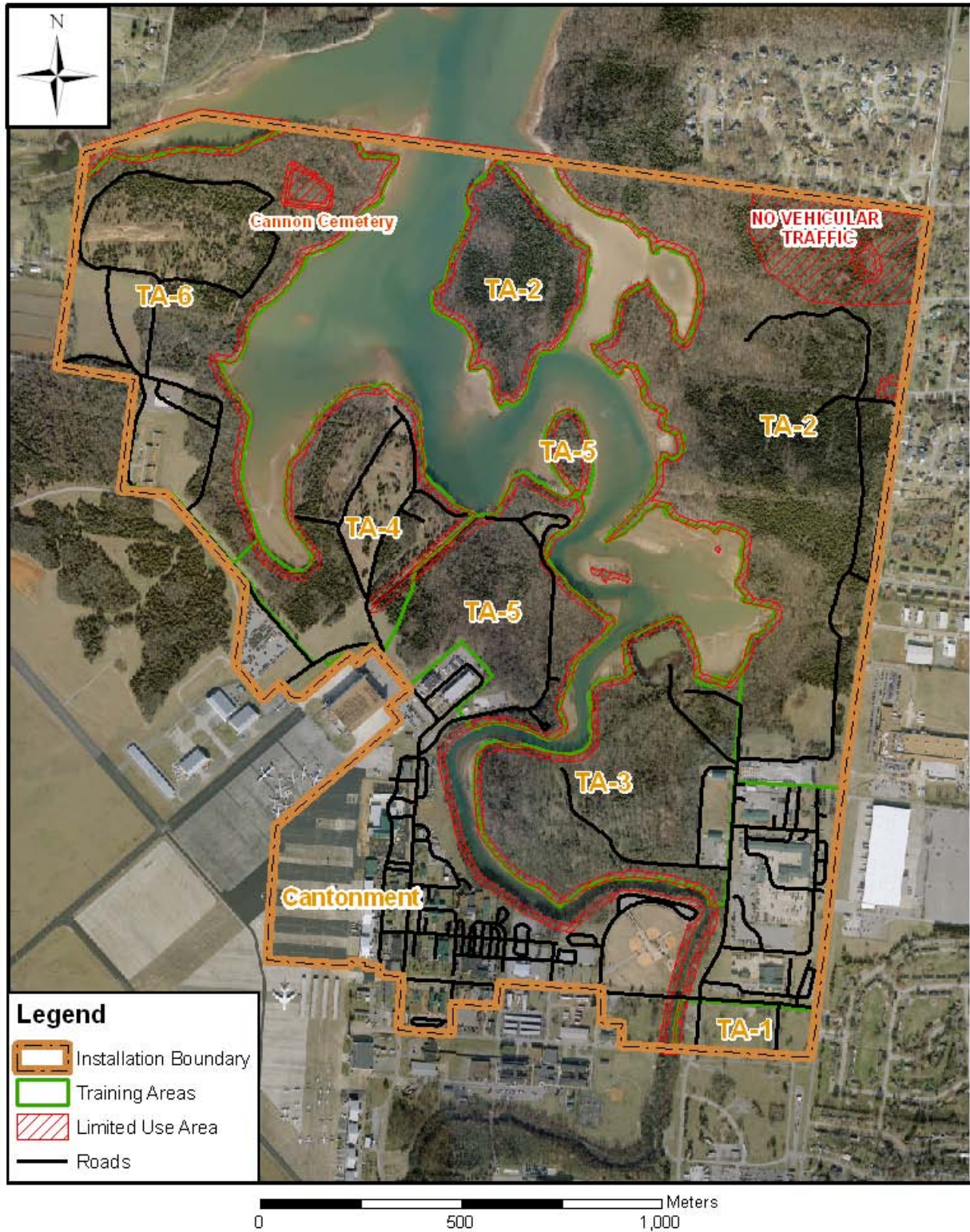


Figure A1.1: Training areas as used for forest stand delineation on the VTS-Smyrna.

are almost exclusively restricted to burns that would to reduce excessive accumulations of fuels to reduce wildfire risks and, in most cases, would be conducted infrequently on a 6-year rotation, unless otherwise specified. Annex 2 provides more details on the prescribed burning program at the VTS-S.

2.0 FOREST INVENTORY

The forest inventory for VTS-S was conducted in April 2005 by Forest Management Group, Inc., based in Hattiesburg, Mississippi. The forest inventory was developed using the established training areas and cantonment area to serve as the basic forestry management units. Figure A1.1 shows the locations of the Cantonment Area and the 6 training areas that make up the VTS-S.

The forest resources occurring within the forestry management units were inventoried. Each management unit was subdivided as appropriate into individual forest stands based on the sharing of common characteristics that served to define each stand. Among the parameters considered to delineate the forest stands were species composition, age, size, and condition. Delineation of the stands was accomplished by both the use of aerial imagery and ground observations of the different timber types and ages. A consistent forest stand numbering system was used throughout the inventory to identify each stand based on the major land features and forest types that characterized each stand.

The forest inventory provides the volumes of sawtimber (in tons and board feet) and pulpwood (in tons and cords) that was available within each stand at the time the inventory was performed in April 2005. The sawtimber is apportioned between pine, pine poles, CNS (chip-n-saw: pine timber that can yield both 2x4s and chips), spruce pine, red oak, white oak, hickory, poplar, cedar, ash, walnut, and miscellaneous hardwood (i.e., all other hardwood species that may be present). The pulpwood is apportioned between pine and hardwoods. The timber volume data is presented on both a per acre basis and as a total per stand for each product class.

The forest inventory also provides supplementary information to better understand the major characteristics of each stand. That information includes:

- Dominant and co-dominant tree species occurring within each stand
- Average basal area and DBH of trees within each stand on a per acre basis
- Average number of snags per acre; the minimum and maximum age of the trees
- A general assessment of the overall health of the stand
- An evaluation of the current condition of the stand
- General remarks on other major characteristics of the stand where appropriate and useful.

The forest inventory determined that a total of 456 acres of VTS-S was covered in forests at the time the forest inventory was conducted in April 2005. Table A1.1 presents summary volume data for the inventoried timber products on a per acre basis and for the entire installation.

The Forest Inventory also revealed that the overall average diameter at breast height (DBH) of trees on the entire installation was 8.3 inches and that the installation had an average basal area of 56.1 square feet per acre. The forest stands on VTS-S are typically dominated by eastern redcedar, red oaks, and other miscellaneous hardwoods such as maples and hackberries, with a substantial amount of green ash in some stands. Red oaks are co-dominant in some stands, as are hickory, sycamore, and black willow. Most stands were characterized by trees ranging from 5-30 years old, but some had trees approaching 40 years in age, while a few stands were dominated by very young trees. The overall health of the forest stands was observed to be good during the April 2005 Forest Inventory.

Table A1.1 Forest Product Volume Summary for VTS-Smyrna Based on the April 2005 Forest Inventory

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

Army guidance requires all installations with a forestry program to keep their forest inventories current (i.e., not older than 10 years) when such forests are essential to the mission and/or capable of commercial use. Since the existing forest inventory for VTS-S was conducted in April 2005, the forest resources should be re-inventoried no later than 2015. The inventory intensity should be appropriate at that time to reflect the planned use of the forest and for monitoring the long-term health and sustainability of the forest. In addition to determining the volume of merchantable forest products available on the installation in 2015, the inventory should be directed at evaluating the overall health and characteristics of the forest community and to assessing the effectiveness of the forest management prescriptions that have been implemented during the intervening 10-year period.

3.0 FOREST MANAGEMENT GUIDELINES

Based on the results of the 2005 forest inventory, the health of most of the VTS-S forest stands is judged to be good to excellent. However, despite the relative good health of the majority of the forest stands considered, the stem density in several of the installation's forest communities is so thick that effective military training has become extremely difficult on portions of some of the training areas (i.e., Training Areas 2, 4, and 6) and without significant thinning, the health of many of the forest stands on the installation is expected to begin exhibiting signs of decline within the next 10 years.

The Management Prescriptions section presents the recommended forestry management prescriptions developed for each forest stand occurring within the cantonment area and each of the 6 training areas that comprise VTS-S. The management recommendations are intended to improve conditions for training and

enhance forest resource quality and habitat value. All planned harvests at this time will be thinning to remove smaller trees.

In all harvest activities, pre-commercial or commercial, there will be no timber removal within 100 feet of creek or lake shorelines. A 100 ft buffer will also be maintained along property boundaries except for the 25 ft security line of site clearing required along the fence-line itself.

Generally, no more than 60 acres will be harvested in a given year. In the event that the island portion of TA 2 is harvested, the entire 70 acres (minus buffer zones) will be harvested at one time to minimize impacts on the mudflat that will have to be crossed to access the island. Stands less than 60 acres may be subdivided and harvested in multiple years if training needs dictate on-going access to a portion of the stand.

The use of prescribed fire is also addressed for each forest stand. Recommendations for prescribed burning are almost always restricted to burns that would be directed toward reducing excessive accumulations of fuels to reduce wildfire risks and would be conducted infrequently at intervals of no less than 6 years. Annex 2 should be referred to for information on the weather guidelines that should be considered when conducting such burns and for the management objectives that are to be accomplished by prescribed burning.

3.1 Forest Management Objectives

The individual forestry management recommendations were based upon a consideration of the following broad management objectives developed for the overall forest community occurring on VTS-S.

- Provide appropriate vegetation cover for training needs as determined by mission requirements.
- Maintain a healthy forest ecosystem appropriate to the region through even and uneven aged management techniques. Forest values to be protected or improved are:
 - Soil conservation and water quality protection
 - Wildlife habitat
 - Biodiversity
 - Timber and forest products
- Control invasive pest plants (IPP) for the health of the forest.
- The cedar-dominated stands should be subjected to extensive thinning to reduce stem density, enhance training opportunities, reduce wildfire risks, and promote restoration of native grasses and other herbaceous plants that prefer open areas.
- Create conditions that encourage the establishment of young trees that will be available to regenerate the forest when the existing trees are removed.
- Utilize prescribed fire appropriately for each community types:
 - Prescribed fire should be applied in cedar dominated forest stands only after thinning is accomplished. Thereafter, burns should be directed toward reducing excessive accumulations of fuels to reduce wildfire risks and should be conducted at intervals of 3 years.

- Prescribed fire in bottomland hardwood stands should only be used as necessary for fuel reduction or to meet military mission needs. Hardwood stands should be burned no more frequently than every 6 years.
- Stands dominated by grasslands should be burned at 1 to 2 year intervals. Monitoring should be performed at the midpoint between intervals to determine if the interval between burn events should be reduced or increased.

3.2 Timber Harvest Operations

The periodic harvest of timber is the primary measure used to manage forestry resources. The principle purpose of the forest management program on the VTS-S is to support the military mission and ecosystem management goals, while optimizing the forest resource and its associated forest products and benefits. Timber harvest decisions are not to be directed solely to generate revenue.

Timber harvests must be consistent with the military mission and comply with federal laws and policies, including avoiding adverse impacts on sensitive species and cultural resources. Prerequisites for timber harvests include the following:

- A current and approved Forest Management Plan that is normally included in an INRMP.
- National Environmental Policy Act documentation
- Comply with applicable laws
- Be a fiscally sound investment
- Capable of ecosystem sustainability
- Comply with installation safety restrictions
- Consider potential effects on significant archeological resources and historic properties.

The process for conducting a timber sale on VTS-S will start several months prior to harvest time:

- A stand-specific harvest plan will be developed in accordance with this plan (January)
- A Record of Environmental Consideration will be prepared for the harvest plan to satisfy NEPA requirements
- The harvest plan and REC will be sent to the TN SHPO for consideration (before March 1)
- The harvest plan and REC must be submitted to NGB with a Timber Report of Availability (ROA) (by May 30 prior to the fiscal year in which the harvest is planned)

3.3 Pest Management

Trees are susceptible to periodic infestations of insects and fungi that have the potential to result in serious damage to an installation's forest resources and overall landscape. This can result in the diminishment in the quality of the training landscape; economic loss of potential merchantable timber; modification of habitat conditions within the forest ecosystem that could influence wildlife populations; and an increased risk of wildfire. While such infestations are a natural phenomenon, actions may be required on occasion to prevent the spread of the infecting vector and/or remove damaged and diseased trees.

The U.S. Forest Service (USFS) is responsible for protecting forests from insects and disease in cooperation with the owners of forest lands. The DoD and the U.S. Department of Agriculture entered into a Memorandum of Agreement (MOA) in 1990 to conduct forest insect and disease suppression on lands administered by the DoD. Under the MOA, the USFS provides technical assistance and funds to

provide foliage protection, reduce specific insect and disease populations, reduce risk of artificial spread to uninfested areas, and to prevent tree mortality.

Army installations may receive funds from the USFS for forest pest suppression projects under the terms of the MOA. Installations wanting to receive pest management funding should have a biological assessment of the forest resources in questions conducted by the local USFS staff. The biological assessment should recommend the type of technical assistance required and management actions that could be pursued to address the pest problem. This could include population monitoring, surveys, biological evaluations, determination of trends and projected damage, and consideration of environmental and economic impacts. Approximately one year is required before funds are received for approved requests. The USFS funds are provided to the installations through Army channels to the proponent organizations for distribution to the appropriate installations. In the case of the TNARNG, pest management funds are received from the NGB.

3.4 Salvage of Disaster Damaged Trees

Natural weather phenomena such as tornadoes and ice storms can have a severe impact on forests. For example, large swaths of trees can be uprooted and/or their trunks broken above the ground by tornadoes, while large ice storms can create extensive alterations in the forest canopy by damaging limbs and small branches. If the damage to trees is significant and widespread, individual trees can be weakened and become more susceptible to disease and parasites in the years following the weather event. That damage can reduce growth rates and possibly even result in the death of individual trees.

If the damaged trees represent a significant economic loss or if the physical aftermath creates a safety hazard, impediment to training, or threat of insect infestation, it may prove prudent to undertake salvage operations in an attempt to recover as much of the lost volume and value of the damaged timber as possible. Salvage actions must be pursued relatively quickly following the disaster to prevent the deterioration in the quality of the damaged wood so as to recover as much economic value as possible. Even though prompt action is needed, the environmental evaluation requirements are typically not waived. In the event a salvage harvest is deemed necessary, TNARNG will coordinate with USACE to conduct the necessary environmental review and emergency harvest procedures.

4.0 ENVIRONMENTAL CONSIDERATIONS IN FOREST MANAGEMENT

All timber sales must be consistent with all applicable environmental laws and regulations. Experience has shown that cultural resources (i.e., historic and/or archaeological) and endangered and threatened species issues have the greatest potential to affect forestry management operations, including timber sales.

4.1 Cultural Resources

Forest management activities must not negatively impact cultural resources on the VTS-S. Several aspects of timber management have the potential to affect cultural resources, including timber harvest operations, site preparation and planting, and prescribed fire. Cultural resources investigations (Phase I survey in 1999 and Phase II survey in 2005) have identified two archaeological sites that are eligible for listing in the National Register of Historic Places, as well as other sites considered ineligible. These sites are identified in the TNARNG GIS system and will be incorporated into forest management planning. All efforts will be made to minimize any impacts on known cultural resources.

The known archaeological sites, whether eligible or not, will be excluded from ground-disturbing activities unless full consultation with the Tennessee State Historic Preservation Officer (SHPO) has been

conducted for the project. Such activities include, but are not limited to, the construction of plowed fire breaks (see Annex 2, Figure A2.1 for “no plow zones”), the use of dozers or other heavy equipment to clear stumps and logging slash, and the use of mechanical planting equipment. Cannon cemetery will be protected from damage during forestry activities by maintaining a 50 foot no-harvest buffer zone surrounding it.

This plan will be submitted for review to the Tennessee SHPO prior to implementation. In addition, the SHPO will be contacted for comments on the annual report of timber availability submitted each year for timber sale planning. Other forestry projects which have the potential to impact known cultural resources on the VTS-S will be coordinated with the SHPO as appropriate.

4.2 Sensitive Species

Chapter 3 of the INRMP contains information on sensitive species occurring or having the potential to occur on the installation based on information obtained from the Tennessee Division of Natural Heritage and on-site surveys. The VTS-S has no known resident federally listed threatened or endangered species. Two species that have been documented on the training site – the meadow jumping mouse and the sharp-shinned hawk – have partial federal status, indicating that a subspecies of each taxa is designated as threatened or endangered in a portion of its national range. The populations found in Tennessee, however, do not include this subspecies and have been determined to be secure at this time. These two species are listed as deemed in need of management by the state of Tennessee. A number of other species of concern (see Table 3.5) have been documented within a 5-mile radius of VTS-S, but have not yet been observed on the facility.

Almost all of the plant species and some of the animals listed in Table 3.5 prefer cedar glade habitat. Although there is considerable cedar habitat present on VTS-S (particularly in Training Area 2), much of it is overgrown with high stem densities and considerable branching. These conditions make the habitat unsuitable for most of the sensitive species to thrive on the installation. The forest management measures described in Section 6 of this annex include actions that could be taken to improve habitat conditions for these species.

If any federally listed species are found to be regularly utilizing the VTS-S, consultation with the USFWS will be initiated to ensure that further forest management and other natural resources activities will not negatively impact the species. Efforts will also be made to protect any state-listed threatened or endangered species that may be found on the training site through coordination with the Tennessee Wildlife Resources Agency (TWRA) and the Tennessee Natural Heritage Program.

4.3 Forestry Best Management Practices

Protection of watersheds and water quality during forest management activities can be a significant concern. Forestry practices can generate nonpoint source (NPS) pollution including sediment, organic matter, pesticides, nutrients, and elevated water temperatures. Removal of or damage to vegetative cover can increase runoff and erosion. The Stewart Creek embayment of the J. Percy Priest Lake is a major landscape feature at VTS-S, with significant portions of all six training areas bordering the lake’s shoreline at various locations on the installation. The entire installation drains into the embayment.

The headwaters of Stewart Creek originate upstream of VTS-S. The installation represents the most downstream portion of the drainage basin before the stream flows into J. Percy Priest Lake. The area contained in the installation represents only a small portion of the Stewart Creek Basin’s total drainage area. Much of the basin upstream of VTS-S has been developed as part of the urban sprawl associated with Nashville. The installation’s training areas represent the most significant remaining undeveloped

blocks of land in the Stewart Creek Basin and serve as a buffer between the lake's shoreline and surrounding land uses.

Forestry Best Management Practices (BMPs) have been developed to reduce the adverse effects of forest operations on ecosystems and to protect water quality. A BMP is a practice or combination of practices considered to be the most effective means of preventing or reducing the amount of pollution by nonpoint sources to a level compatible with water quality goals and protecting fish and wildlife populations and habitats. BMPs will be applied to all timber management activities on the VTS-S.

The Tennessee Division of Forestry has adopted BMPs for forestry operations to prevent the impairment of water quality in the State's streams. The Tennessee BMPs are offered as nonregulatory guidelines to be used during the construction of roads, log landings, and skid trails to minimize the environmental impact of forest management activities. The BMPs are summarized in Table A1.2 and are available in manual form at <http://www.state.tn.us/agriculture/forestry/bmpmanual.html>. Although the BMPs are offered as guidelines, the State of Tennessee has firm expectations that appropriate BMPs will be employed in all forestry operations. Under the Tennessee Water Quality Control Act as amended in 2000, the Tennessee Department of Environment and Conservation has the power to issue a stop work order if a timber harvesting operation is determined to pollute waters of the State because a logger failed or refused to implement BMPs.

Table A1.2: Forestry Best Management Practices for VTS-Smyrna. (From Guide to Forestry Best Management Practices in Tennessee. 2003. Tennessee Department of Agriculture, Division of Forestry.)

Forestry Practice	Activity/Resource	BMP
Forest Roads	Locating Roads	Use soil surveys and topographic maps to develop plan.
		Use existing roads to minimize length of road construction.
		Locate roads as far from water bodies as possible.
		Avoid locating roads at confluence of streams.
		Avoid building roads in streamside management zones and sensitive areas.
		Avoid or minimize stream crossings. When that is not possible, crossings should be constructed at right angles.
		Locate roads on upper slopes near ridge crests to promote drainage, but avoid top of ridges.
		Fit roads to topography by following natural contours and keep grade between 2 and 12 percent. Avoid road sections with 0 percent grade.
		Constructing Roads
	Avoid construction during wet weather.	
	Construction grades on 2 to 12 percent slopes where possible. Steeper slopes should be used for only short distances where adequate drainage structures are provided.	
	Runoff from roads should not directly discharge into streams.	
	Minimize runoff at stream crossings.	
	Control drainage from roads by using appropriate design techniques: varying grades, crowning, outsloping, wing ditches, sediment control structures, broad-based dips, water bars, water turnouts, and/or cross-drain culverts.	
	Push cleared trees and brush to downhill side of road to assist in trapping sediment.	
	Maximize sunlight exposure to road surface.	
	Minimize road width, right-of-way, and stream crossings to minimize soil	

Forestry Practice	Activity/Resource	BMP	
		disturbance Revegetate exposed soils in potential problem areas that could generate sediment.	
	Road Retirement	Construct water bars or other drainage structures immediately after active logging has ceased. If logging will be delayed, construct temporary drainage and erosion control structures. Remove temporary bridges, culverts, and pole fords. Remove sediment and debris from dips, ditches, and culverts. Use mulch and/or seed with lime and fertilizer to prevent soil erosion.	
	Streamside Management Zones (SMZs)	Perennial and Intermittent Streams	Streamside Management Zone (SMZ) planning should be done before beginning timber harvest. Mark SMZ boundary prior to harvest.
			SMZ width will be a minimum of 50 feet between disturbed area and top bank, with 20 additional feet for each additional 10% of slope. This applies to both sides of the waterway.
			If trees are harvested in SMZ, maintain 50 percent canopy cover or greater.
			Do not use stream channels as roadways for equipment.
			Harvest of timber on training site's islands will be done only during winter pool. Avoid equipment operation within SMZ; harvested trees should be cabled or winched out.
Ephemeral Streams or Wet Weather Conveyances			Avoid skidding within drains during wet conditions.
		Avoid locating roads in drains except when necessary for crossings.	
		Do not empty road runoff into drains.	
Sensitive Areas		Minimize soil exposure and compaction to protect ground vegetation.	
		Avoid skidding in these areas.	
		Avoid locating roads in these areas.	
		Do not empty road runoff into drains.	
Stream crossings		Crossings	Avoid or minimize stream crossings. When that is not possible, crossings should be constructed at right angles.
	Locate crossings on straightest stream sections.		
	Avoid locating crossings at confluence of streams.		
	Design to minimize disruption of movement of aquatic life.		
	Approaches should be graveled and should rise away from streams to minimize erosion, Install broad-based dips and wing ditch turnouts to turn water off roads before entering stream		
	Fords		Use fords for haul roads only, not for skid trails.
		Locate fords where stream banks are low.	
		Fords should have a solid bottom.	
		Where necessary, use gravel to establish low water crossing.	
	Culverts	Permanent culverts should be sized to accommodate the area to be drained.	
		Temporary culverts may be smaller, but must be removed after completion of logging. Install culverts in a manner that minimizes disturbance of stream. Stabilize fill material with riprap and/or vegetation.	
		Inspect culverts periodically to ensure they are free of blockages.	
		Install culverts on grade with bottom of channel to allow movement of aquatic life.	

Forestry Practice	Activity/Resource	BMP
	Bridges	<p>Locate bridges across narrow points of stream and on firm soils.</p> <p>Protect banks from sloughing during construction.</p> <p>Remove temporary bridges.</p> <p>Do not cover bridges with soil.</p> <p>Use temporary bridges for skid trails to prevent equipment and logs from entering stream channels.</p>
Log Landings	Log Landings	<p>Locate landings outside of SMZs and away from streams and sensitive areas.</p> <p>Slope landings 2-5 percent to allow for drainage.</p> <p>Prevent debris and fuels/lubricants from being washed by runoff into streams.</p> <p>Re-vegetate landings after use if they pose a potential water quality problem.</p> <p>Install drainage and sediment control structures to divert runoff.</p>
Skid Trails	Skid Trails	<p>Minimize number of skid trails by using existing trails.</p> <p>Locate skid trails on slopes 2 to 30 percent. Steeper slopes can be used for short distances if water control/drainage structures are provided.</p> <p>Runoff from skid trails should not discharge into a stream.</p> <p>Control runoff by varying trail grade, water bars, wing ditches and/or sediment control structures.</p> <p>Prevent runoff associated with stream crossings.</p> <p>Avoid skidding across streams, drains, and sensitive areas.</p> <p>Use culverts or temporary crossing structures.</p> <p>Do not use fords to skid across streams.</p> <p>Do not operate equipment in streams.</p> <p>Avoid skidding directly up or down hill, but follow contours or “zigzag” if possible.</p> <p>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.</p> <p>After completing logging, remove temporary bridges and culverts, sediment and debris from dips, ditches, and culverts, and revegetate problem areas.</p> <p>Use mulch and/or seed with appropriate amounts of lime and fertilizer when needed to prevent soil erosion.</p> <p>Avoid ruts that risk channeling water into a stream.</p>
Logging Debris	Disposition of Debris	<p>Trees should not be felled in or across streams.</p> <p>Pull treetops far enough from waterways to prevent them from being washed in during high water.</p> <p>Do not drag trees and tops through a stream channel.</p> <p>Do not remove stumps and roots from stream banks.</p>
Servicing and Maintaining Equipment	Oils and fuels	Prevent oil and fuel spills. If a spill occurs, clean up all spilled materials and contaminated soils and dispose of both properly. Notify Tennessee Department of Environment and Conservation of spill incident.
Site Preparation for Tree Planting	Mechanical	Choose site preparation method that will expose and disturb as little bare soil as possible.
		Establish SMZs to minimize sediment entering streams.
		Carry out all mechanical site preparation operations and tree planting along the contour of the land.
	Slopes over 30 percent should be hand planted and should not be subjected to mechanical site preparation.	
Chemical	Favor chemical methods over mechanical methods on steep slopes and erodible soils to control undesirable vegetation.	
	Follow all EPA label instructions	
	Never apply pesticides directly to water except when registered for	

Forestry Practice	Activity/Resource	BMP
		application over water.
		Establish SMZ to minimize chemicals entering streams.
		Avoid use of chemicals in or near sensitive areas.
		Consider weather conditions and equipment capabilities to avoid herbicide drift.
		Calibrate spray equipment to apply chemicals uniformly and in correct quantities.
		Prevent chemical leaks from equipment and check equipment.
		Mix and load chemicals outside of SMZs and sensitive areas.
		Rinse spray equipment and discharge rinse water only in areas that are part of the application site. Never rinse tanks or sprayers in or near streams
		Dispose of chemical containers according to label instructions.
Prescribed Fire	Preparation	Locate windrows well away from drains to prevent materials from being washed into streams.
		Construct fire lines on the contour in advance of prescribed burning.
		Plow fire lines only as deep and wide as necessary to control the spread of the prescribed fire and to minimize soil disturbance.
		Construct water bars and wing ditches at appropriate intervals on firelines to turn water into adjacent undisturbed areas.
Fertilization	Application and Clean Up	Determine appropriate amounts and types of fertilizer needed before application.
		Consider weather conditions and equipment capabilities to avoid drift into SMZs.
		Conduct all on-site fertilizer handling away from waterbodies, wells, ditches, and sensitive areas.
		Clean up and/or contain all fertilizer spills immediately.
		Dispose of fertilizer containers and/or excess fertilizer according to applicable governmental regulations and label requirements.

4.4 Monitoring and Inspections

Monitoring is a key element in ecosystem management. Army forest managers are required to balance increasing demands for resource use, such as military training, forest product sales, biodiversity conservation, and, where applicable, recreation use of military lands. The VTS-S forestry program should be periodically monitored to: (1) assess whether or not forest management objectives are being met; and (2) detect trends in forest health and condition in response to the forest management actions proposed.

Forestry program monitoring on the VTS-S will include:

- The progress of each timber sale should be monitored to assure that the harvest is being conducted in accordance with the terms of the contract. Monitoring should be coordinated with the USACE's Mobile District if the timber sale is administered by the USACE. At the conclusion of the timber harvest, a final inspection of the site should be conducted jointly by the USACE and the TNARNG to assure the cut was conducted in accordance with the contract stipulations to allow release of the buyers' bond.
- Effective management requires feedback on the results of the management activities. The necessary assessment may be conducted specifically for the forestry program or as a part of another program area. The VTS-S forests will be monitored to assess:

- Whether the overall condition of the forest is meeting military mission requirements
 - The effects of training activities on forest resources
 - Response to forest management activities
 - Wildlife habitat quality
 - Influence of forest management on sensitive species
 - Impacts on cultural resources
 - Erosion problems related to timber management practices and the success of repair efforts
 - Any areas affected by disease or insect infestations (particularly southern pine beetles during summer months)
 - Storm or other natural damage
 - Invasive pest plant problems
 - Fuel loads on the forest floor and the risk for wildfires
 - Areas for inclusion in future timber ROAs
- The baseline forest inventory was conducted for VTS-S in 2005. Forest resources should be re-inventoried in 2015. If that work is to be accomplished by contract, adequate advance time should be allowed to prepare the scope of work and to award the contract by that timeframe. The 2015 inventory should include a specific task requiring a comparison of the forest condition in 2015 with the results of the 2005 inventory to determine the direction the installation's forest is headed; how effective management measures have been in assuring a quality forest is provided; and identifying adjustments in the long-term management goals in the installation's forest management program.

5.0 MANAGEMENT PRESCRIPTIONS

The following stand descriptions and management prescriptions are based on the 2005 forest inventory. All planned harvests will thin smaller trees to open up the stands for training purposes, to release existing dominant and subdominant trees for further growth, and to encourage germination and seedling growth for advance regeneration.

Generally, no more than 60 acres will be harvested in a given year. In the event that the island portion of TA 2 is harvested, the entire 70 acres (minus buffer zones) will be harvested at one time to minimize impacts on the mudflat that will have to be crossed to access the island. Stands less than 60 acres may be subdivided and harvested in multiple years if training needs dictate on-going access to a portion of the stand.

As the Cantonment area is heavily developed and Training Area 1 is maintained as a regularly mown grassy field, these areas are not considered further in the VTS-S forest management plan.

In all harvest activities, pre-commercial or commercial, there will be no timber removal within 100 feet of creeks or J. Percy Priest Lake. A 100' buffer will also be maintained along property boundaries except for the 25' line of site clearing required along the fence-line itself.

5.1 Training Area 2

With 217 acres on the mainland, Training Area 2 is the largest of the VTS-S's six training areas. Training Area 2 lies along much of the installation's eastern boundary and about half of the northern boundary. The western boundary of the mainland portion of the training area is formed by the shoreline of the J. Percy Priest Lake. A large island in the lake is also considered a part of Training Area 2, although it is rarely utilized for training. The island is approximately 71.3 acres in size.

Training Area 2 supports two forest stands: a bottomland hardwood dominated forest at the lower elevations bordering the lake shoreline and a cedar dominated forest in the upland areas. The cedar dominated stand has a high stem density with low branching that makes it almost impenetrable, which severely limits training activities.

A network of sinkholes has been identified in the northeastern corner of TA2; this 23 acre portion of the training area will be excluded from all timber harvests. An approximately 10-acre tract along the training area's southern boundary is maintained in an open condition for equipment training and storage.

Stand Descriptions

Stand s0201 is a 126.3-acre immature upland cedar and hardwood forest occurring on the higher upland areas on the mainland portion of the training area and covering the island as well. The stand is dominated by cedar and oak and contains a few pines. The trees range in age from 10 to 30 years. Stem density is high among the cedars, with numerous low branches. The overall health of the stand is excellent but will only decline over the next ten years without management.

Stand s0201(d) is the 71 acre continuation of the immature upland cedar and hardwood forest located on the island.

Stand s0202 is a 78.2-acre mature hardwood forest occurring at the lower elevations of the training area along the lake. The stand is dominated by red oak and miscellaneous hardwood species, with a mix of hickory, poplar, walnut, and pine. The trees range in age from 30 to 50 years. The overall health of the stand is good.

Forest Management Prescription

Stand s0201. This stand will be thinned by removing all cedar trees that are less than 16 inches in diameter at breast height (DBH). This will allow room for the remaining trees to grow and assist in training them. During the thinning operation, all hardwoods will be left regardless of size. Large portions of the stand are covered in almost pure growths of redcedar. Such areas need to be opened up to allow other species to seed in. Where a preferred hardwood seed source exists, openings may be up to 2 acres in size.

Field training should improve considerably once small cedars are thinned out, allowing for greater maneuverability and providing better sight lines. The stand will be divided into two sections to be thinned in different years in order to meet the 60 acres per year guideline.

The island portion of stand s0201 can be accessed only by watercraft during summer months. During winter drawdown of the lake, the island may be reached by crossing a mudflat that is approximately 400 to 500 feet wide. Thinning operations on this island are not a priority as it is rarely used for training exercises; however, any future timber harvests to occur on the island will be conducted during winter

months when lake water level is at winter pool. Skid bridges will be used to cross the mudflats. Upon completion of harvest, all materials used in construction of skid bridges must be completely removed from the crossing and carried offsite or disposed of in an appropriate manner. See Best Management Practices listed in Table A1.2 for further guidelines regarding timber harvesting in sensitive areas.

Following thinning of this stand, prescribed burning can be done once every 3 years to prevent the accumulation of highly combustible forest fuels. No burning should be attempted prior to thinning because of the extreme fire hazard associated with the dense cedar stands.

Stand s0202. This stand will be thinned from below by removing all trees that are not in the dominant or co-dominant crown class. The goal would be for tree crowns to not touch each other on at least three sides. Some of the co-dominants may be removed to allow more room for the remaining trees to grow. The stand will be divided into two sections to be thinned in different years in order to meet the 60 acres per year guideline.

Several small wetland areas occur along the shores of J. Percy Priest Lake. Trees may be harvested from these areas in accordance with the prescription; however, equipment use within the wetland will be minimized to avoid soil disturbance. Harvesting operations will occur in this stand only during winter drawdown of the lake in order to minimize impacts to soils. As with all other harvests, a 100 foot non-harvested buffer will be maintained along the shore of the lake and the property boundary.

Prescribed burning may be done every 6 years for fuel reduction if necessary. Burning should be conducted in strict accordance with the weather guidelines listed in Annex 2. No burning should be performed before the thinning is done.

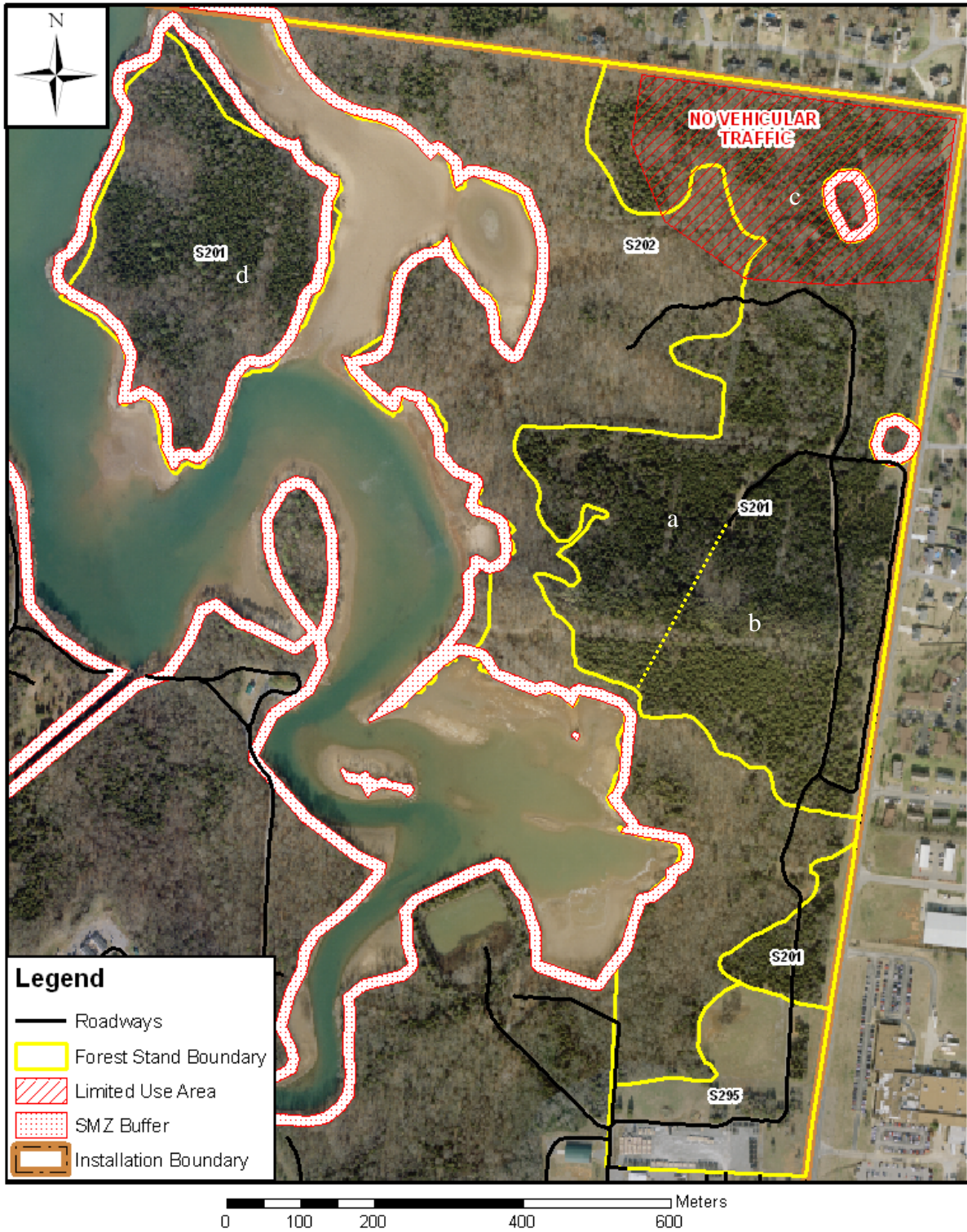


Figure A1-2: Forest stands in Training Area 2 on VTS-Smyrna.

5.2 Training Area 3

Training Area 3 is 74-acre site that is bounded on the north, west, and south by the impounded portion of Stewart Creek and on the east by Training Area 2 and an element of the cantonment area. Part of this area was used as a landfill for various types of refuse when the installation was operated as Sewart Air Force Base (AFB) by the U.S. Air Force. For the purposes of this Forest Management Plan, TA3 also contains the remains of the former AFB sewage treatment lagoon (actually in TA2). Because of these contamination issues, the TNARNG does not use this area for active training. An area totaling less than 10 acres along the training area's eastern boundary contains structures associated with the installation's cantonment area and is permanently maintained in an open condition. A single forest stand covers 68.4 acres (92 percent) of the training area.

Stand Description

Stand 01 is a 68.4-acre stand of immature bottomland hardwood forest occurring on the relatively low elevations that characterize most of the site. The stand is dominated by red oak and white oak, with a mix of hickory, poplar, walnut, and a few pines. The trees range from 10 to 25 years in age and are the result of ecological succession over the years since the site was maintained in a cleared condition by the U.S. Air Force. The overall health of the stand is excellent.

Forest Management Prescription

Stand s0301 will be thinned by removing all trees that are less than 14 inches DBH. This will allow room for the remaining trees to grow, plus aid in training. If, by following this DBH guideline, thinning would create an opening of 1 acre or greater in size, some of the trees smaller than 14 inches should be retained to maintain forest coverage of the area unless areas of this size are desired for specific training purposes.

Training Area 3 contains both bottomland hardwoods and upland redcedar woodlands. The bottomland hardwoods cover the lower elevation areas that border the J. Percy Priest Lake shoreline. The cedar woodlands occupy the higher elevation areas and are relatively dense, with numerous other woody shrubs and other hardwood species being intermingled among the cedars. The area does contain some small openings that are covered in grasses and other herbaceous plants. Although the training potential of Training Area 3 would definitely benefit from selective thinning of the cedars and other woody species and the subsequent application of prescribed fire, use of this area for training has been impeded by historic waste disposal issues that date back to the prior occupation and use of the installation by the U.S. Air Force. Until the waste-related issues are resolved, Training Area 3 will be designated as a No Burn Area. In addition, prior to conducting any prescribed burns in adjoining portions of Training Area 2 firebreaks will be constructed around known landfill sites in Training Area 3.

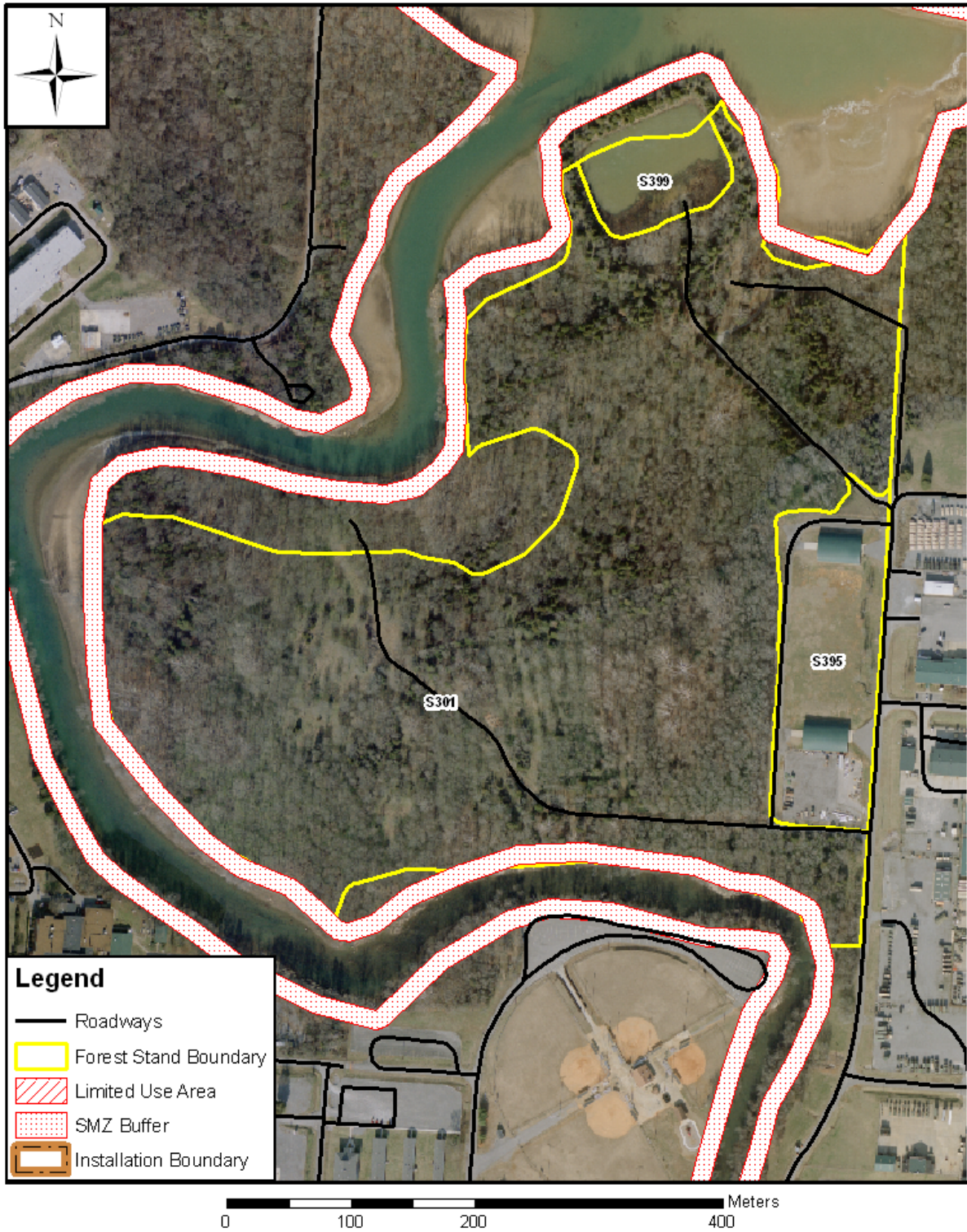


Figure A1-3: Forest stands in Training Area 3 on VTS-Smyrna.

5.3 Training Area 4

The 55 acres comprising Training Area 4 occur as broad peninsula protruding north into the waters of J. Percy Priest Lake. Smyrna Airport is located to the south, and Training Areas 5 and 6 to the east and west, respectively. The 2005 Forest Inventory determined that only one forest stand with a diverse assemblage of individual tree species occurs on the site. The interior of the training area supports a savannah-like grassland with numerous cedar trees being scattered throughout the open area. A small portion of the training area nearest to the airport is maintained in a permanent grassed condition

Stand Description

Stand s0401 consists of 42.2-acre immature upland pine and hardwood forest. The stand is dominated by red oak and white oak, with a mix of hickory, cedar, and a few pines. The site appears to have been a former open field that naturally regenerated over several decades. The trees range in age from 10 to 30 years. The hardwood species are more dominant at the lower elevations along the lake shoreline, while cedars are more abundant on the interior upland areas. Although the overall health of the stand is excellent, its condition will decline without management

Forest Management Prescription

Stand s0401 will be thinned by removing all trees that are less than 10 inches DBH. This will allow room for the remaining trees to grow, plus aid in training of the trees that are left. If following this DBH guideline would create an opening of 1 acre or greater in size, some of the trees smaller than 10 inches should be retained to maintain forest coverage of the area.

Following thinning, the frequency of prescribed burning would depend upon the primary vegetation assemblage occurring within specific portions of the training area. For example, hardwood dominated sites should be burned no frequently than every six years, cedar and cedar grassland associations every 3 years, and permanently maintained open grassed areas once a year or every other year. Prescribed burns should be conducted with the objective of preventing excessive accumulations of organic fuel loads. No burning should be attempted prior to thinning because of the extreme fire hazard associated with the dense cedar stands.

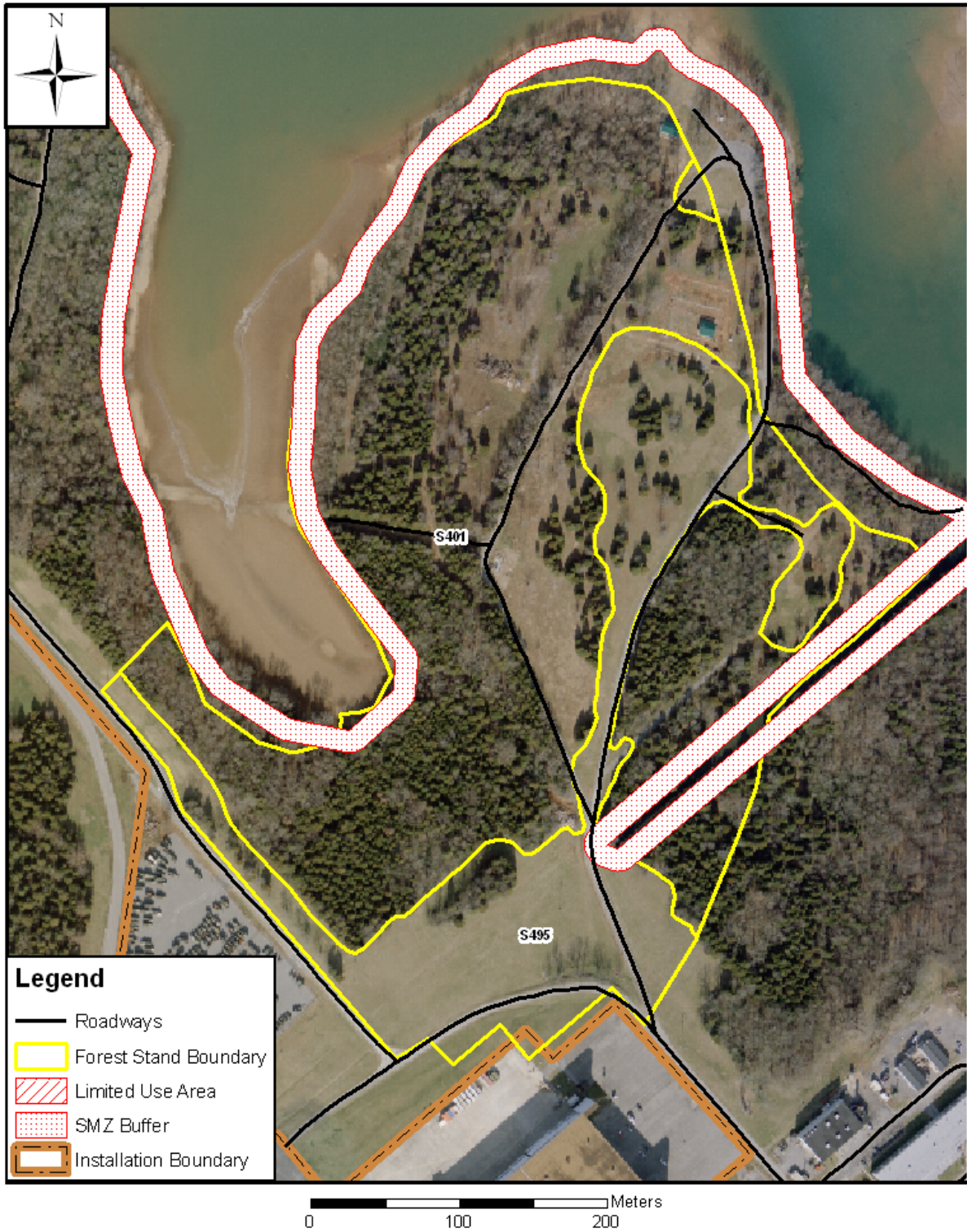


Figure A1-4: Forest stands in Training Area 4 on VTS-Smyrna.

5.4 Training Area 5

Training Area 5 is 54 acres in size. It is a peninsula that extends to the north and east into the upstream reaches of the Stewart Creek Embayment of J. Percy Priest Lake. The overall training area includes a small island that is approximately 4.4 acres in size. Almost 94% of the training area is forested and is designated as a single stand for forest management purposes. The training area is bounded to the west by Training Area 4 and to the south by a portion of the installation's cantonment area.

Stand Descriptions

Stand s0501 is a 50.6 acre mature pine and hardwood forest. The stand is dominated by pines and miscellaneous hardwoods. The hardwoods are more common at the lower elevations, while the pines are more abundant at the higher elevations on the site. The trees range in age from 10 to 35 years. The overall health of the stand is judged to be good.

Forest Management Prescription

Stand s0501 will be thinned by removing all trees that are less than 10 inches DBH. This will allow room for the remaining trees to grow, plus aid in training of the trees that are left. If following this DBH guideline would create openings of 1 acre or greater in size, some of the trees smaller than 10 inches should be retained to maintain forest coverage of the area.

This training area contains a small island just north of the boat ramp. During summer months, this island can be accessed only by watercraft. During winter drawdown of the lake, the island may be reached by crossing a mudflat that is approximately 50 feet wide. Thinning operations on this island are not a priority as it is rarely used for training exercises; however, any timber harvests to occur on the island will only occur during winter months when lake water level is at winter pool. Skid bridges will be used to cross the mudflat. Upon completion of harvest, all materials used in construction of the skid bridge must be completely removed from the crossing and carried offsite or disposed of in an appropriate manner. See Best Management Practices listed in Table A1.2 for further guidelines regarding timber harvesting in sensitive areas.

Following thinning, prescribed burning can be done once every 6 years for fuel reduction. Burning should be accomplished in strict accordance with the weather guidelines listed in the Prescribed Fire Plan (see Annex 2). This will minimize the potential for damage to the hardwoods.

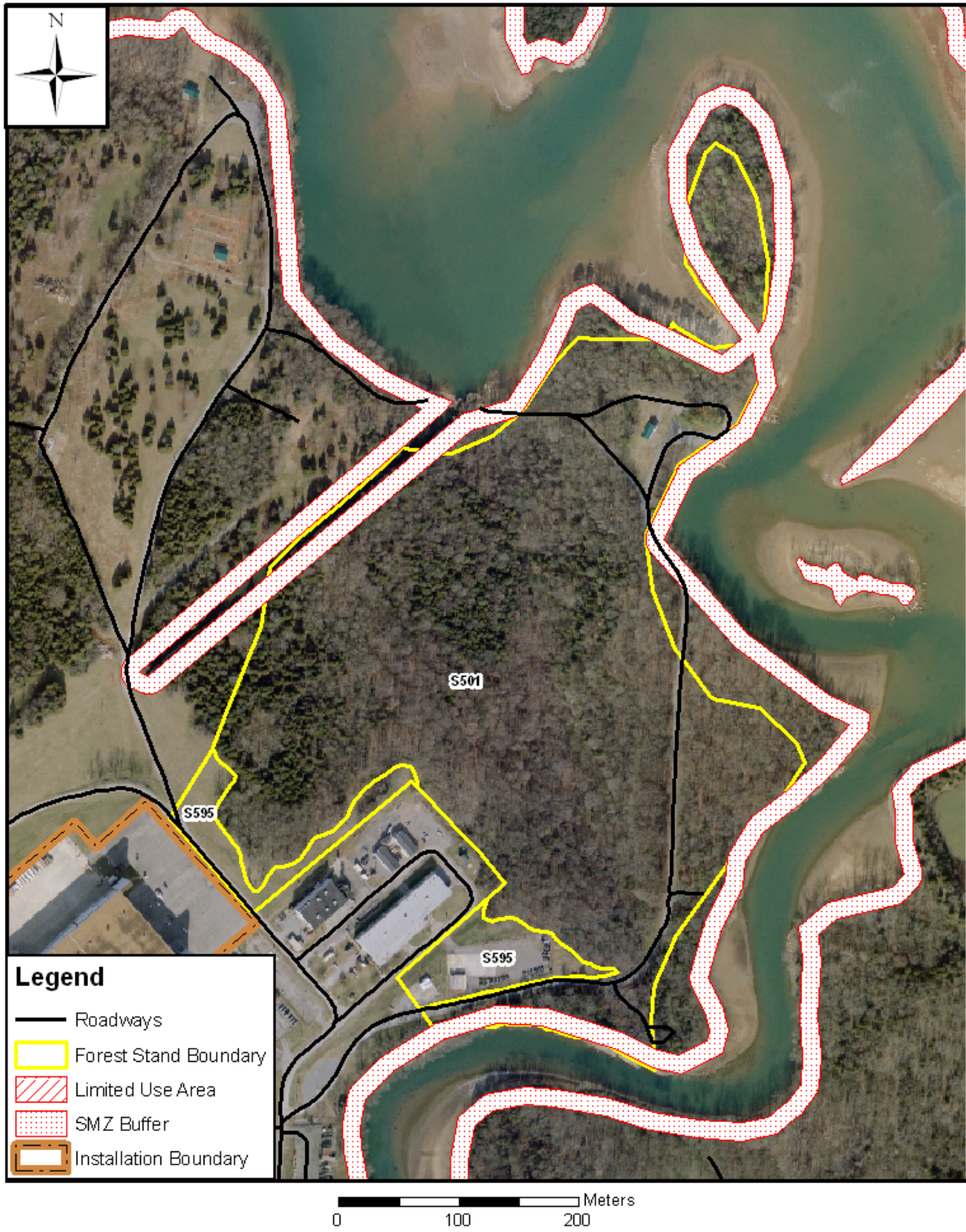


Figure A1-5: Forest stands in Training Area 5 on VTS-Smyrna.

5.5 Training Area 6

At 110 acres, Training Area 6 is the second largest of VTS-S's six training areas. Over half of the training area is bordered by J. Percy Priest Lake to the east and north. Undeveloped lands and agricultural property lie adjacent to the western boundary, while Smyrna Airport property forms the southern boundary. Two large open areas are maintained in permanently grassed conditions for training purposes. The southernmost of these open areas contain the small arms firing range and associated buildings. Although the 2005 Forest Inventory designated the forested area on TA6 to be a single stand for forestry management purposes, two principal vegetation associations actually occur within the area. The lower elevations are dominated by hardwoods, while the higher elevations are covered in open savannah-like prairie habitat within which cedar trees are abundant. The Cannon Cemetery is located on the most northern point of land extending into the lake.

Stand Description

Much of the 90.8 acres found in Stand s0601 is characterized as an immature upland pine and hardwood forest. The lower elevations within the stand are dominated by miscellaneous hardwoods, with a mix of hickory, white oak, poplar, walnut, and a few pines. The higher elevation areas support a considerable amount of cedar. The trees range in age from 10 to 50 years, with the oldest trees typically being hardwood specimens occurring along the lake shoreline. The present overall health of the stand is considered to be excellent for the hardwood component, but poor for the cedars due to over-stocking in some areas.

Forest Management Prescription

Stand s0601: The hardwood component of this stand will be left as is for the next 10 years. After the next Forest Inventory update is prepared, the management prescriptions for this stand will be reconsidered. The eastern redcedar component on approximately 25 acres will be lightly thinned to enhance the utility of the area for military training purposes and to promote the expansion of native prairie grasses.

Prescribed burning in hardwood component may be accomplished every 6 years to reduce forest fuels. Burning within the cedar component should be attempted every 3 years to inhibit the spread of cedars and other undesirable scrubby vegetation. To the extent possible, the open areas in TA6 could be burned every year. All burning should be undertaken in strict accordance with the weather guidelines listed in the Prescribed Fire Plan (see Annex 2) to minimize both damage to the hardwoods and the potential for fire to escape to off-installation lands.

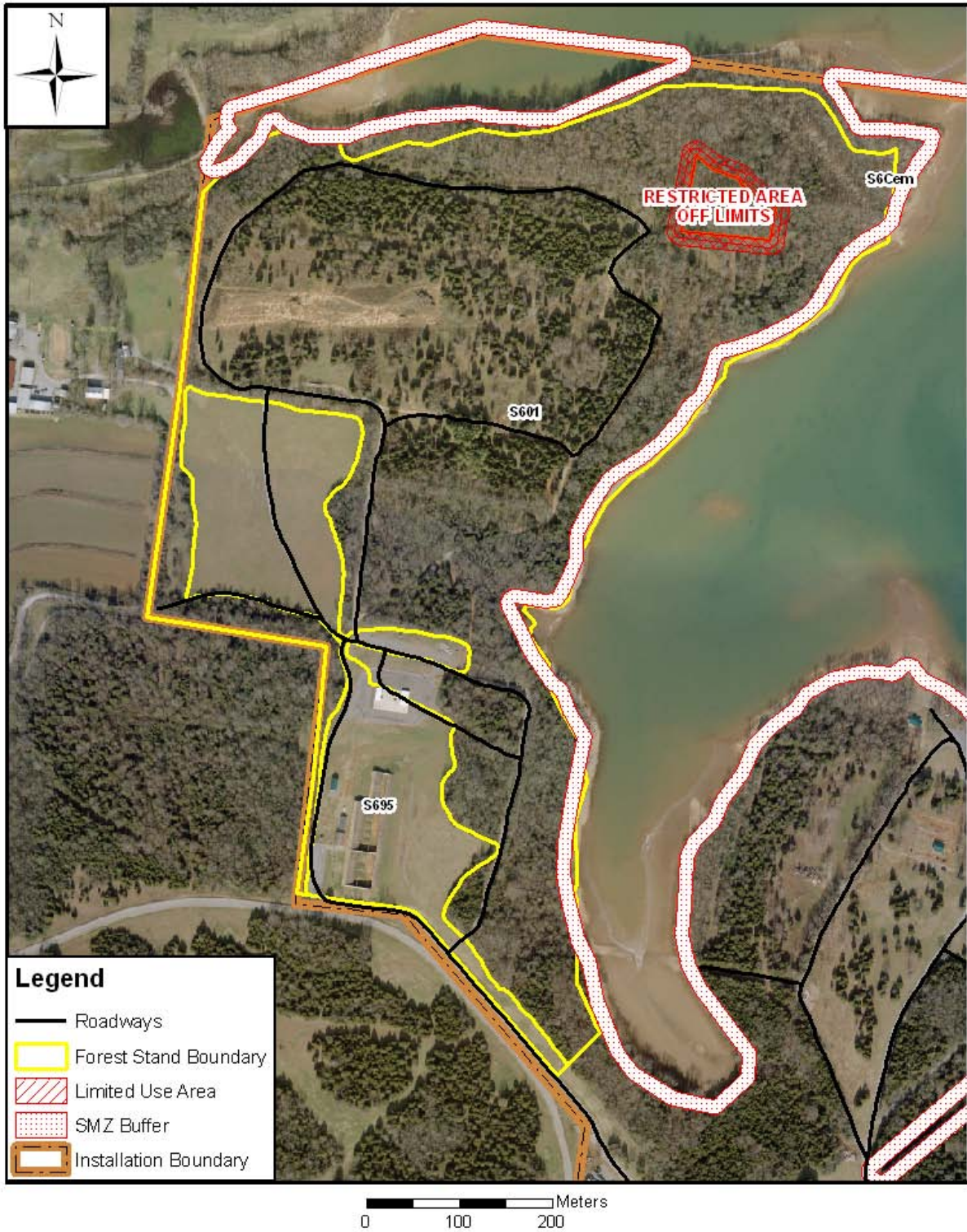


Figure A1-6: Forest stands in Training Area 6 on VTS-Smyrna.

6.0 RECOMMENDED IMPLEMENTATION SCHEDULE

A total of six individual forest stands have been designated on VTS-S, with one stand subdivided into 3 management sections. In general, the overall health of the installation's forest resources is considered to be relatively good. Despite the good health of the forest stands observed at the time the Forest Inventory was conducted in April 2005, the conditions are anticipated to decline over the next five to ten years if the stands are not thinned.

Due to the relatively young age composition of the forest associations occurring over most of the training areas, it appears that much of the installation was once maintained in cleared condition. This may have occurred prior to 1970 when the installation was managed as the Sewart AFB by the U.S. Air Force. Since the TNARNG assumed control of the installation property in 1970, the process of ecological succession has allowed forest communities to become established, and in some cases the present stem density is so thick that effective military training has become extremely difficult on portions of some of the training areas (e.g., Training Areas 2, 4, and 6). As a result, many of the forest stands are in need of thinning to improve conditions for training.

Generally, no more than 60 acres will be harvested in a given year. In the event that the island portion of TA 2 is harvested, the entire 70 acres (minus buffer zones) will be harvested at one time to minimize impacts on the mudflat that will have to be crossed to access the island. Stands less than 60 acres may be subdivided and harvested in multiple years if training needs dictate on-going access to a portion of the stand.

Table A1.3 lists stands in order of the priority of treatment for the first ten years of management. Harvests may skip a year, depending on site access, and so this list may not be completed within ten years. This schedule is subject to change based on military mission needs and updated forest inventory data. A resurvey of the VTS-S forest stands is scheduled for 2015. This plan and the harvest priority will be revised as dictated by the results of the new inventory.

Application of prescribed fire should be an important management tool in the management of VTS-S's forest resources, particularly for those areas that are dominated by thick growths of cedar. See Annex 2 for information on the individual burn units into which the forest stands are recommended to be divided, and the intervals that should be considered between burn operations for the respective units.

Table A1.3: Timber stand harvest priority for VTS-Smyrna.

Training Area	Stand & Section	Acres	Primary Management Action
2	s0201(b)	32	Thin redcedar <16"
4	s0401	42	Thin <10"
5	s0501	51	Thin <10"
2	s0201(a)	35	Thin redcedar <16"
6	s0601	25	Thinning
2	s0202	78	Thin below dominant/subdominant
3	s0301	55	Thin <14"
2	s0201(d)	71	Thin redcedar <16"

ANNEX 2

**WILDLAND FIRE MANAGEMENT PLAN
VTS-SMYRNA**

Wildland Fire Management Plan

VTS-S

Tennessee Army National Guard

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Signature

Date

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1.0 INTRODUCTION

This Wildland Fire Management Plan (WFMP) has been developed in accordance with the 2002 Department of Army (DA) Wildland Fire Policy Guidance. It presents the standards by which the VTS-Smyrna (VTS-S) wildland fire control and prescribed burning programs will be conducted. This plan is a component of the Integrated Natural Resources Management Plan (INRMP) for the training site 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-S was developed to support the following goals:

- Provide for the safety of fire crews on every wildland fire activity.
- Reduce wildfire potential on the training site and suppress undesired wildfires to protect lives, property, and natural and cultural resources in a cost-effective manner.
- Utilize prescribed fire where appropriate 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 the Fire Management Plan.

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-S is an 868 acre training facility managed by the Tennessee Army National Guard (TNARNG). The installation is located in Rutherford County in middle Tennessee, approximately 22 miles southeast of Nashville and partially within the city limits of the Town of Smyrna. The training site contains an intensively developed cantonment area of 169 acres; six designated training areas totaling 520 acres; and approximately 180 acres of aquatic habitat associated with Stewart Creek and J. Percy Priest Lake. The exact acreage of the installation covered by water varies depending on the prevailing surface elevation of the lake.

The region surrounding VTS-S has been greatly influenced by urban sprawl originating from the growth and development of Nashville, the second largest city and the capital of Tennessee. The areas surrounding and immediately adjacent to the installation reflect the expanding residential and light industrial/commercial activities that are typical of the overall region and which create a complex and varied pattern of land uses.

The installation's southwestern and western boundaries are formed by the Smyrna/Rutherford County Regional Airport. On the east VTS-S is bounded by densely populated residential areas and light industrial/commercial development. Additional residential developments are located along the installation's northeastern boundary. The only undeveloped lands bordering the installation are located to the northwest.

Stewart Creek and J. Percy Priest Lake are the primary water features at VTS-S. Stewart Creek enters the training site along the southeastern border and flows into J. Percy Priest Lake, an impoundment of the Stones River covering approximately 14,200 acres (22.2 square miles). The lake is surrounded by 18,854 acres of associated project lands, 10,000 acres of which are devoted to wildlife management. The lake is maintained by the Nashville District of the USACE and is operated to generate hydroelectric power, provide both drinking water and flood protection, promote fish and wildlife resources, and to create recreational opportunities. Over 97% (847 acres) of VTS-S property is licensed to TNARNG by either the Nashville or Mobile District of the USACE. Under the terms of the license, military training activities on the licensed lands cannot conflict with the operation of J. Percy Priest Lake. Much of the land is subject to flooding by the lake as a part of regional flood control practices. As a result, the actual amount of lands available for training within the licensed area vary during the course of the year, depending upon the current level of the lake.

Approximately 53% (456 ac) of the training site is forested. Low-lying areas near the lake and creek are occupied by bottomland hardwoods, while the higher, inland areas are dominated by eastern redcedar woodlands which are often densely overstocked. The remainder of the training site includes a heavily developed cantonment area (169 acres) and a number of small grassland areas maintained for military training purposes. There is no unexploded ordnance on the VTS-Smyrna.

2.0 PROGRAM OVERVIEW

2.1 Organizational Structure and Responsibilities

The wildland fire program on VTS-S will operate in accordance with DA Memo (4 Sep 2002), “Army Wildland Fire Policy Guidance,” and the DA “Sustainable Range/Installation Environmental Activities Matrix” (2 Sep 2005) for funding. The Adjutant General (TAG), as commander of the TNARNG, is directly responsible for the operation and maintenance of the Volunteer Training Sites, including implementation of this WFMP. TAG delegates fire-related duties among environmental and training site staffs.

The Wildland Fire Program Manager for the TNARNG is the Natural Resources Manager (NRM) in the Environmental Office. 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-S Range Control is responsible for immediate wildland fire control response on the training site. The Smyrna Fire Department is the primary responder for all non-aviation related fires at VTS-S onsite and would respond to any fires within the VTS-S. If needed, the Smyrna Airport Fire Department and the Tennessee Division of Forestry would respond. A unified command will be set up with any of the above departments and any qualified VTS-S personnel in the event that the outside agencies are called in to help control a wildland fire that is beyond the capabilities of the training site staff. The Smyrna Fire Department or the Smyrna Airport Fire Department would respond to any structural fires on the training site.

Prescribed fire activities on the VTS-S are cooperative actions conducted by training site personnel and the Environmental Office with backup support from the Tennessee Division of Forestry.

2.2 Interagency Cooperation and Mutual Aid Agreements

The Town of Smyrna Fire Department would be the first agency alerted in the case of most fire emergencies that could occur during a prescribed burn. While the Smyrna Airport Fire Department is located immediately adjacent to the VTS-S cantonment, they are primary responders only for aviation-related fires, that is, fires affecting either the airport or the AASF. Smyrna Fire Department could, however, request additional support from the Airport Fire Department, if needed. The Tennessee Division of Forestry (TDF) may also be contacted if additional assistance is needed to conduct or manage prescribed and/or wildland fires. A Memorandum of Agreement is being developed between the TNARNG and the TDF to facilitate cooperation between the two agencies for future activities including wildland fire training, the potential availability of TDF personnel to function as burn boss, and other support.

2.3 Personnel

VTS-S currently has one trained wildland firefighter (FFT2). Additional firefighters may be requested from other TNARNG facilities to aid in prescribed burning.

2.4 Available Equipment

The VTS-S maintains a cache of fire equipment for wildland fire suppression and prescribed burning (Table A2.1). In addition, personal protective equipment (PPE) conforming to National Fire Protection Act (NFPA) 1977 (Standard on Protective Clothing and Equipment for Wildland Fire Fighting) is maintained for all 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 A2.1: Available fire equipment at VTS-S.

Fire rake	7
Pulaski axe	4
Shovels (long-handled)	6
Shovel (d-handled)	3
Axe	4
16" Skill chainsaw	3
Portable pressure washer (no holding capacity)	1
200 gal trailer mounted pressure washer	1
500 gal water tank + pump + 50' hose	2
10,000 gal water tanker + trailer	1
300 gal Bambi bucket (used by air support)	2
D-7 bulldozer	1
D-3 John Deere bulldozer (state-owned)	1
120-G grader	2
Gyro-track with brush grinder	1
6400 JD tractor	1
6415 JD tractor	1
T1520 New Holland tractor	1
New Holland back hoe	1
Bobcat frontend loader	1
24-C skid loader	2
MD24C 2.5 yd ³ bucket loader	1
Chevy 108 4WD diesel pickup truck	5
Chevy Blazer 4WD diesel	1
6' scraper	1
6' box blade	1
10' bush hog	1
16' batwing bush hog	1
Disc harrow	1
100 gal spray tank	1
John Deere 6x4 Gator	

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.

Environmental funds may be utilized for prescribed burning that has a specific ecosystem management or rare, threatened, and endangered species management objective as presented in the INRMP and for wildland fire management activities conducted for the purpose of compliance with environmental laws and regulations. Forestry reserve account funds may be requested for fire-related projects that will improve forest health or timber management concerns on the facility.

The funds available will be used to continue the training of the on-site resources and maintain a cache of personal protective equipment and wildfire tools. The VTS-S personnel should use appropriate management response in all incidents which will maintain a cost efficient program.

2.6 Public Relations

When involved with any fire application, VTS-S personnel should always consult with the Smyrna Airport and should contact the Smyrna Airport Fire Department and the Smyrna Fire Department. Permits are required from both the Tennessee Department of Agriculture (TDA) Division of Forestry and from the Town of Smyrna (see Section 6.7 for additional contact information). The surrounding public should be made aware of any smoke issues that may arise and could cause any health issues.

2.7 Environmental Review

Implementation of this Integrated Wildland Fire Management Plan requires an assessment of the environmental effects as required by AR 200-2, *Environmental Effects of Army Action*, and the National Environmental Policy Act of 1969. This assessment will be completed before implementation of the plan, in conjunction with the environmental review for the Integrated Natural Resources Management Plan for the VTS-S.

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 Tennessee Division of Forestry or Smyrna Fire Department 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.

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 National Weather Service through the Tennessee Division of Forestry webpage (http://burnsafetn.org/forecasts_links.html):

- A predicted temperature greater than 85° F
- A predicted wind speed greater than 18 mph at the 20' level
- A predicted relative humidity less than 25%
- An atmosphere with Red Flag conditions issued by TDF or USDA-FS
- Inadequate personnel or equipment available to manage the prescribed burn

3.1.3 Fire Danger Rating and Burning Index

Fire danger (Table A2.2) rating is a classification based on the Burning Index and is available from the USDA-FS Wildland Fire Assessment System (<http://www.wfas.us/context/view/17/32>). 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:

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-S personnel. The NRM will keep track of the training being offered close to the installation and inform training site personnel of its availability.

3.3 Physical Fitness Standards

Based on the conditions and terrain encountered in wildland fire situations on the VTS-S, 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).

Table A2.2: 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.

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-S is to support unit requirements for maneuver, range operations, equipment use, and other combat readiness training. Much of the military training that takes place at the VTS-S involves air assets, due to the proximity of the military facilities to the Smyrna Airport, or equipment maintenance as reflected in the considerable infrastructure located within the installation's cantonment area. The enclosed firing ranges on Training Area 6 are extensively used. However, field exercises are also conducted on portions of the six training areas, with most of the training activities occurring in Training Areas 4, 5, and 6. The extreme density of the cedar woodlands in Training Area 2 make this site difficult to use for training purposes. Training Area 3 is not used because of environmental contamination issues. Lastly, Training Area 1 is so small as to have limited use in training. A timber thinning program followed by the periodic application of prescribed fire would enhance the utility of Training Area 2 for both wheeled vehicle maneuvering and dismounted infantry and land navigation tactics.

This WFMP supports the military mission of the VTS-S by providing for timely wildfire response, thus minimizing training downtime and facility loss to wildfires. The prescribed burn program provides a cost effective method of maintaining and expanding open training areas such as ranges and controls fuel buildup to minimize wildfire intensity.

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-S. No new permanent firebreaks (off existing roads and trails) will be developed without consultation with the Tennessee State Historic Preservation Officer (SHPO). Temporary plow line firebreaks may be constructed in those portions of the training site which have been surveyed and identified as free of significant archaeological or historical resources.

A Phase I archaeological survey of VTS-S conducted in 1998 identified 14 archaeological sites and four historic sites on the installation. One of the archaeological sites and all four historical sites were recommended as eligible for the National Register for Historic Places. These sites are considered “no plow” zones, and are included on Figure A2.1 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.

The Cannon Cemetery is located in Training Area 6. It will be protected from wildfire and prescribed burns.

4.3.2 Natural Resources

- Water resources are the most significant natural feature on the VTS-S. Riparian forests represent over 25 percent of the total forest cover occurring in the installation and are found on either side of Stewart Creek and J. Percy Priest Lake, as well as on the two islands in TAs 2 and 5. Riparian hardwood vegetation is highly sensitive to burning. Frequent burning and/or hot fires can cause stress and damage to the trees making up this forest community.

If wildland fire were allowed to burn completely to the shoreline, potential erosion and water quality issues would be created by the removal of the ground vegetation and leaf litter that were burned. Portions of Stewart Creek upstream from the training site have been designated impaired by the Tennessee Division of Water Pollution Control and are listed as 303(d) impaired as a result of nitrate runoff and loss of biological integrity due to siltation. It is extremely important that waters adjacent to the VTS-S are protected from further contamination to avoid additional listing and to promote stream recovery. In addition, shoreline burning could create a short term aesthetic problem for the recreating public on the lake.

To minimize these concerns and potential erosion issues, all efforts will be made to protect a 50 foot buffer (also known as a Streamside Management Zone [SMZ]) from the banks of Stewart Creek and J. Percy Priest Lake. This vegetated buffer will protect water quality and provide a screen between burned areas and the lake. In a number of locations, bottomland hardwood forests border the lake. In those situations, if possible, the entire extent of the bottomland hardwood forest bordering the lake will be used as the buffer zone and will remain unburned. The SMZ is also a “no-plow zone” (Figure A2.1); if possible, firebreaks should be established further than 100 feet from the stream bank as needed.

- Erosion control on firebreaks is also a concern in order to minimize the potential for sedimentation into these water bodies. Water control structures to manage surface water movement will be installed during firebreak construction. Permanent fire lines will have water control structures maintained. Temporary firelines will be rehabilitated as soon as practicable after any fire. Existing barriers such as roads and trails will be used whenever possible to reduce the need for fire line construction and to minimize resource impacts.
- No federally listed plant species have been discovered on the VTS-S; however, populations of four federally listed endangered plants have been documented within five miles of the training site. Twenty-one additional plant species (see Section 3.9.1 of the INRMP) of concern to the Tennessee Natural Heritage Program have also been found within five miles of the VTS-S, although not on the training site property.

The life histories of these plant species suggest that occasional burning in the dormant season would be beneficial, especially in expanding open areas and controlling competitors. Most of these sensitive species prefer limestone cedar glade and/or barrens habitat, the former of which is widely prevalent in surrounding undeveloped and protected lands and which may have existed on the site of VTS-S prior to human development. If any of these species are identified in future rare species surveys on the training site, this wildland fire management plan will be reconsidered with regards to the management of the new species.

- Two animals with partial federal status have been sighted at VTS-S: the meadow jumping mouse (*Zapus hudsonius*) and the sharp-shinned hawk (*Accipiter striatus*). These species are protected in a portion of their range, but the populations in Tennessee are stable and are not included under the protected designation. Both species are considered in need of management by the State of Tennessee, as are three other species documented at the site: great egret (*Ardea alba*), cerulean warbler (*Dendroica cerula*), and yellow-bellied sapsucker (*Sphyrapicus varius*); however populations of all five species appear to be stable in Tennessee at this time (NatureServe 2007). Prescribed fire should have little impact on avian populations on and around the training site. Burning can influence small mammals through habitat destruction and, less frequently, direct injury. The scheduling of prescribed burns across the training site (see Figure A2.3) is designed to ensure unimpacted habitat is maintained within close proximity of burn sites each year.

In addition, one federally listed endangered species, gray bat (*Myotis grisescens*), and four state species of concern have been found within five miles of the training site (see Section 3.9.2 of the INRMP for the complete list). As noted for local sensitive plant species, if any of these animals are found on VTS-S property, reevaluation of this plan may be necessary.

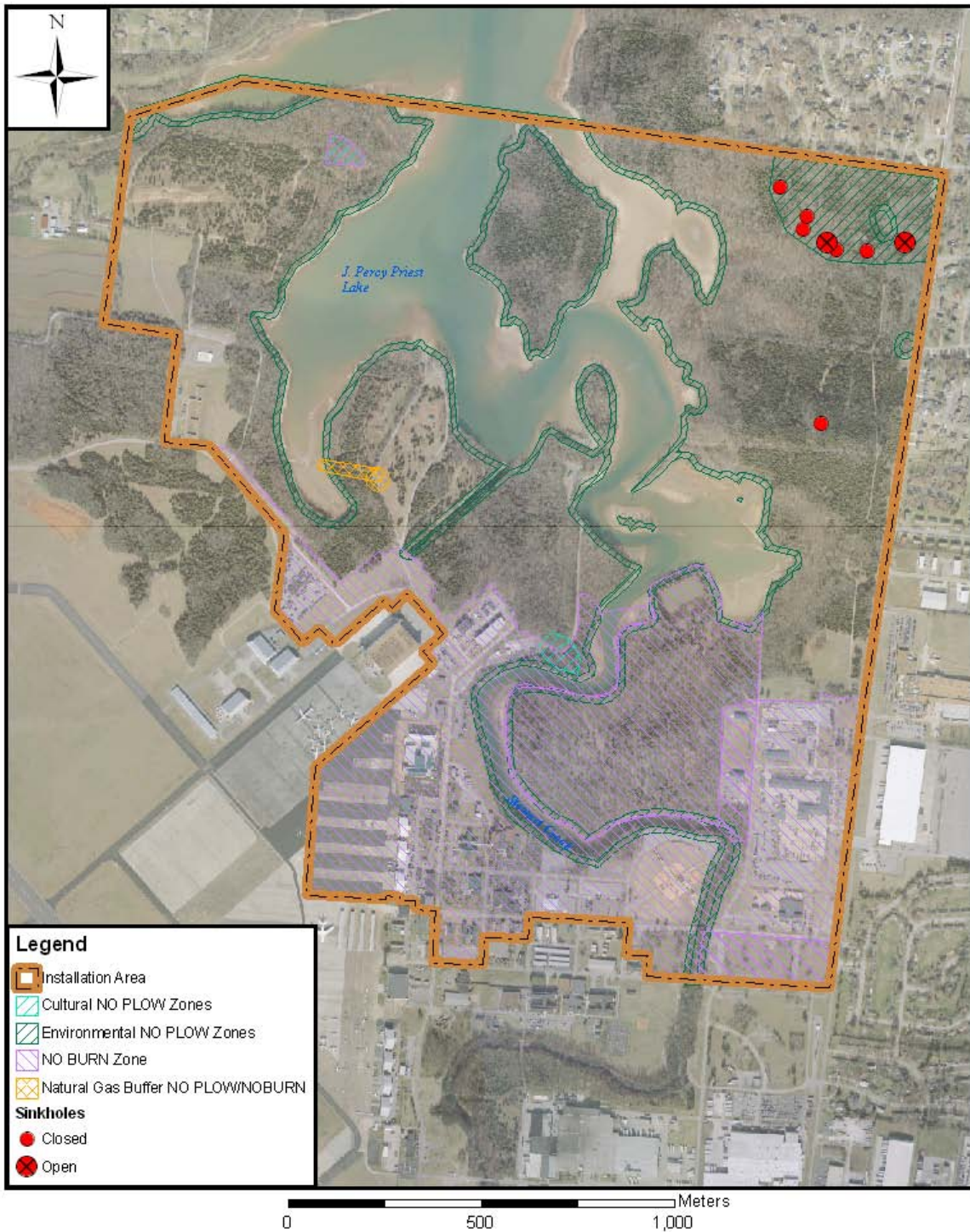


Figure A2.1: No-Plow/No Burn Zones on VTS-S

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 oak-hickory forest types found at VTS-S. Fire is a natural maintenance disturbance for these types of stands, and is used to maintain and regenerate oak-hickory for timber stand improvement and wildlife stand improvement concerns.

Fire Regime II: This regime is known as the frequent replacement group. It is primarily for grasslands and shrub lands where fires typically replace greater than 75 percent of the stand. This regime covers short and tall grass ecosystems and eastern redcedar stands like those found on the VTS-S.

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-S consists of 868 acres, approximately 20% of which is developed cantonment area. Slightly more than half of the training site land is covered in either managed grasslands or with redcedar woodlands that range from dense stands with little understory vegetation to sparse savanna-like communities with significant grass cover. Bottomland hardwoods and mixed evergreen/hardwood stands generally occur on the lower elevation lands bordering the lake. The training site consists of the following fuel models (Figure A2.2).

4.5.1 Grass Group

These fuels are seen on approximately 117 acres on VTS-S. 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 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 lawns in the VTS-S cantonment area.
- **Fuel Model 2** (timber w/grass understory) Fire spread is primarily through the fine herbaceous fuels that have cured or are nearly cured. Fires are surface fires where herbaceous matter, litter, and dead-down stemwood from the open overstory contribute to the intensity. Open shrub lands and pine stands or scrub oak stands that cover one-third to two-thirds of the area generally fit this model; such stands may include clumps of fuels that generate higher intensities and may produce firebrands.

=> Open areas with scattered and clumped overstory trees in Training Areas 4 and 6.
- **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, in Training Area 6 and parts of 2, which are maintained by occasional bush-hogging.

4.5.2 Shrub Group

These fuels are frequently encountered on VTS-S and make up approximately 160 acres. Eastern redcedar 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.

=> Much of Training Area 2, including the small island in the lake, and a portion of Training Area 3.
- **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.

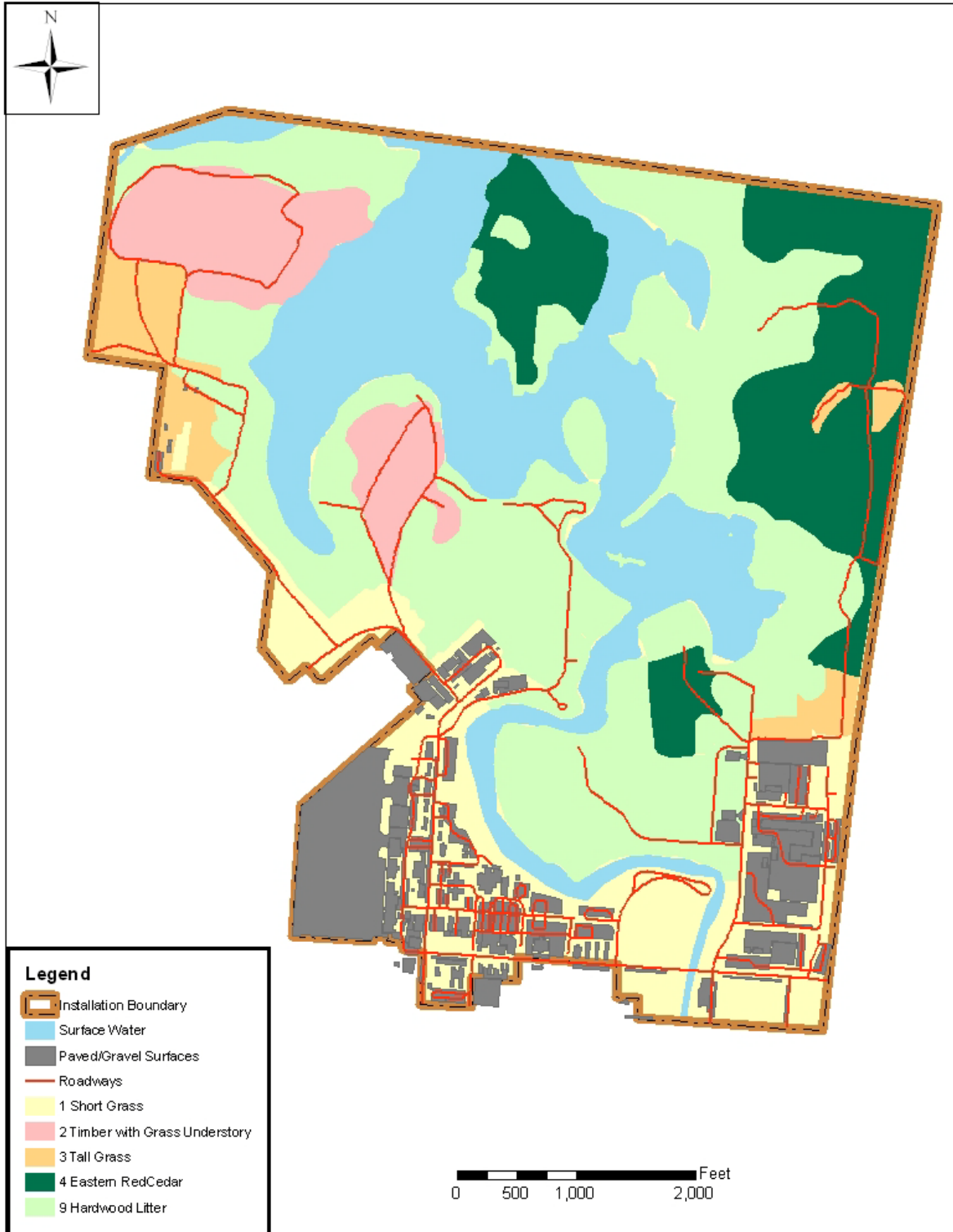


Figure A2.2: Fuel types on the VTS-S

4.5.3 Timber Litter Group

Approximately 200 acres of VTS-S is in the timber litter group. The fuel under most forest stands consists of light to moderate loading of fuel, most of which is compacted on the ground. Fuels of this type are found throughout the Piedmont and Upper Coastal Plains 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 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 bottomland hardwood forests that occupy most of the shoreline of the VTS-S.

5.0 WILDLAND FIRE CONTROL

Due to its small size, the VTS-S is not subdivided into fire management zones. Wildfire in all areas outside the Cantonment (where structural firefighters would almost always be needed) will be addressed similarly with the objectives of:

- preserving firefighter and other human safety
- protecting real property
- containing all fires within the training site boundaries
- protecting significant natural and cultural resources
- suppressing or using wildland fire in accordance with military and environmental needs

5.1 Suppression and Prevention

Qualified VTS-S 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 Town of Smyrna Fire Department or the Smyrna Airport Fire Department will be notified if assistance is needed.

Under normal circumstances, immediate suppression will be the goal of wildland fire response on VTS-S. 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-S 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-S are responsible for detecting and reporting wildfires. All wildfires must be reported to Range Control.

5.3 Dispatch Procedures

VTS-S Range Control is responsible for wildland firefighting activities on the training site. If additional support is needed, Smyrna Fire Department would be dispatched by training site personnel. The Smyrna Fire Department could then request backup from the Smyrna Airport Fire Department, if necessary. A unified command will be set up with the Fire Department and any qualified VTS-Smyrna 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-S 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 Tennessee Division of Forestry 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 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-S. However, because of the forest types on the installation, prescribed fire should be used selectively and under a limited set of circumstances. The sensitivity of hardwoods and eastern redcedar to fire necessitates that the burner be experienced in conducting prescribed burns in these forest communities. The following overall burning guidelines were considered in developing the prescribed fire objectives and the recommended prescribed burn program for VTS-S.

- A buffer of at least 50 feet should be maintained between areas burned and the shoreline of J. Percy Priest Lake and Stewart Creek to protect water quality and to screen burn operations from the lake. Plowed fire breaks must be further than 50 feet from the shoreline.
- If burning is done in hardwood stands, the fire should be done 2-6 days after good rainfall and when relative humidity is 40 to 50%.
- Eastern redcedar stands should not be burned until after a thinning harvest to reduce available fuel.
- 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-S which are described in more detail below:

- Reduce fuel load and wildfire threat.
- Utilize prescribed fire, as appropriate, to create and maintain conditions as required by the military mission.
- Utilize prescribed fire, as appropriate, to aid in control of invasive plant species.
- Utilize prescribed fire, as appropriate, to aid in the regeneration of native glade and barrens communities and to improve health of forest resources on VTS-S.

6.1.1 Reduce fuel load and wildfire threat. Fire management activities should concentrate on preventing, managing, and controlling wildfires that originate on the installation, as well as fires that may encroach onto the installation from neighboring properties.

As eastern redcedars have thin bark and fine, flammable foliage that ignites easily, they are highly susceptible to fire. Prior to conducting prescribed burns in densely forested stands, selective thinning using mechanical methods must be accomplished to reduce the available fuel and created conditions that safely and effectively allow controlled burns. The thinning operations will be focused on creating openings and access lanes that will suit military training needs and provide appropriate spacing among the remaining trees. Lower limbs will be removed as possible to a minimum height of 4 feet above the ground to reduce the risk of uncontrolled fire that could engulf the cedar trees.

The bottomland hardwood forests should be burned on a 6-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, resulting in a sparse tree canopy, reduction in growth rates, diminishment of the quality of harvested timber, the outright death of affected trees, and encouragement of dense undergrowth and invasion by other woody plants that will take advantage of the increased sunlight penetration to the forest floor. Forests on the VTS-S 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. The military mission at the VTS-S requires a variety of landscape conditions. The dense redcedar forests found in TA2 and portions on TA6 are currently not favorable for many aspects of the military mission and could be effectively managed by prescribed fire after thinning operations are conducted. Open areas and grasslands may be effectively managed by prescribed burning to control woody species encroachment and to rejuvenate herbaceous and graminoid species.

- TA2 will be thinned and prescribed fire will be used to further open up the area to make it more suitable for wheeled and dismounted combat trails, land navigation training, and a Forward Operating Base (FOB) location.
- In TA6, prescribed burning will improve maneuverability and would allow for the construction of additional combat trails.
- Approximately 13% of the training site is composed of managed open areas and grasslands, with the largest portions found in TA6 and TA4. Although these open areas have historically been maintained by mowing or bushhogging, use of prescribed fire would minimize the required frequency of such mechanical control. In addition, fire will improve the health of the herbaceous and graminoid components of the grassland, better control woody species encroachment, and assist in controlling exotic invasive pest plant species, including common privet, sericea lespedeza, and Japanese honeysuckle.

6.1.3 Utilize prescribed fire to aid in control of invasive plant species. Prescribed fire can be effectively used in combination with mechanical and herbicidal methods to control two of the invasive species that are problematic on VTS-S: 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 such as Johnson grass.

6.1.4 Regenerate native glade and barrens communities. Ecosystems at VTS-S have been heavily manipulated over the last 200 years, primarily due to agricultural practices and military use. Fire suppression, over the same time period, has caused further declines in the structure and health of the installation's plant communities. Introducing prescribed fire could help to restore naturally-occurring communities such as cedar glades and barrens by controlling redcedar stand density, reducing accumulation of forest floor litter, and allowing the establishment of a more diverse mix of grasses and forbs.

Most plants endemic to prairie and cedar glade habitats flower and bear seeds from late summer into early fall. Therefore, prescribed fire should be applied in late spring prior to green-up in the existing savannah-like areas in Training Areas 4 and 6 and to newly thinned areas in TA2. Such a burning schedule will maintain the open conditions required for military training while encouraging a native species assemblage. Bushhogging should be avoided in these areas, if feasible, between July and September to allow flowering and maturation of seeds of the native grassland plants and to deter exotic invasive species from colonizing the opening.

6.2 Constraints

In addition to minimizing damage to the hardwood timber, prescribed fire on VTS-S must be conducted cautiously with concern for other major limitations on burning on the training site:

6.2.1 Safety hazards

There will be no burning in Training Area 2 until after mechanical thinning has been conducted and much of the biomass has been removed. Other areas that contain very dense stands will also be harvested prior to the initiation of a new fire regime (see the Forest Management Plan Annex for more information).

Controlled burns will not be used in Training Area 1, due to its location, small size, and need for a manicured, mowed appearance. Other grassed locations at VTS-S that will be excluded from prescribed burning include all lawns immediately adjacent to buildings, parking areas, and other developed areas and those sites that are routinely used to store equipment for training purposes. Controlled burns will also be restricted from Training Area 3, which is currently designated as off limits for all training activities due to its previous use as a DoD landfill prior to TNARNG management. Until restoration of these sites is complete, TA3 will be a No Burn Area (see Figure A2.2)

The northeast corner of Training Area 2 contains several sinkholes which have been mapped and posted. Any prescribed burns in this area will be initiated with a safety briefing regarding the locations of these sinkholes and appropriate actions to avoid entrapment or physical injury around them.

6.2.2 Protection of the waterways and streambank erosion prevention. Water resources are the most significant natural feature on the VTS-S, due to the immediate proximity of Stewart Creek and J. Percy Priest Lake. A 50 foot buffer (a.k.a. SMZ) will be maintained along all banks of Stewart Creek and J. Percy Priest Lake, within which neither vegetation nor soils should be disturbed. See Section 4.3.2 for additional discussion of SMZs.

Erosion control on firebreaks is also a concern in order to minimize the potential for sedimentation into these water bodies. Water control structures to manage surface water movement will be installed during firebreak construction. Permanent fire lines will have water control structures maintained. Temporary firelines will be rehabilitated as soon as practicable after any fire. Existing barriers such as roads and trails will be used whenever possible to reduce the need for fire line construction and to minimize resource impacts.

6.2.3 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-S.

No federal or state-listed threatened, endangered, or sensitive plant species have been identified on the VTS-S; however, federal and state listed plants and animals have been found within five miles of the training site. These species are discussed in more detail in Section 3.9 of the INRMP and in Section 4.3.2 of this plan. Maintenance of appropriate habitat for these species is a conservation concern and will be considered in prescribed fire planning. If any of the federally listed species are identified on the VTS-S, this plan will be revised to ensure sufficient protection.

6.3 Smoke Management and Air Quality

The U.S. Environmental Protection Agency (EPA) monitors specific air quality parameters to determine if a particular area is in attainment with the National Ambient Air Quality Standards (NAAQS). The

parameters of interest are ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen oxides, and lead. Smoke produced by wildfires contains a number of these pollutants.

The Tennessee Department of Environment and Conservation's (TDEC) Division of Air Pollution Control is responsible for protecting the State's air quality. TDEC has developed regulations governing open burning, which is defined as any burning event that generates combustion products that are emitted directly into the open atmosphere without passing through an open stack. Prescribed burns are a type of open burning; however, TDEC regulations specifically exempt prescribed open burns of forests and grasslands performed in connection with land management activities from having to receive permits issued by TDEC. As a result, TDEC places no special requirements on the conduct of prescribed burns, other than directing burners to obtain Burn Permits from the TDA Division of Forestry and complying with local burn regulations and ordinances.

As a precaution to ensure full compliance with TDEC open burn regulations, the area to be burned should be visually inspected prior to the burn to assure that no items that are prohibited from open burning have been abandoned within the site (e.g., tires, oils, paints, vinyl siding, treated wood, etc.). Should such materials be present, they should be removed prior to burning. To assist in reducing the amount of smoke generated during each burn event, the acreage burned on any given day should be selected to ensure it is of a manageable size. Of equal importance, burns should only be conducted when conditions will minimize the amount of smoke produced.

Although it is not required in order to obtain a TDF burn permit, the TDEC Division of Air Pollution Control should be contacted prior to conducting a prescribed burn to ensure that the burn site is not located within a declared Air Pollution Episode (e.g., air pollution alert, warning, or emergency). If some form of Air Pollution Episode has been declared, the prescribed burn will be postponed until conditions improve. All questions on air quality issues should be directed to the Division of Air Pollution Control (1-888-891-8332).

Atmospheric conditions should be favorable for smoke to rise into the upper air and away from smoke-sensitive areas such as highways, airports, and urban areas. There are several smoke-sensitive areas at VTS-S that will warrant consideration during the conduct of every prescribed burn:

- Smyrna Airport borders VTS-S to the west and southwest. It is operational 24 hours a day and averages 250 flights each day. Landings for all aircraft are primarily made from the south on Runway 32, with take-offs occurring to the northeast on Runway 14. However, if wind conditions are not suitable, the secondary landing approach is Runway 19 from the north, with departures using Runway 1 toward the south. The orientation of the runways means that planes using Runways 1 and 19 have the potential of either taking off or landing, respectively, over portions of the VTS-S. Thus, planes using these two runways may have a greater potential to be exposed to smoke during prescribed burn events.

Although smoke generated from controlled burns has the potential to create short term problems in managing air traffic, the Smyrna Airport has indicated that it is willing to work with the TNARNG in the conduct of prescribed burns. The Smyrna Airport Manager shall be notified at least 24 hours before a prescribed burn is to be performed so that the control tower personnel can be informed of the impending burn and issue a notice to the Federal Aviation Administration Nashville Center so that all pilots planning to use the airport will be aware of the potential for smoke to influence visibility in the immediate vicinity of the airport. Due to the proximity of Smyrna Airport to the VTS-S, the Smyrna Airport Manager should also be consulted during the advance planning for each prescribed burn so that potential air traffic issues can be factored into the preparation and decision-making process for each burn event.

- Roads – A number of roads and highways are located in the areas surrounding VTS-S. Traffic volumes on these roadways vary, ranging from very heavily used major highways to limited use access roads into residential subdivisions. The combined US Highway 41/State Highway 70 is the most heavily used roadway near the installation and is located approximately a quarter of a mile to the south.

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 in case smoke impedes visibility on the roads. Consideration should also be given to placing temporary signage during prescribed burns to inform motorists of potential smoke hazard issues.

- Businesses and Residences – A diverse array of light industrial operations and businesses are located to the south and southeast of VTS-S, with residential developments concentrated to the north and northeast. These developments begin immediately adjacent to the installation boundary, typically being separated by only a road or a thin strip of vegetation.

All burn activities should consider the potential effects of smoke dispersion on the residents and employees located within these areas. Preparatory to all prescribed fire operations, a news release should be provided to local media outlets serving the immediate area to assist in notifying the public of the impending burn events. Any complaints or concerns expressed by the public will be recorded on the post-burn evaluations and will be considered in the planning for subsequent burns.

- J. Percy Priest Lake is a 14,200 acre reservoir operated by the USACE. The lake forms much of the northern border of the installation, with the Stewart Creek embayment winding its way through the VTS-S to the point at which its namesake stream flows into the lake. All six of the installation's training areas border the lake or stream to some extent. The lake is operated for multiple purposes, including hydroelectric power generation, flood protection, fish and wildlife resources, and recreation.

Smoke has a tendency to move down slope toward bodies of water. This is particularly true at night when air temperatures decrease and humidity is typically higher, causing the heavier air to sink to lower elevations. The problems can be intensified by the smoke mixing with fog if conditions are favorable for producing fog. These conditions can create visibility problems on the lake that adversely affect navigation and recreational activities.

Because of the intimate nature in which the lake's Stewart Creek embayment is associated with the installation lands, special emphasis shall be placed on conducting all prescribed burns so that they will be completed and all smoke production ended well before the onset of night. To the extent possible, all burns will be timed to be completed in the early afternoon. The USACE Resource Manager for the lake should be consulted during the planning of all prescribed burns and informed at least 24 hours before the conduct of each burn so the Corps will be prepared to respond to any lake management or safety issues associated with the smoke that will be generated. The Resource Manager for J. Percy Priest Lake may be contacted at (615)889-1975.

- Smyrna Municipal Golf Course – The golf course, owned and operated by the City of Smyrna, is located less than a quarter of a mile southwest of the VTS-S, on the far side of the Smyrna Airport. It consists of 27 holes and a variety of associated facilities. The golf course should be informed in advance of all prescribed burns so that appropriate arrangements can be made to provide information to golf course users on the days the burns are conducted. This can be

accomplished by contacting the course Golf Pro at either (615)459-2666 or hal.loflin@townofsmyrna.org.

6.4 Use of Fire Breaks

Fire breaks can consist of established roads, logging trails, cleared lanes used for the sole purpose of controlled burns, utility rights-of-way, and watercourses. Ideally, fire breaks should be capable of supporting groundcover to guard against erosion when not being used to contain fires. Prior to the conduct of a prescribed burn, the fire breaks should be inspected to ensure that they are in the proper condition to contain the fire. Following the burn, the fire breaks should be inspected again to determine if any remedial measures are needed to prevent erosion and other problems from developing.

To ensure that fire breaks are available when needed, a regular maintenance program must be pursued to maintain the fire breaks in a cleared and open condition, with a minimum of undergrowth and low hanging limbs. The best maintenance scenario exists when the fire breaks serve dual or multiple purposes (i.e., roads, utility rights-of-way, etc.). In such situations, it is possible to distribute maintenance costs to other installation activities instead of having to assign the total costs to the prescribed fire program.

The existing road system provides the basis of the fire break network on the VTS-S. A perimeter fire break should be 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, especially in training areas 2, 4, and 6 because of the high stem density of redcedar in these areas. The new breaks will be developed in conjunction with the planned timber thinning in these training areas – prior to any prescribed burning. Where possible, the fire breaks will eventually function as and be maintained as tank trails. Firebreak construction will be limited in the northeast portion of TA2 due to the presence of several sinkholes and related karst features.

Permanent firebreaks will be constructed with appropriate erosion control features to manage surface water runoff. Those not utilized as tank trails will be maintained in a grassed condition to the extent allowed by the available sunlight penetrating the forest canopy. With the exception of periodic bushhogging, the vegetative cover on these firebreaks will only be disturbed when necessary during the conduct of prescribed burns or in preventing the spread of wildfire. Temporary fire breaks will be cut, as needed, prior to prescribed burns or during wildfire control, in accordance with the no-plow zones (Figure A2.1). These fire breaks will be reclaimed and revegetated as soon as possible following the fire.

The City of Smyrna Gas Department (615/459-2553) has a large meter on their gas line that crosses a portion of TA4. A firebreak should be constructed around this utility feature and care should be exercised in conducting any prescribed burn in its vicinity. Cannon Cemetery is located in the northwestern portion of VTS-S in TA6. A firebreak should be constructed around the periphery of the cemetery, beyond the 50 buffer zone, to protect it during prescribed fire events.

There are culturally significant earthen features in TA5 that are designated No Plow zones (see Figure A2.1) and in which, no firebreaks may be constructed. These features are not sensitive to fire.

6.5 Training and Crew Requirements

Prescribed fire personnel will follow the training set forth in the PMS-310-1 (<http://www.nwccg.gov/pms/docs/docs.htm>). The following positions should be filled during operations:

- Prescribed Fire Crew Members (VTS-S personnel with FFT2 training)
- Prescribed Fire Burn Boss (1, 2, or 3) depending on complexity

- 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 Tennessee Division of Forestry.

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?
- Were 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 transects with photo points may be established to monitor and measure tree densities and plant composition. Observations of rare species reaction to fire management will be noted.

6.9.2 Fire effects monitoring 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. The general prescription for prescribed burning in the open grassland areas of VTS-S is presented in Table A2.3, for cedar stands in A2.4, and the prescription for burning the hardwood forest habitat of the training site is presented in Table A2.5.

Table A2.3. Prescription for controlled burns in grasslands, fields, and forest openings.

Stand Description:	Overstory	None to scattered trees
	Understory	Grasses and small brush
	Fuels	1, 2, 3
	Topography	Gentle rolling hills to flat
Weather Range	Surface wind (dir/speed)	North, West, South at 5 – 8 mph
	Transport wind (dir/speed)	Greater than 5 mph
	Mixing height	Greater than 500 m
	Stagnation index	0 – 3 daytime
	Relative humidity	35 – 55 %
	Temperature	High 70°F Low 30°F
	Start time	9:30 am (or as soon as permit allows)

Table A2.4. Prescription for controlled burns in eastern redcedar stands.

Stand Description:	Overstory	Mainly redcedar trees
	Understory	Grasses and cedar needles
	Fuels	4, 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	30 – 45 %
	Temperature	High 80°F Low 30°F
	Start time	9:30 am (or as soon as permit allows)

Table A2.5. Prescription for controlled burns in hardwood stands.

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-S are presented in Table A2.6. Recommended fire frequency is depicted for all burn units in Figure A2.3. 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 1 of the INRMP).

The open grasslands of the training site will be subject to a 2 year fire rotation. Forest stands that are dominated by eastern redcedar will also be burned on a 2 year rotation, but not until after these stands have been thinned through timber harvest. The hardwood stands (generally along the shoreline) will only be burned every 6 years, and the 50 foot buffer zone along the lake or creek will not be burned at all. Table A2.6 is subject to minor changes if timber harvests are not completed on schedule.

Table A2.6: Approximate Burn Schedule.

Year	Burn Units						Total Acreage
	2 yr rotation		3 yr rotation*		6 yr rotation		
1	4-2	5	4-5	9	2-5	71	115
	6-1	15	6-6	15			
2	5-6	1	2-2	42	6-3	22	89
	6-2	14	4-6	10			
3	4-2	5	2-3	26	5-3	11	92
	6-1	15	4-3	8			
			4-7	8			
			6-7	19			
4	5-6	1	4-5	9	6-5	21	60
	6-2	14	6-6	15			
5	4-2	5	2-2	42	5-2	34	106
	6-1	15	4-6	10			
6	5-6	1	2-3	26			66
	6-2	14	4-3	8			
			4-7	8			
			6-7	19			

* Stands in the 3-yr rotation group will not be subject to prescribed burning until after stand thinning or timber harvest.

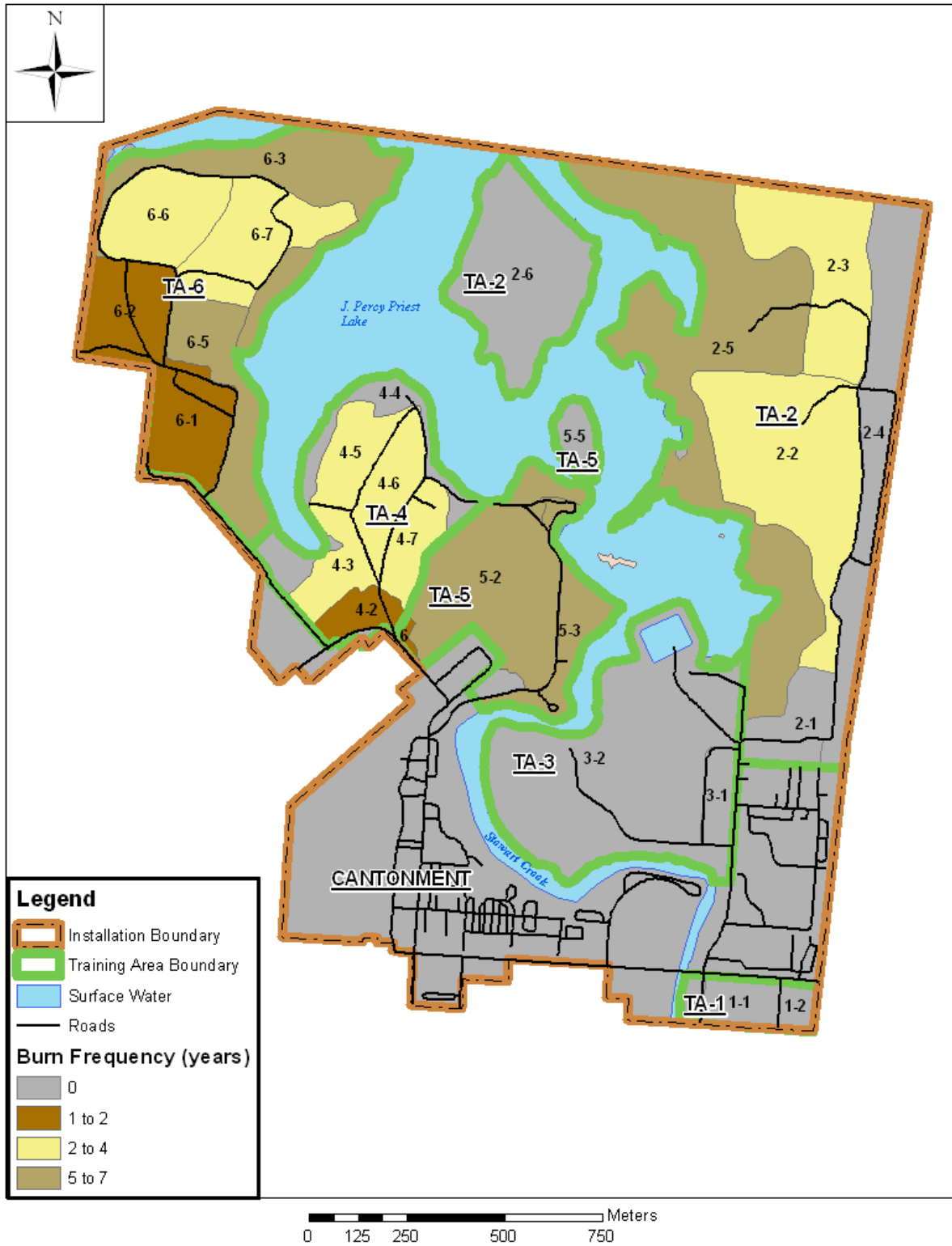


Figure A2.3: Prescribed burn frequency for burn units on VTS-S

7.0 ATTACHMENTS

7.1 Reference Materials

Department of Army Memorandum. 4 Sep 2002, Army Wildland Fire Policy Guidance.

Department of Army Memorandum. 2 Sep 2005, Sustainable Range/Installation Environmental Activities Matrix.

Interagency Prescribed Fire – Planning and Implementation Procedures Guide (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.

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

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

Weather Information

Spot Weather Forecast, <http://spot.nws.noaa.gov/cgi-bin/spot/spotmon?site=ffc>

General Forecast, <http://www.srh.noaa.gov/ffc/html/firewx.shtml>

Middle Tennessee Fire Weather, <http://www.srh.noaa.gov/bna/firewx.php>

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

	YES	NO
Has the area (inside and outside the unit) experience unusual drought conditions or does it contain above-normal fuel loadings which were not considered in the prescription development? If YES, go to question below. If NO, continue with Section B.		
If YES, have appropriate changes been made to plans for ignition, holding, mop-up, and patrol? If YES, continue with Section B. If NO, stop and consult Fire Manager.		

B. Prior to Crew Briefing:

- Fire Unit is as described in plan
- Copy of burn plan is on site
- Certified Burn Boss present; Permit obtained (#_____)
- Required number personnel present, with required PPE
- Weather forecast obtained & within prescription; Long-range forecast checked for chance of severe weather
- Official & neighbor notifications complete
- Required equipment for holding, weather monitoring, ignition, & suppression is on-site & functioning
- Crew has reviewed equipment
- Planned ignition & containment methods are appropriate for current & predicted conditions
- Planned contingencies & mop-ups are appropriate for current & predicted conditions
- List of emergency phone numbers are in each vehicle
- Off-site contingency resources are operational and available

C. Crew Briefing:

- Prescribed Fire Objectives
- Burn Unit size & boundaries
- Burn unit hazards & safety issues
- Expected weather & fire behavior
- Organization of crew & assignments
- Methods of ignition, holding, mop-up, communications
- Contact with the public; Traffic concerns
- Safety & medical plan
- Location of back-up equipment, supplies, & water
- Contingencies for escaped prescribed fire
- Contingencies for medical emergency

D. Prior to Ignition:

- On-site weather and fuel conditions are within prescription & consistent with forecast
- Test burn conducted; fire & smoke behavior within prescribed parameters.

Burn Boss: _____

Date: _____

1. Burn Objectives

2. Location and Physical Description (Attach map)

A. Site_____ **Training Area**_____

B. Size_____

C. Topography / Slope_____

D. Project Boundary_____

E. Complexity_____

3. Vegetation / Fuels Description

A. On-site Fuels

Vegetation Types	Fuel Models	% of Unit Area	% Slope	Aspect

B. Adjacent Fuels

Vegetation Types	Fuel Models	% of Unit Area	% Slope	Aspect

4. Description of Unique Features

A. Natural:_____

B. Cultural:_____

5. Special considerations (fences, power poles, ...):

6. Prescription

A. Environmental Prescription: _____

B. Fire Behavior Prescription: _____

7. Fuel and Weather Prescription (acceptable ranges)

Fuel Parameters	Prescription MIN/MAX	Forecast* MIN/MAX	Test Fire	Rx Burn
1-Hour Fuel Moisture (%)				
10-Hour Fuel Moisture (%)				
100-Hour Fuel Moisture (%)				
Live Fuel Moisture (%)				
Other (e.g., KBDI, live/dead ratio,...)				
Weather Parameters				
Air Temperature (°F)				
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	
Tennessee Division of Forestry		Telephone	800-337-3157
Smyrna Fire Department		Telephone	615-459-6644
Smyrna Airport		Telephone	615-459-2651
Smyrna Airport Fire Department		Telephone	615-220-8841
USACE Percy Priest Lake Office		Telephone	615-889-1975
Smyrna Golf Course		Telephone	615-459-2666
Rutherford County Sheriff		Telephone	615-898-7771
Smyrna Police Department		Telephone	615-459-6644
Tennessee State Patrol		Telepone	615-741-3181

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 3

INVASIVE PEST PLANT CONTROL
VTS-SMYRNA

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1.0 INTRODUCTION

1.1 Background

As in most other regions of the world today, VTS-Smyrna suffers from infestations of invasive exotic pest plants. These pest species are causing significant changes to the natural vegetation communities and wildlife found on the site which, in turn, impacts the suitability and sustainability of the facility for military mission training. They are pervasively found in open areas along roadsides, streambanks, and other clearings as well as in the densely shaded understories of forested training areas.

Invasive exotic pest plants are species that evolved in other regions of the world but have become established in a new area where the lack of natural predators, diseases, and other controls allows them to thrive. The primary problem species at VTS-S include privet (*Ligustrum vulgare* and *L. sinense*), Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus umbellata*), silver thorn olive (*E. pungens*), sericea lespedeza (*Lespedeza cuneata*), mimosa (*Albizia julibrissin*), Japanese Grass (*Microstegium vimineum*), Johnson grass (*Sorghum halepense*), and tree of heaven (*Ailanthus altissima*). Sparse infestations of Fuller's teasel (*Dipsacus fullonum*), woolly mullein (*Verbascum thapsus*), winter creeper (*Euonymus fortunei*), and white poplar (*Populus alba*) exist on VTS-S but can be eradicated with prompt application of mechanical and/or chemical controls.

This annex provides more detailed information on each of these problem species, including recommended methods of control. It also outlines the plan of attack for controlling these species on the training site, to be

implemented as funding allows. It is important to note that complete eradication of widespread invasive plant species is nearly impossible and is cost-prohibitive. Small, confined occurrences may be completely eliminated by prompt, decisive action; however, with well-established populations (e.g., the privet and Japanese grass on VTS-S) the only feasible goal is to contain and thin the infestation and hopefully prevent it from spreading further. Both eradication and control will take multiple years of repeated treatment to achieve.

The control plan on VTS-S will be a two-tiered approach: first, small occurrences (white poplar, tree-of-heaven, mimosa, winter creeper, woolly mullein, Canada thistle, Fuller's teasel) will be identified and treated on a training area-by-training area basis, and second, the larger infestations (privet, honeysuckle, Nepal grass, etc.) will be treated on a species basis in manageable sections. The spatial occurrence of the invasive species is described in more detail below. Control methods will typically use a combination of mechanical (cutting, pulling, mowing) and chemical (herbicide) means.

1.2 Objectives

The objective of this plan is to provide effective control of invasive exotic pest plants on the VTS-S, limiting the areas infected by exotics and allowing the native vegetation communities to reestablish themselves.

Factors guiding the eradication program:

- Eradication and suppression efforts will be coordinated and scheduled to avoid interference with training events
- There should be no detrimental environmental impact resulting from this control effort
- Limited vegetation removal may occur but will not be done in a manner destructive to the stability of the lake, stream bank, or the ecosystem present. Only herbicides labeled for application to water will be applied within 100 feet of any recognized waterway.
- Small or new infestations should be treated with the intent of complete eradication.

1.3 Species Targeted for Suppression

Invasive plant species are successful invaders because they generally grow rapidly, create large amounts of seed, and are thus positioned ecologically to exploit the greater amount of light found on the edges of man-made and natural openings as well as all disturbed areas. In this case the invasive species are adept at exploiting available light and space in the edges of roads and other breaks and openings in the forest canopy. The roads and openings of the forested and woodland portion of the VTS-S have provided many places for invasive plant species to seed into and dominate.

The Tennessee Exotic Pest Plant Council (TN-EPPC) has also developed a list of invasive plants and ranked them according to the threat that they pose. TN-EPPC recommends that Rank 1 and Rank 2 species be controlled and managed in the early stages of detection when possible. The classification of each invasive plant species observed at VTS-S is noted in the list below. Abundance of the invasive species in the aggregation was coded Dominant, greater than 50%, Present, 10 to 50 %, and Sparse, less than 10%.

Table A3.1 is a summary of the invasive species observed at the VTS-S site during the 2005 invasive species survey. It is organized alphabetically by species observed.

Table A3.1: Invasive exotic plant species observed on VTS-Smyrna (from Dynamic Solutions 2005).

Scientific Name	Common Name	TEPPC Ranking	Abundance at VTS-S
<i>Ailanthus altissima</i>	tree-of-heaven	Rank 1: Severe Threat	Present in TA-6, TA-2, TA-5, and TA-4 along roads, perimeter boundaries, and increasingly in the understory.
<i>Albizia julibrissin</i>	mimosa	Rank 1: Severe Threat	Present in TA-1, TA-2, TA-4, and TA-6 generally in edges of roads and openings.
<i>Cirsium arvense</i>	Canada thistle	Rank 2: Significant Threat	Sparsely throughout VTS-S.
<i>Dipsacus fullonum</i>	Fuller's teasel	Rank 2: Significant Threat	Sparsely in isolated location in TA-4.
<i>Elaeagnus pungens</i>	silver thorn olive	Rank 1: Severe Threat	Present in edges of TA-2 and pervasively present in TA-4, TA-5, & TA-6.
<i>Elaeagnus umbellata</i>	autumn olive	Rank 1: Severe Threat	Present in edges of TA-2 and pervasively present in TA-4, TA-5, & TA-6.
<i>Euonymus fortunei</i>	winter creeper	Rank 1: Severe Threat	Present in ornamental plantings and along Stewart Creek in the cantonment and sparsely in the under story of TA-5.
<i>Lespedeza cuneata</i>	sericea lespedeza	Rank 1: Severe Threat	Dominant in open grassy and open wooded areas and along roads.
<i>Ligustrum sinense</i> &/or <i>Ligustrum vulgare</i>	privet	Rank 1: Severe Threat	Pervasively present in edges and understory of TA-2, TA-4, TA-5, and TA-6.
<i>Lonicera japonica</i>	Japanese honeysuckle	Rank 1: Severe Threat	Present in edges and understory of TA-2, TA-4, TA-5, and TA-6.
<i>Microstegium vimineum</i>	Japanese grass; microstegium	Rank 1: Severe Threat	Dominant as shaded understory of all training areas.
<i>Populus alba</i>	white poplar	Rank 2: Significant Threat	Sparsely in one isolated population in TA-2.
<i>Rosa multiflora</i>	multiflora rose	Rank 1: Severe Threat	Present in all training areas.
<i>Sorghum halepense</i>	Johnson Grass	Rank 1: Severe Threat	Pervasively present in open sunny areas of all training areas and lawns of cantonment.
<i>Verbascum thapsus</i>	wooly mullein	Rank 2: Significant Threat	Sparsely in isolated population in TA-6.

2.0 CONTROL PLAN

2.1 Small Infestations

The several small infestations of white poplar, winter creeper, Fuller's teasel, wooly mullein, tree-of- heaven, and mimosa will be treated first, with the goal of complete eradication of these species on VTS-S.

White poplar occurs at VTS-S in a population at the south end of Training Area 2 (TA2). Large trees will be treated with Garlon 3A via either the cut stump method or by basal bark application. Both methods are effective throughout the year, as long as the ground is not frozen. Small trees and sprouts will be treated in the summer with a foliar application of glyphosate. Individual, isolated saplings may be effectively removed by hand pulling, as long as the entire root is extracted.

Winter creeper occurs in a few locations in the cantonment, around ornamental landscape trees and within the vegetative buffer along Stewart Creek and J. Percy Priest Lake. Effective control of this species should be achieved by initial hand cutting in August followed by foliar application of Garlon 4 in the winter. This will be repeated annually for several years. Cutting the vine to the ground prior to spraying will minimize fruit and seed development.

Fuller's teasel has been found in one isolated location just west of the entrance gate to Training Area 4. Hand or spade pulling is the most practical removal method for such a small population as this. Mowing the plants to the ground in early summer prior to flowering may also be an effective means of control.

Woolly mullein is found along road edges and Cannon Cemetery in Training Area 6. It will be treated by hand pulling in early spring (March – May). Plants will be bagged for disposal and, as mullein seed germination requires bare ground, the areas in which it is occurring will be sown with an appropriate native grass and forb seed mixture. These areas will be scouted and treated annually for several years until the seed bank is exhausted.

Tree-of-heaven and mimosa will be treated at the same time. A crew will travel the road system of the training site during the late summer or mid-winter and treat all individuals of these species that they encounter, and as documented in the 2005 survey. Tree-of-heaven has previously been found in TAs 2, 4, 5, and 6, while mimosa has been documented in TAs 1, 2, 4, and 6. Both species are generally found along roads and streambanks, in open areas, and along cleared property boundary lines. Large trees will be stem-injected or felled and the stump treated with Garlon 3A. Saplings will be basal-bark treated with Garlon 4. The following summer, a crew will return to treat all sprouts and seedling with a foliar spray of Garlon 4.

2.2 Extensive Infestations

A number of invasive species have become thoroughly established on the VTS-S and are unlikely to ever be completely removed. The goal of this program is to bring those infestations under control, reducing the numbers of exotic plants, rehabilitating native communities that have been affected, and limiting further spread of the invasives. The principle species falling under this category are privet, silver thorn and autumn olive, Japanese grass, Japanese honeysuckle, multiflora rose, and an open-areas combination of sericea lespedeza and Johnson grass.

For each of these species, the control effort will be intensive and require several years of effort. It would be most efficient to have a firm commitment of manpower and funding for at least 3 years' work prior to initiating any control efforts. A single year of effort without follow-up will have little long-term impact on the invasive species and will represent wasted effort and money.

In addition to the control efforts, it will be necessary to be prepared with a plan for reestablishing native vegetation once the invasives have been cleared. Native species restoration plans will be developed individually for areas requiring such. Restoration efforts will utilize all native species and will involve a minimum of soil disturbance.

2.2.1 Silver thorn and autumn olive

Both silver thorn and autumn olive are found pervasively throughout the training site, absent only from the cantonment and TA1. The two species are commonly found together at the facility, at times dominating open woodlands. Populations are found with greater size and density as one moves east to west across the site; that is, olives are much more prevalent in TA6 than in TA4, and in TA4 than in TAs 5 or 2. Control, therefore, will begin in TA2 and proceed westward with efforts directed at roadsides, open areas, and forest boundaries. For infestations with large quantities of low-growing leaves, a foliar spray of Arsenal AC will be applied. If stems

are too tall for this method to be effective either basal bark application of Garlon 4 or cut stump treatments of Arsenal AC would be more appropriate. This effort should be conducted in mid winter. The following summer, a return visit will be made to treated areas to foliar spray sprouts with Arsenal AC. See Table A3.2 for the herbicide concentrations to be used for each method.

2.2.2 Privet

Privet occurs pervasively in every training area on VTS-S and in the cantonment. It is found within a wide range of environmental conditions: from sunny, shallow-soiled streambanks to densely shaded cedar woodlands to open fields and roadsides. While open areas tend to yield larger, fuller privet plants, extremely dense populations of smaller plants are also present in the forest understory of all training areas. As roadsides and streambanks are generally easier to access, efforts to control privet will begin in these areas. Control will begin along the banks of Stewart Creek and J. Percy Priest Lake and then along all major roads within the training sites. Additional control efforts will focus on forest openings in the training areas. Individual plants less than 5" dbh will be treated with a basal bark spray of Garlon 4. Larger stems will be cut and immediately stump treated with Arsenal AC. This process will be repeated in manageable chunks starting with the Stewart Creek shoreline in the cantonment, working around the edges of the lake, and then moving inland to treat roadways and clearings within the training areas. This effort should be conducted in mid winter. The following late summer, a return visit will be made to treated areas to foliar spray sprouts with Arsenal AC. See Table A3.2 for the herbicide concentrations to be used for each method.

The same program will need to be repeated each winter for several years.

If there are areas of infestation in which little to no desirable vegetation remains, and that are at least 50 feet from any shoreline, the gyrotrack or similar equipment may be used to mow down the privet while leaving any other trees and shrubs standing, as possible. This should be conducted in summer when the ground is dry but before seed set. This will be followed up in the fall with broadcast foliar application of Arsenal AC to the sprouts.

2.2.3 Japanese grass

Japanese grass occurs in low-lying, shaded areas throughout VTS-S. It dominates the understory in all bottomland forests and along partly to densely shaded roadsides. It does not appear to be as pervasive in areas regularly inundated by the lake. Management will be concentrated along roadsides and shorelines where sunlight is greater and competition from other plants suppresses population densities.

Treatment will consist of foliar application of herbicide; the type used will depend on the surrounding vegetation. Glyphosate will be used where there is little desirable vegetation mixed with the Japanese grass. Sethoxydim, a grass selective herbicide, will be applied in locations where native herbaceous vegetation is still present. Treatment will be made in early June, with a second application in late July of the same year to ensure complete kill. Care will be taken to avoid drift onto the waterways (e.g., using a coarse spray, not conducting control activities near water on windy days). Sites will be inspected the following June for new germination. Complete removal will require several years to exhaust the seedbank.

Areas that are accessible and also sufficiently dry may be treated without chemicals by mowing in August. This method requires careful timing to remove the flowers before seed set but late enough to negate the possibility of new flower development. This method will also require several years of repeat treatments to exhaust the seedbank.

Areas that were heavily infested with Japanese grass will need to be reseeded or planted with native species to minimize the available space for re-invasion.

2.2.4 Japanese honeysuckle

Japanese honeysuckle is also present throughout the training site. It is found in all light regimes; however, populations are typically denser along forest edges, where more light is available. The first stage of control will be to treat infestations along roads and streambanks. Foliar spray with Garlon 3A will be conducted in the late fall. Care will be taken to avoid drift onto the waterways (e.g., using a coarse spray, not conducting control activities near water on windy days). Areas will be checked the following summer to determine the need for retreatment with the same prescription.

2.2.5 Open areas complex

Most open fields and roadsides around the training site are infested with some combination of sericea lespedeza, Johnson grass, and Canada thistle. Control of these species will be undertaken in combination with an effort to restore native grasses where feasible on the training site. Small arms ranges and lawns are typically not appropriate locations for native warm season grasses, due to their tall growth form. Such areas will be maintained with the existing mixtures of fescue, bermudagrass, crabgrass, and similar species. Canada thistle will be spot treated with glyphosate or Garlon when found in these areas.

Less manicured open areas (e.g., the open fields surrounding the small arms range and the M203 range, both in TA6) may be treated for invasive pest plants in preparation for reseeding native warm season grasses. A mixture of glyphosate and imazapic applied in the spring, followed by prescribed burning should control the fescue sufficiently so that native warm season grasses may be seeded and successfully established in these fields.

2.3 Environmental Precautions

VTS-S is bisected by the connected waters of Stewart Creek and J. Percy Priest Lake, the latter of which serves as a municipal drinking water source for numerous communities in the area. Protecting stream habitat from both chemical pollutants and sedimentation is of utmost importance.

- There will be no herbicide applications to water unless the chemical is labeled for aquatic use
- Within 25 feet of water, only stem treatments will be used to minimize risk of drift
- Foliar treatments will be avoided in any situation where the spray would be carried toward water
- At all times, care will be taken to minimize pesticide drift to desirable vegetation
- Where possible, dead vegetation will be left standing on the creek banks
- There will be no stump removal on creek banks
- Where creek bank vegetation is composed of more than 50% invasive species, revegetation and bank stabilization will be conducted immediately following IPP control

All label requirements will be followed, as will state and DoD pesticide regulations. Only state or DoD certified applicators will apply herbicides for IPP control. Non-certified personnel may help with non-chemical aspects of control, but will be briefed on pesticide safety prior to initiating work.

Due to the presence of Air Force Base-era landfills on Training Area 3, this parcel is designated as a restricted use area and is off limits to training and all other TNARNG activities. For this reason, Training Area 3 was omitted from the Invasive Plant Species Survey conducted in 2005, from which much of the baseline data for this plan was derived, as well as from the most recent Vegetation Community Survey (AMEC 2007).

Therefore, little data is available regarding the extent of invasive pest plants in this training area. While pest plant issues on TA3 are most likely the same or very similar to those in all other regions of the VTS-S, control efforts will not be initiated until the status of this area has been revised by the U.S. Army Corps of Engineers.

2.4 Personal Protective Equipment (PPE)

Personnel who handle and/or apply pesticides are required to wear personal protective equipment and clothing designated on the herbicide label IAW the Federal Insecticide, Fungicide, and Rodenticide Act (40 CFR 162), Occupational Safety and Health Standards (29 CFR 1910), and DOD Directive 4150.7. Such protective devices include masks, respirators, gloves, goggles, and protective clothing necessary for the pest management operations being conducted and the pesticides used.

2.5 Treatment Methods

Cut stump

The cut stump method is a method used for trees and woody shrubs greater than 5" dbh. The tree is cut down, leaving a stump 2 to 6 inches high (excessive stump height can limit the effectiveness of this method). The appropriate herbicide solution is applied to the outer 20% of the freshly cut stump within a few minutes, if possible. (After 2 hours, a basal bark treatment with penetrant will have to be applied.) Apply the appropriate herbicide solution to the outer 20% of the stump's cut surface. All stems coming from the base or roots of the plant should be cut and treated at the same time.

The cut stump method is most effective when the plant is actively growing but not during the first flush of spring growth. Therefore, cut stump treatments may be initiated in late April to early May and continue through the summer. Cut stump can also be applied during the dormant season.

Stem injection

Stem injection is another method for use on large trees and shrubs. Incision cuts are made downward into the stem, and herbicide is applied into the cut. With hard to control species, the cuts should completely frill the stem. There is less physical effort required for this method as opposed to completely cutting down the tree, but it leaves a dead snag standing, which may be beneficial or not depending on the situation.

Like cut stump, stem injection is most effective in late winter or throughout the summer. It should not be utilized during the heavy spring sap flow.

Basal bark spray

The basal bark method is a recommended method for controlling young trees with smooth bark (generally individuals under 5" dbh). A 6 to 12 inch band of herbicide is applied around the circumference of the tree trunk approximately one foot above ground level. The width of the sprayed band depends on the size of the tree and the species' susceptibility to the herbicide. Ester formulations are most effective due to their ability to readily pass through tree bark. Esters are volatile and care must be taken to follow the label – avoid ester formulations on hot days because vapor drift can injure nontarget plants. A chemical penetrant should be included in the herbicide mixture.

Basal bark applications are usually made in late winter and early spring, when leaves do not interfere with trunk access. This method is effective during the summer, but much more difficult.

Foliar spray

The foliar spray method can be used for all target species not in close proximity to environmentally sensitive areas. This method is most effective in areas where there is a low density of desirable vegetation. Care must be taken to use appropriate spray equipment with sufficient droplet size to minimize drift to nontarget plants. Handheld sprayers can only treat plants up to about 6' in height. Leaves should be wet thoroughly but not to the

point that herbicide runs off and impacts non-target species. Air temperature should be above 65 F to ensure absorption of herbicides.

Foliar sprays should not be used on windy days. Care must be taken to minimize threat to surrounding nontarget vegetation and other sensitive sites (riparian areas).

The foliar spray method only works when the plant has full or near full leaf cover and is most effective from mid-summer to late fall, depending on the target species' life cycle. Evergreen or semi-evergreen species like privet and honeysuckle can be treated in the late fall to winter, as well, as long as they retain a significant portion of their leaf cover.

2.6 Herbicides

Table A3.2 reflects the recommended herbicide and standard concentration to use per plant species and the primary method of control. These recommendations must be corroborated with the concentrations approved on each product label. **The label is the law.**

Table A3.2: Herbicide concentrations for use on VTS-S invasive pest plants.

Species	Season	Method	Chemical	Concentration	Additive
Canada thistle	July	Foliar/Mowing	Glyphosate	2%	Surfactant
Japanese honeysuckle	Late fall	Foliar	Garlon 3A	5%	Surfactant
Japanese grass	June & July	Foliar	Glyphosate	2%	Surfactant
	June & July	Foliar	Sethoxydim	Label	
Mimosa	Fall/winter	Cut stump	Garlon 3A	Label	
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Garlon 4	2%	Surfactant
Multiflora rose	Summer	Sprout-Foliar	Garlon 3A	Label	
	Summer/Fall	Basal bark	Garlon 4	20%	Basal oil + penetrant
Olives	Summer	Foliar	Arsenal AC	1%	Surfactant
	Mid winter/summer	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Fall/winter	Cut stump	Glyphosate	20%	Surfactant
Princess tree	Fall/winter	Cut stump	Glyphosate	Label	
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Garlon 4	2%	Surfactant
Privet	Fall/winter	Cut stump	Arsenal AC	10%	Surfactant
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Arsenal AC	1%	Surfactant
Tree-of-heaven	Fall/winter	Cut stump	Garlon 3A	Label	
	Fall/winter	Basal bark	Garlon 4	20%	Basal oil + penetrant
	Summer	Sprout – Foliar	Garlon 4	2%	Surfactant
White poplar	Summer	Foliar	Glyphosate	2%	Surfactant
	Fall/winter	Cut stump	Garlon 3A	Label	
	Fall/winter	Basal bark	Garlon 4	Label	
Winter creeper	August	Hand cut	N/A	N/A	N/A
	Winter	Foliar	Garlon 4	2%	Surfactant

3.0 DETAILED PLANT SPECIES LIST AND PRESCRIPTION

Ailanthus altissima (tree of heaven)

- Description:** Tree of heaven is a rapidly growing small tree but can reach up to 80 feet in height and 6 feet in diameter. It has pinnately compound leaves that are 1-4 feet in length with 10-41 leaflets. Tree of heaven resembles the sumacs and hickories, but is easily recognized by the glandular, notched base on each leaflet. It is extremely tolerant of poor soil conditions and has been known to grow even in cement cracks. It cannot grow in heavily shaded conditions but thrives in disturbed forests or edges. Dense clonal thickets displace native species and can rapidly take over fields and meadows.
- Extent of the Infestation:** Population rapidly increasing at VTS-S. Occurs frequently along roadsides and forest edges in TA-6, with small populations observed in TA-2 along the edge near the eastern boundary fence and scattered populations in TAs 4 and 5.
- Specific Control Prescription:** Small trees may be effectively controlled by hand pulling. Pulling may be done any season. Moist soil facilitates pulling.



During growing season, re-inspect pulled sites in 30 days for regrowth from unpulled roots. Larger trees should be cut at the stump during the growing season. Treat the cut stump immediately with Garlon 3A applying a 2% solution of herbicide and water to the cut stump, making sure to cover the outer 20% of the stump. As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.



Present in Training Areas	
2	4
5	

***Albizia julibrissin* (mimosa)**

- **Description:** Mimosa is a small tree that is 10 to 50 feet in height, often having multiple trunks. It has delicate looking bi-pinnately compound leaves that resemble ferns. Mimosa has very showy, pink flowers that are fragrant, giving way to small, flat bean-pod like fruits. Mimosa invades any type of disturbed habitat. It is commonly found in old fields, stream banks, and roadsides. Once established, mimosa is difficult to control due to the long-lived seeds and its ability to re-sprout vigorously.
- **Extent of the Infestation:** Mimosa occurs sparsely along riparian zone of Stewart Creek and along edges and roads in TAs 1, 2, 4, and 6.
- **Specific Control Prescription:** Small trees may be effectively controlled by hand pulling any time of year. Areas where pulling has been done should be re-inspected during the growing season after 30 days to look for sprouts.



Larger trees should be cut at the stump. Treat the cut stump immediately with Garlon 3A applying a 25% solution of herbicide and water to the cut stump making sure to cover the outer 20% of the stump.

As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.



Present in Training Areas	
1	2
4	6

***Cirsium arvense* (Canada thistle)**

- **Description:** Canada thistle is a tall, erect, spiny herbaceous plant that grows to 4 feet tall. It has an extensive creeping rootstock. The leaves are lance-shaped, irregularly lobed with very prickly margins. The stems are ridged and hairy. The flowers are purple to white and can be up to .5 inch in diameter. The small seeds, called achenes, are 1 to 1.5 inches long and have a feathery structure attached to the base, which lets them float through the air. Canada thistle can invade a variety of open habitats including prairies, savannas, fields, pastures, wet meadows, and open forests. It forms dense stands, which can shade out and displace native vegetation. Once established it spreads rapidly and is difficult to remove.
- **Extent of the Infestation:** Canada thistle occurs sparsely throughout entire training site. It blooms in late August to early-September and is easier to locate during that time.
- **Specific Control Prescription:** Canada thistle control can be achieved through hand cutting, mowing, and controlled burning, and chemical means, depending on the level of infestation and the type of area being managed. Due to its perennial nature, entire plants must be killed in order to prevent regrowth from rootstock. Hand cutting of individual plants or mowing of larger infestations should be conducted prior to seed set and must be repeated until the starch reserves in the roots are exhausted. Because early season burning of Canada thistle can stimulate its growth and flowering, controlled burns should be carried out late in the growing season for best effect.



In natural areas where Canada thistle is interspersed with desirable native plants, targeted application of glyphosate may be effective. For extensive infestations in disturbed areas with little desirable vegetation, broad application of this type herbicide may be the most effective method. Repeated applications are usually necessary due to the long life of seeds stored in the soil.



Present in Training Areas	
1	2
3	4
5	6
Cantonment	

***Dipsacus fullonum* (Fuller's Teasel)**

- **Description:** Fuller's Teasel grows as a basal rosette of leaves for a minimum of one year, then sends up a flowering stalk and dies after flowering. During the rosette stage, leaves are oval or oblong. Leaves may be "hairy" in older rosettes. Common teasel blooms from June through October. Flowering plants have large, oblong, opposite, sessile leaves that form cups (the cups may hold water) and are prickly. Stems also are prickly. Teasel's unique flower head makes the plant easy to identify when blooming. Flowers are small and packed into dense, oval-shaped heads at the tip of the flowering stems and usually have purple flowers. Flowering stems may reach six to seven feet in height. A single teasel plant can produce more than 2,000 seeds. Teasel grows in open sunny habitats. It sometimes occurs in high quality prairies, savannas, seeps and sedge meadows, though roadsides, dumps and heavily disturbed areas are its most common habitats.



- **Extent of the Infestation:** One isolated population of teasel occurs to the west of the entrance gate to TA-4.
- **Specific Control Prescription:** For small populations such as this one, mechanical methods work quite well. Young rosettes can be dug up using a dandelion digger. Just as in digging up dandelions, as much of the teasel root needs to be dug up as possible. Once the rosettes get large, it is difficult to dig the roots up without damaging the area around the plant. Very small seedlings can be pulled up by hand when the soil is moist.

Flowering plants can be cut before seed set slightly below ground level. Bag and dispose of burn all seed heads. Cutting off the flowering stalks just at flowering time will usually prevent resprouting from the root crown. Cutting flowering stalks prior to flowering should be avoided since the plants will resprout and flower again. A later inspection should be performed to catch any root crowns that do resprout. It may take three to five years of control efforts to exhaust the seed stock.



Present in Training Area
4

***Elaeagnus pungens* and *Elaeagnus umbellata* (silver thorn olive and autumn olive)**

- **Description:** Silver thorn olive is a dense evergreen shrub that has invaded natural areas throughout the southeastern United States. The shrub is often multi-stemmed. Short, sharp shoots give it a thorny appearance. The alternate leaves are oval to elliptical in shape with irregular wavy margins and silvery surfaces. The axillary clusters of small, white to brown flowers give way to small, red fruit that are dotted with small brown scales. Closely resembles autumn olive. A high shade tolerance allows thorny olive to invade both in open areas as well as under forest canopies. The seeds are dispersed by animals, giving this plant the potential for rapid spread.



- Autumn olive is a deciduous shrub from 3 to 20 feet in height. It is easily recognized by the silvery, dotted underside of the leaves. Axillary clusters of small, yellowish flowers and red, juicy fruits are abundant. Autumn olive invades old fields, woodland edges, and other disturbed areas. Autumn olive can form a dense shrub layer that displaces native species and closes open areas. This species has been widely planted for wildlife habitat, mine reclamation, and shelterbelts since its introduction to America in 1830.

- **Extent of the Infestation:** Both olive species are present in edge areas in TA-2 and are pervasive in TAs 4, 5, and 6.



- **Specific Control Prescription:** Small plants may be may be effectively controlled by hand pulling any season. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may re-sprout. These species are likely to require mechanical assistance in pulling with tools once they are larger than approximately .25 inches at the root collar.

Larger or un-pullable plants require cutting at ground level with saws. Cutting is most effective when trees have begun to flower to prevent seed production. Cutting is an initial control measure, and success will require either an herbicidal control or repeated cutting of re-sprouting. Cutting during winter and follow-up spraying of resulting tender sprouts in spring and mid-summer is likely to provide effective control.



Treat the cut stump immediately with glyphosate applying a 20% solution of herbicide and water to the cut stump making sure to cover the outer 20% of the stump. As a follow-up when and if stump sprouting occurs, apply Arsenal AC in a 1% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Dispose of all plant parts in bags or by burning.

Present in Training Areas	
2	4
5	6

***Euonymus fortunei* (winter creeper)**

- Description:** Winter creeper, also known as climbing euonymus, is an evergreen, clinging vine. It can form a dense groundcover or shrub to 3 feet in height, or climb 40-70 foot high vertical surfaces with the aid of aerial roots. Dark green, shiny, egg-shaped leaves, from 1 - 2 1/2 inches long, with toothed margins and silvery veins, occur in pairs along the stems. Stems are narrow, minutely warty, and have abundant rootlets or trailing roots. Clusters of inconspicuous green-white flowers are produced on a long stalk from June to July and are followed in the autumn by pinkish to red capsules that split open to expose seeds adorned with a fleshy orange seed coat, or aril.



- Extent of the Infestation:** There are populations of this species in the cantonment: two concentrated occurrences serving as ground cover at the bases of landscape trees in the cantonment and occasional infestations are present within the vegetative buffer maintained along Stewart Creek and J. Percy Priest Lake. Occasional populations of winter creeper may also be found in TA 5 and, in some cases, may actually be large enough to pose a threat to timber species.

- Specific Control Prescription:** For small populations, individual vines should be pulled up by the roots and removed from the area. Follow-up during the winter with an application of 2% Garlon 4. A squirt bottle may be used for spot treatment or individual stumps can be painted by hand using a sponge applicator. Treatment should be in late winter when most native vegetation is dormant and prior to the emergence of spring wildflowers.



Present in Training Areas
Cantonment
5

***Lespedeza cuneata* (sericea lespedeza)**

- **Description:** Sericea lespedeza is an upright semi-woody forb, 3 to 6 feet in height with one to many slender stems. It has thin, alternate, abundant, three-parted leaves. Flowers are small and whitish-yellow. It is an extremely aggressive invader of open areas, out competing native vegetation. Once it is established is very difficult to remove due to the seed bank, which can remain viable for decades. Native to Asia and introduced into the United States in the late 1800s, sericea lespedeza has been widely planted for wildlife habitat, erosion control, and mine reclamation.
- **Extent of the Infestation:** This lespedeza is ubiquitous at VTS-S in open and grassy areas with full sun. Upon close inspection of closely mowed turf areas, it serves as an important component of the mowed “grassy” areas. It is likely that it may have been planted for its erosion control and wildlife habitat benefits. This species is currently recommended by the Tennessee Wildlife Resources Agency under certain conditions for those uses.
- **Specific Control Prescription:** The best control of lespedeza combines both mechanical and chemical treatments. Hand pulling is impractical due to its extensive perennial root system, but mowing plants at the flower bud stage for two to three consecutive years can significantly reduce the vigor of stands as well as control further spread. Mowing followed by an herbicide treatment is likely the most effective option for the successful control.



The herbicides triclopyr, clopyralid, and glyphosate are known to control this lespedeza. Herbicide should be applied in early to midsummer, during the flower bud stage. A 2% triclopyr solution or a 0.5% clopyralid solution is effective at control during the vegetative stage prior to branching or during flowering. Note that lespedeza and Johnson grass were observed to be growing together and any treatment of one will harm or benefit the other, so plan accordingly.



Present in Training Areas	
1	2
3	4
5	6
Cantonment	

***Ligustrum sinense* &/or *Ligustrum vulgare* (privet)**

- **Description:** Privet is a thick, semi-evergreen shrub to 30 feet in height. Trunks usually occur as multiple stems with many long, leafy branches attached at near right angles. Leaves are opposite, oval and .5 to 1.5 inches long. White flowers are very abundant and occur at the end of branches in clusters. Fruits ripen to a dark purple to black color and persist into winter. Although several species occur they are hard to distinguish. It commonly forms dense thickets in fields or in the understory of forests. It shades and outcompetes many native species and, once established, is very difficult to remove.
- **Extent of the Infestation:** Privet is found pervasively throughout the entire training site. It occurs in all settings with better growth and larger plants found where sunlight is more available.



- **Specific Control Prescription:** Privet is mostly evergreen in Tennessee and thus can be identified and treated at any time during the year. Small plants may be effectively controlled by hand pulling. Plants should be pulled as soon as they are large enough to grasp, but prior to seed production. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may re-sprout. Smaller privets are usually easy to pull; larger individuals are likely to require mechanical assistance in pulling.

Mowing or other mechanical reduction of plant mass is effective for providing safer spraying access but is not an effective control by itself. Foliar Spraying can be effective for large thickets of privet where risk to non-target species is minimal. Timing applications for late fall or early spring when many native species are dormant will help minimize damage to non-target species. Generally foliar herbicides offer better control in warmer weather, as plants are growing faster, but privet keeps its leaves which can make it easier to locate when most other plants do not have leaves. To spray, apply a 2% solution of Garlon 4 to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray-drift damage to non-target species.



Larger or unpullable plants require cutting at ground level with saws. Cutting is most effective when plants have begun to flower to prevent seed production. Cutting is an initial control measure, and success will require either an herbicidal control or repeated cutting of re-sprouting.

Present in Training Areas	
1	2
3	4
5	6
Cantonment	

Treat the cut stump immediately with Arsenal AC applying a 10% solution of herbicide and water to the cut stump making sure to cover the outer 20% of the stump. As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

***Lonicera japonica* (Japanese honeysuckle)**

- **Description:** Japanese honeysuckle is a perennial vine that climbs by twisting its stems around vertical structures, including limbs and trunks of shrubs and small trees. Leaves are oblong to oval, sometimes lobed, have short stalks, and occur in pairs along the stem. In Tennessee, Japanese honeysuckle leaves often remain attached through the winter. Flowers are tubular, with five fused petals, white to pink, turning yellow with age, very fragrant, and occur in pairs along the stem at leaf junctures. Stems and leaves are sometimes covered with fine, soft hairs. Japanese honeysuckle blooms from late April through July and sometimes into October. Small black fruits are produced in autumn, each containing 2-3 oval to oblong, dark brown seeds about 1/4 inch across.



- **Extent of the Infestation:** Japanese honeysuckle occurs throughout the training site. It is present across all light regimes and is more dominant in edges where more sunlight is available.
- **Specific Control Prescription:** Mowing and fire are effective at reducing the aboveground mass of plant material, but require herbicide follow-up for effective control of honeysuckle.

Foliar spraying with triclopyr herbicides is very effective for controlling Japanese honeysuckle. Timing applications for late fall or early spring when many native species are dormant will help minimize damage to non-target species. Generally foliar herbicides offer better control in warmer weather, as plants are growing faster, but honeysuckle keeps its leaves which can make it easier to locate when most other plants do not have leaves. To spray, apply a 5% solution of Garlon 4 plus a 0.5% non-ionic surfactant to thoroughly wet all leaves.



Larger or unpullable plants require cutting at ground level with saws. Cutting is most effective when plants have begun to flower to prevent seed production. Re-sprouting is common after treatment. Cutting is an initial control measure, and success will require either an herbicidal control or repeated cutting of re-sprouting.

Treat the cut stump immediately with Garlon 3A applying a 20% solution of herbicide and water to the cut stump making sure to cover the outer 20% of the stump. As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 5% solution to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

Present in Training Areas	
1	2
3	4
5	6
Cantonment	

***Microstegium vimineum* (Japanese grass, Nepalese brown top)**

- **Description:** Japanese grass, also known as Nepalese brown top and other names is an annual plant. It has a sprawling habit and grows slowly through the summer months, ultimately reaching heights of 2 to 3 1/2 ft. (6-10 dm.). The leaves are pale green, lance-shaped, asymmetrical, 1-3 in. (3-8 cm.) long, and have a distinctive shiny midrib. Slender stalks of tiny flowers are produced in late summer (August - September). The fruits or achenes mature soon after flowering and the plant dies back completely by late fall. It forms a dense carpet that chokes out other species and maintains an abundant seedbank.



- **Extent of the Infestation:** *Microstegium* dominates shaded road edges and wooded understories in all training areas. It occurs ubiquitously in shaded, moist soils, but is not present in areas near the lake that are subject to inundation. It will grow well in full sun, but appears to have difficulty competing with other invasives under those conditions.

- **Specific Control Prescription:** Mow plants as close to the ground as possible using a weedeater or similar grass-cutting tool. Treatments should be made when plants are in flower and before seeds are produced. Treatments made earlier may result in plants producing new seed heads in the axils of lower leaves.

Herbicide treatments should be made late in the growing season but before the plants set seed. Treatments made earlier in the growing season may allow a second cohort of plants to produce seeds. Apply a 2% solution of glyphosate to thoroughly wet all foliage. Do not spray to the point of runoff. Ambient air temperature should be above 65°F to ensure translocation of the herbicide to the roots. Do not apply if rainfall is expected within two hours following application. Additional treatments are likely to be necessary to exhaust the supply of seed in the soil.



An alternative chemical treatment is to use grass selective sethoxydim or clethodim. Apply a 1.5% solution of sethoxydim and water plus 1% non-phytotoxic vegetable-based oil to all foliage on a spray-to-wet basis. Do not spray to the point of runoff. Ambient air temperature should be above 65°F. Do not apply if rainfall is expected within one hour following application.

Present in Training Areas	
1	2
3	4
5	6
Cantonment	

***Populus alba* (white poplar)**

- **Description:** White poplar is a tree that, at maturity, may reach 70 feet or more in height and 2 feet in diameter. The smooth, greenish-white bark becomes dark and rough with age. Young green or brown twigs are coated with dense, woolly hair, especially near the tip. A cross-section of the stem reveals five-pointed, star-shaped pith. The 2 to 5-inch long leaves are oval to maple-leaf in shape with 3-5 broad teeth or lobes, and are dark green above and covered with dense white hair below. Male and female flowers are borne in catkins on separate trees and appear in March and April. The small seeds are adorned with cottony fluff that is easily blown by the wind in late spring.
- **Extent of the Infestation:** An isolated population is present adjacent to the large gravel parking area on the south end of TA-2.
- **Specific Control Prescription:** White poplar can be controlled using a variety of physical and chemical controls. Removal of seedlings and young plants by hand will help prevent further spread or establishment. Plants should be pulled as soon as they are large enough to grasp. The entire root system of these pulled plants, or as much of it as possible, should be removed to prevent resprout from fragments. Hand removal of plants is best achieved after a rain, when the soil is loose.



Trees of any size may be felled by cutting at ground level with power or manual saws. Because resprouts are common after cutting, this process may need to be repeated many times until the reserves of the tree are exhausted. Girdling, which kills the tree by severing tissues that conduct water and sugars, also may be effective for large trees, especially if accompanied by application of a systemic herbicide to the cut area. A hatchet or saw is used to make a cut through the bark encircling the base of the tree, approximately six inches above the ground and deep into the bark. Girdling will kill the parent tree but may require follow-up cutting or treatment of sprouts with an herbicide.

Chemical control of white poplar seedlings and small trees has been achieved by applying a 2% solution of glyphosate to the foliage until the leaves are thoroughly wet. Use of low pressure and a coarse spray with large droplet size will reduce spray drift and damage to non-target plants.



The cut stump herbicidal method should be considered when treating individual trees or where the presence of desirable species precludes the use of foliar herbicides. Stump treatments can be made at any time of year as long as the ground is not frozen. After cutting the tree near ground level, a 25% solution of Garlon 3A is applied to the stump by spray bottle or brush, making sure to cover the outer 20% of the stump. Basal bark herbicidal treatment is also effective throughout the year, as long as the ground is not frozen, and does not require cutting of the tree. A mixture of 25% Garlon 4 and 75% horticultural oil is applied to the bark in a wide band around the base of the tree to a height of 12-15 inches from the ground. Spray until run-off is just noticeable at the ground line, but not running off-site.

Present in Training Area
Cantonment

Rosa multiflora (multiflora rose)

- **Description:** Multiflora rose is a thorny, perennial shrub with arching stems (canes), and leaves divided into five to eleven sharply toothed leaflets. The base of each leaf stalk bears a pair of fringed bracts. Beginning in May or June, clusters of showy, fragrant, white to pink flowers appear, each about an inch across. Small bright red fruits, or rose hips, develop during the summer, becoming leathery, and remain on the plant through the winter.
- **Extent of the Infestation:** Multiflora rose occurs in all training areas but is not widespread or dominant like privet. Where it occurs, this plant thrives under sunny conditions.
- **Specific Control Prescription:** Mowing/Cutting is appropriate for small initial populations or environmentally sensitive areas where herbicides cannot be used. Repeated mowing or cutting will control the spread of multiflora rose but will not eradicate it. Stems should be cut at least once per growing season as close to ground level as possible. Hand cutting of established clumps is difficult and time consuming due to the long arching stems and prolific thorns.



Three methods using herbicides are practical for different plant situations. The foliar spray method should be considered for large thickets of multi-flora rose where risk to non-target species is minimal. Air temperature should be above 65°F to ensure absorption of herbicides. Apply Garlon 3A in concentration recommended on product label. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

The cut stump method should be considered when treating individual bushes or where the presence of desirable species precludes foliar application. This treatment remains effective at low temperatures as long as the ground is not frozen. Horizontally cut multiflora rose stems at or near ground level. Immediately apply a 20% solution of Garlon 4 to the cut stump making sure to cover the entire surface.



The basal bark method is effective throughout the year as long as the ground is not frozen. Apply a mixture of 20% Garlon 4 and 75%

Present in Training Areas	
1	2
3	4
5	6
Cantonment	

horticultural oil to the basal parts of the shrub to a height of 30-38 cm (12-15 in) from the ground. Thorough wetting is necessary for good control; spray until run-off is noticeable at the ground line.

***Sorghum halepense* (Johnson grass)**

- Description: Johnson grass grows as tall as six feet and is a rhizomatous perennial grass that invades open areas throughout the United States. The two-foot long, lanceolate leaves are arranged alternately along a stout, hairless, somewhat upward branching stem. Flowers occur in a loose, spreading, purplish panicle. Johnson grass is adapted to a wide variety of habitats including open forests, old fields, ditches, and wetlands. It spreads aggressively and can form dense colonies, displacing native vegetation and restricting tree seedling establishment.
- Extent of the Infestation: Johnson grass occurs as part of the mix of plants present in virtually all of the mowed and bushhogged areas of VTS-S. Its presence is diminished in these mixes by the dominance of sericea lespedeza.
- Specific Control Prescription: Johnson grass reproduces through rhizomes and seeds. It cannot be controlled simply by mowing or cutting. It is recommended that mowing followed by herbicide treatment, several times during the growing season for several seasons. Repeated applications of 1% glyphosate, taking care to thoroughly wet all leaves, will be necessary to control Johnson grass.



Present in Training Areas	
1	2
3	4
5	6
Cantonment	

***Verbascum thapsus* (Woolly mullein)**

- **Description:** Woolly or common mullein is a biennial most commonly found in sites that have experienced disturbance. First year mullein plants are low-growing rosettes of bluish gray-green, felt-like leaves that range from 4-12 inches in length and 1-5 inches in width. Mature flowering plants are produced the second year, and grow to 5 to 10 feet in height, including the conspicuous flowering stalk. The five-petaled yellow flowers are arranged in a leafy spike and bloom a few at a time from June-August. Leaves alternate along the flowering stalks and are much larger toward the base of the plant. The tiny seeds are pitted and rough with wavy ridges and deep grooves and can germinate after lying dormant in the soil for several decades.
- **Extent of the Infestation:** A population of woolly mullein was observed along the road edges in TA-6 north of the firing range during the July, 2005 data collection. These plants had been bushhogged and were not found during a late-August 2005 visit to VTS-S.
- **Specific Control Prescription:** Common mullein can be very difficult to eradicate. There are a variety of management methods available, depending on the particular situation. Because mullein seedling emergence is dependent on the presence of bare ground, sowing sites with early successional native grasses or other plants may decrease seed germination and the chance of successful emergence of mullein seedlings.



Mullein plants are easily hand pulled on loose soils due to relatively shallow tap roots. This is an extremely effective method of reducing populations and seed productivity, especially if plant is pulled before seed set. If blooms or seed capsules are present, reproductive structures should be removed, bagged, and properly disposed of in a sanitary landfill. Care should be taken, however, to minimize soil disturbance since loose soil will facilitate mullein seed germination.

For situations where hand-pulling of plants is not practical or safe, for example, on very steep slopes where hand pulling is dangerous or would cause significant soil disturbance, herbicidal control is an effective option. Apply a 2% solution of glyphosate, using a tank or backpack sprayer to thoroughly cover all leaves. Do not apply so heavily that the herbicide drips off the leaf surface.



Present in Training Area
6