

Annex 1

**FOREST MANAGEMENT PLAN
VTS-MILAN
2010-2016**

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1.0 INTRODUCTION

The forestlands of the VTS-Milan were inventoried in 2005. A management plan was then developed based on forest health and timber management needs. This plan has been modified somewhat to account for military needs and plans. It presents the recommended forestry management prescriptions for the forest stands occurring within the Cantonment Area and each of the 18 training areas that comprise the VTS-M (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 enhance the quality and economic value of the forestry resources on VTS-M. The use of prescribed fire is also addressed for each forest stand. Recommendations for prescribed burning within forest stands are almost always restricted to burns that would be directed toward reducing excessive accumulations of fuels to reduce wildfire risks and, in most cases, would be conducted infrequently on a 7-year rotation, unless otherwise specified. Annex 2 provides more details on the prescribed burning program at the VTS-M.

2.0 FOREST INVENTORY

The forest inventory for the VTS-M was conducted in April 2005 by the 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 18 training areas that make up the VTS-M.

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.

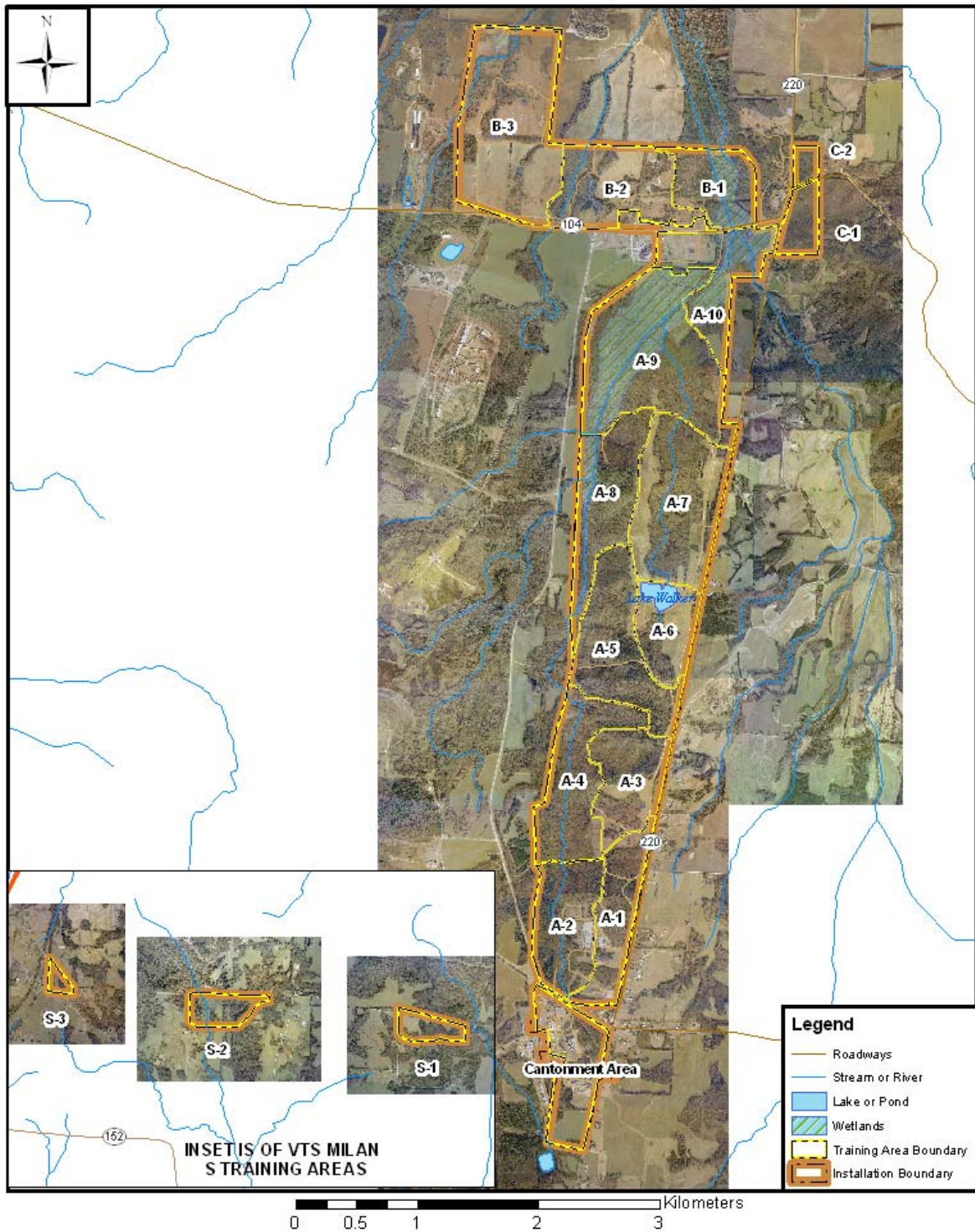


Figure A1.1: Training areas as used for forest stand delineation on the VTS-Milan.

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

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

The forest inventory determined that a total of 1,735 acres (70%) of VTS-M 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.

Table A1.1: Forest Product Volume Summary for VTS-Milan Based on the April 2005 Forest Inventory (from Thompson Engineering, et al. 2006)

| Timber Product | Per Acre | | Installation Total | |
|------------------|----------|------------|--------------------|------------|
| | Tons | Board feet | Tons | Board feet |
| <i>Sawtimber</i> | | | | |
| Pine | 6.9 | 741.2 | 11,958 | 1,284,581 |
| Pole | 0.1 | 7.4 | 173 | 12,825 |
| CNS | 3.8 | 350.4 | 6,586 | 607,282 |
| Cedar | 0.8 | 59.3 | 1,386 | 102,773 |
| Red Oak | 19.9 | 1963.2 | 34,489 | 3,402,441 |
| Hickory | 1.6 | 155.4 | 2,773 | 269,325 |
| White Oak | 7.2 | 698.2 | 12,478 | 1,210,057 |
| Ash | 1 | 98.5 | 1,733 | 170,711 |
| Poplar | 5.2 | 583.7 | 9,012 | 1,011,616 |
| Walnut | 0.4 | 33.5 | 693 | 58,059 |
| Misc. Hardwood | 13.7 | 1319 | 23,744 | 2,285,972 |
| <i>Pulpwood</i> | | | | |
| Pine | 0.2 | 0.1 | 347 | 173 |
| Hardwood | 20.9 | 7.7 | 36,222 | 13,345 |

The Forest Inventory also revealed that the overall average diameter at breast height (DBH) of trees on the entire installation was 13 inches and that the installation had an average basal area of 93 square feet per acre. The forest stands on VTS-Milan are typically dominated by red oaks and white oaks, with yellow poplar being a common co-dominant species in many stands. Pine was a dominant or co-dominant species in only two stands (totaling approximately 36 acres) across the entire installation. Most stands were characterized by older mature trees between 30-40 years old, with many of the oldest individuals approaching 70 years in age. As a result, there are many trees that may be considered over-size by lumber mills. In addition, a number of stands show signs of past hot fires which caused damage to some of the trunks.

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-Milan 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-Milan forest stands is judged to be good to excellent, although a number of the stands showed signs of having experienced past fires that were too hot and had caused some damage to the trunks. However, despite the relative good health of the majority of the forest stands considered, the installation's overall forest community was determined to be dominated by older trees and to be in significant need of forestry management to enhance its regeneration potential, potential economic value, and the contributions that the forest resources make to the ecosystem. Without the implementation of aggressive forest management measures, the health of many of the stands on the installation are expected to begin exhibiting signs of decline within the next 10 years.

The Management Prescription section presents the recommended forestry management prescriptions developed for each forest stand occurring within the Cantonment Area and each of the 18 training areas that comprise VTS-Milan. The management recommendations are generally based upon standard forestry practices to maximize timber production and improve forest ecosystem health but have been modified as needed to meet military training requirements. The use of prescribed fire is also addressed for each forest stand. Prescribed burning in forest stands will be primarily for the purpose of reducing fuel loads and will be conducted on a 7 year fire rotation. Annex 2 provides the details of the prescribed fire program at VTS-Milan. The forest stand prescriptions focus on actions that will enhance the quality and economic value of the forestry resources on VTS-M while enhancing conditions favorable to the conduct of the installation's military mission.

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-Milan.

- Remove older trees through selective thinning. The hardwood stands should be thinned during the next 5 to 10 years to remove the old large trees. This will promote growth and better health in the younger and small trees. Thinning should alternate among the training areas and their respective constituent stands to produce a random mosaic of habitat conditions instead of large blocks in which all thinning is performed at the same time.
- Enhance canopy conditions through selective thinning to promote the release of struggling individual trees that now make up the understory.
- Any pines that are found in the hardwood stands should be left as seed trees to maintain diversity within the installation's forest community.

- Prescribed fire should be initially applied in forest stands after thinning is accomplished. Thereafter, burns should be directed toward reducing excessive accumulations of fuels to reduce wildfire risks and should be conducted infrequently on a 7 year rotation. Monitoring should be performed at the midpoint between intervals to determine if the interval between burn events should be reduced or increased.
- Apply the shelterwood-burn method in a carefully selected upland hardwood stand within Training Area A-9 on a 5-year test case to determine the potential of this method to produce a regenerated oak-dominated forest while enhancing the military mission (see Annex 2).

3.2 Timber Harvest Operations

The periodic harvest of timber is the major measure used to manage forestry resources. Timber harvests can be undertaken for a variety of purposes. For example, timber cuts can be directed at harvesting merchantable timber for economic gain; removing undesirable species; culling older, less productive individual trees; improving growing conditions for young trees; conversion from one forest type to another; influencing the age distribution of individual trees comprising a forest stand; removing infected trees damaged by pest infestation; salvaging storm damaged trees; and improving wildlife habitat.

In the case of military installations, the principle purpose of the forest management program 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 archaeological resources and historic properties

The process for conducting a timber sale on VTS-M 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 of 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 question conducted by the local USFS staff. The biological assessment should recommend the type of technical assistance required and management actions that could be pursued to address the pest problem. This could include population monitoring, surveys, biological evaluations, determination of trends and projected damage, and consideration of environmental and economic impacts. Approximately one year is required before funds are received for approved requests. The USFS funds are provided to the installations through Army channels to the proponent organizations for distribution to the appropriate installations. In the case of the TNARNG, pest management funds are received from the NGB.

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-M. Several aspects of timber management have the potential to affect cultural resources, including timber harvest

operations, site preparation and planting, and prescribed fire. Phase I surveys have been conducted for the majority of the VTS-Milan. Seven historic-era archaeological sites and five cemeteries were identified. All of these sites were deemed ineligible for the National Register of Historic Places. Several historic buildings are located on the training site; however, no forest management activities will be conducted in the vicinity of these buildings. 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 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 for the “no plow zones”), the use of dozers or other heavy equipment to clear stumps and logging slash, and the use of mechanical planting equipment. The cemeteries are surrounded by fencing and will be further protected from damage during forestry activities by maintaining a 50 foot buffer zone surrounding them.

This plan will be submitted for review by 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-M will be coordinated with the SHPO as appropriate.

4.2 Sensitive Species

Chapter 3 of the INRMP contains information on sensitive species occurring on the installation. The VTS-Milan has no known resident federal- or state-listed threatened or endangered species (the endangered interior least tern was sighted once during an avian baseline survey, but there is no evidence that this species routinely utilizes any habitat on the training site, which is outside its expected range). However, several bird species “deemed in need of management” by the State of Tennessee have been identified on the training site (Table 3.?). Of these are species, the sharp-shinned hawk and yellow-bellied sapsucker, as upland forest birds, are most likely to be impacted by forest management activities; however, the nature of the timber harvests planned (typically thinning rather than clearing) and the distribution of the harvests over time and space should ensure that habitat for these birds continues to be available on the site. The protection of waterways and wetland areas during timber management activities should support the water birds and lowland forest species.

If any federally listed species are found to be regularly utilizing the VTS-M, 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 TWRA and the TN 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. Halls Branch runs northward through the western side of the “A” area of the VST-M, draining all of the A training areas, and joins Johns Creek near the conjunction of the A, B, and C areas. Other tributaries to Johns Creek drain training areas B2 and B3. The prevalence of stream drainages across the site, coupled with the highly erosive nature of the soils, result in a high potential for sedimentation problems resulting from any activity which disturbs the soil surface or impacts the vegetation cover.

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-M.

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-Milan. (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 tops of ridges. |
| | | Fit roads to topography by following natural contours and keep grade between 2 and 12 percent. Avoid road sections with 0 percent grade. |
| | Constructing Roads | Complete construction several weeks in advance of use by logging traffic to allow road bed time to settle. |
| | | Avoid construction during wet weather. |
| | | Construct 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 roads to assist in trapping sediment. |
| | | Maximize sunlight exposure to road surface. |
| | | Minimize road width, right-of-way, and stream crossings to |

| Forestry Practice | Activity / Resource | BMP |
|--|--|---|
| | | minimize soil 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 see 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 should 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 stream. |
| | | If trees are harvested in SMZ, maintain 50 percent canopy cover. |
| | | Do not use stream channels as roadways for equipment. |
| | | Avoid equipment operation within SMZ; harvested trees should be cabled or winched out. |
| | Ephemeral Streams or Wet Weather Conveyances | Avoid skidding within drains during wet conditions. |
| | | Avoid locating roads in drains except when necessary for crossings. |
| | | Do not empty road runoff into drains. |
| | | Minimize soil exposure and compaction to protect ground vegetation. |
| | Sensitive Areas | Avoid skidding in these areas. |
| | | Avoid locating roads in these areas. |
| | | Do not empty road runoff into drains. |
| | | Minimize soil exposure and compaction to protect ground vegetation. |
| | Stream Crossings | Crossings |
| Locate crossings on straightest stream sections. | | |
| Avoid locating crossings at confluences 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. |
| Culverts | | Where necessary, use gravel to establish low water crossing. |
| | | 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 |

| Forestry Practice | Activity / Resource | BMP |
|--|-----------------------|--|
| | Bridges | movement of aquatic life. |
| | | Locate bridges across narrow points of stream and on firm soils. |
| | | Protect banks from sloughing during construction. |
| | | Remove temporary bridges. |
| | | Do not cover bridges with soil. |
| Log Landings | Log Landings | Use temporary bridges for skid trails to prevent equipment and logs from entering stream channels. |
| | | Locate landings outside of SMZs and away from streams and sensitive areas. |
| | | Slope landings 2-5 percent to allow for drainage. |
| | | Prevent debris and fuels/lubricants from being washed by runoff into streams. |
| | | Revegetate landings after use if they pose a potential water quality problem. |
| Skid Trails | Skid Trails | Install drainage and sediment control structures to divert runoff. |
| | | Minimize number of skid trails by using existing trails. |
| | | Locate skid trails on slope 2 to 30 percent. Steeper slopes can be used for short distances if water control/drainage structures are provided. |
| | | Runoff from skid trails should not discharge into a stream. |
| | | Control runoff by varying trail grade, water bars, wing ditches, and/or sediment control structures. |
| | | Prevent runoff associated with stream crossings. |
| | | Avoid skidding across streams, drains, and sensitive areas. |
| | | Use culverts or temporary crossing structures. |
| | | Do not use fords to skid across streams. |
| | | Do not operated equipment in streams. |
| | | Avoid skidding directly up or down hill, but follow contours or "zigzag" if possible. |
| | | Use low ground pressure tires on skidders when available and concentrate skidding as much as possible on a few primary skid trails to minimize site disturbance and soil compaction. |
| | | After completing logging, remove temporary bridges and culverts, sediment and debris from dips, ditches, and culverts, and revegetate problem areas. |
| | | Use mulch and/or see with appropriate amounts of lime and fertilizer when needed to prevent soil erosion. |
| Avoid ruts that risk channeling water into a stream. | | |
| Logging Debris | Disposition of Debris | Trees should not be felled in or across streams. |
| | | Pull treetops far enough from waterways to prevent them from being washed in during high water. |
| | | Do not drag trees and tops through a stream channel. |
| | | Do not remove stumps and roots from stream banks. |
| Servicing and Maintaining Equipment | Oils and Fuels | Prevent oil and fuel spills. If a spill occurs, clean up all spilled materials and contaminated soils and dispose of both properly. Notify Tennessee Department of Environment and Conservation of spill incident. |
| Site Preparation for Tree 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 |

| Forestry Practice | Activity / Resource | BMP |
|-------------------|--------------------------|--|
| | Chemical | subjected to mechanical site preparation. |
| | | Favor chemical methods to control undesirable vegetation over mechanical methods on steep slopes and erodible soils. |
| | | Follow all EPA label instructions. |
| | | Never apply pesticides directly to water except when registered for application over water. |
| | | Establish SMZ to minimize chemicals entering streams. |
| | | Avoid use of chemicals in or near sensitive areas. |
| | | Consider weather conditions and equipment capabilities to avoid herbicide drift. |
| | | Calibrate spray equipment to apply chemicals uniformly and in correct quantities. |
| | | Prevent chemical leaks from equipment and check equipment. |
| | | Mix and load chemicals outside of SMZs and 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 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/pr 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-M forestry program should be periodically monitored to: (1) assess whether or not forest management objectives are being met; and (2) detect trends in forest health and condition in response to the forest management actions proposed in this plan.

Forestry program monitoring on the VTS-M will include:

- The progress of each timber sale will be monitored to ensure that the harvest is being conducted in accordance with the terms of the contract. Monitoring will be coordinated with the USACE's Mobile District if the timber sale is administered by the USACE. At the conclusion of the timber harvest, a final inspection of the site will be conducted jointly by the

USACE and the TNARNG to assure the cut was conducted in accordance with the contract stipulations to allow release of the buyers' bond.

- Effective management requires feedback on the results of the management activities. The necessary assessment may be conducted specifically for the forestry program or as a part of another program area. The VTS-M forests 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
 - Emergency harvests needs
- Installation INRMPs are to be reviewed for operation and effect every five years. During this process, needed forestry related studies or surveys will be identified and included in the INRMP and appropriate funding will be programmed for these activities.
- The baseline forest inventory was conducted for VTS-Milan 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. Timber harvests will typically involve thinning the stands to encourage improved growth rather than clearcutting a stand, unless mission needs require a cleared site. Recommendations for the use of prescribed fire are also included; complete burn prescriptions are found in the prescribed fire section of the Wildland Fire Management Plan, Annex 2 of the INRMP. There will be no harvesting or prescribed fire within the 50' SMZs bordering Halls Branch, Johns Creek, and their tributaries.

5.1 Cantonment Area

The 121 acre Cantonment Area is the management center for the VTS-M and contains most of the building infrastructure for the installation. A single 36.31 acre forest stand occurs on this area, but it is divided into three separate components.

Stand Description

Stand cc0101 is a mature upland pine and hardwood forest. The stand is dominated by red oak and poplar, with a mix of hickory, white oak, and walnut. Ages of the trees range from 30 to 70 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is excellent and does not show signs of having experienced past hot fires.

Forest Management Prescription

Stand cc0101. This stand will be thinned by removing all hardwood trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training (i.e., encouraging trees to grow tall and straight before forming branches through competition for growing space as the individual trees strive to reach the forest canopy). Some areas within the stand are covered entirely with cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size.

Prescribed burning can be done once every 6 years for fuel reduction only. No burning should be accomplished before the thinning is completed. Due to the proximity of installation buildings, any prescribed burn must be conducted with extreme care.



Figure A1.2: Forest stands in the Cantonment Area of the VTS-Milan.

5.2 Training Area A-1

Training Area A-1 is an elongated 112-acre area located along the installation's eastern boundary. The southern portion of the area contains some infrastructure buildings and a number of graveled roads crisscross the area. Almost half of the area is designated as being in an open condition. A single 65.54-acre fragmented forest stand divided between six separate units occurs on the training area.

Stand Description

Stand ma0101 is a mature upland pine and hardwood forest dominated by red oaks and white oaks, with a mix of hickory, poplar, walnut, and a few pines. The trees range in age from 30 to 70 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is good, but will only decline in next ten years without some type of management.

Forest Management Prescription

Stand ma0101. This stand will be thinned by removing all trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction. This will minimize the potential for damage to the hardwoods.

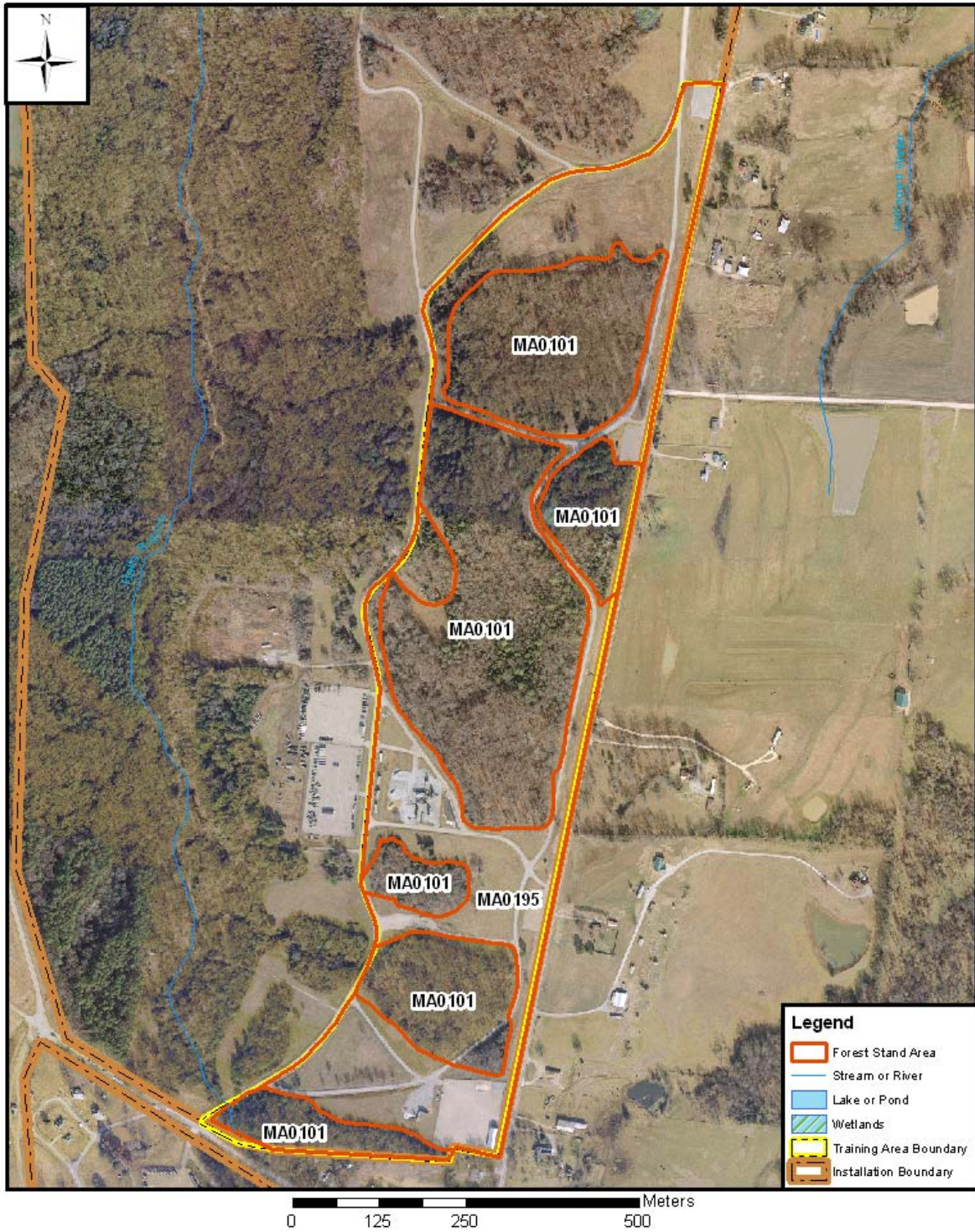


Figure A1.3: Forest stands in Training Area A-1.

5.3 Training Area A-2

Training Area A-2 is 133 acres in size. Most of the area is forested, with only two open areas occurring within the area. Two forest stands make up the majority of the site.

Stand Descriptions

Stand ma0201 is a contiguous 81.28-acre mature upland pine and hardwood forest. The stand is dominated by red oak and white oak with a mix of hickory, poplar, walnut, and a few pines. The trees range in age from 15 to 60 years old. Some of the oaks and poplar are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is good but will only decline in next ten years without some type of management.

Stand ma0202 is a dense over-mature 40- to 45-year old pine stand that appears never to have been thinned. This 29.95-acre stand is separated into three units. The stand appears to be an old field that was planted but has not been thinned to keep the stand healthy. The pines have been dying due to overcrowding. The stand should be thinned immediately.

Forest Management Prescriptions

Stand ma0201. This stand will be thinned by removing all trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aide in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction.

Stand ma0202. This stand will be thinned by removing all trees that are not in the dominant or co-dominant crown class. Some of the co-dominants may be removed to allow more room. The goal would be for the tree crowns not to touch each other on at least three sides. This will allow room for the remaining trees to grow, plus aide in training. During the thinning operation all cedars would be removed regardless of size. Prescribed burning can be done once every 2 to 4 years for fuel reduction. No burning should be performed before the thinning is done.

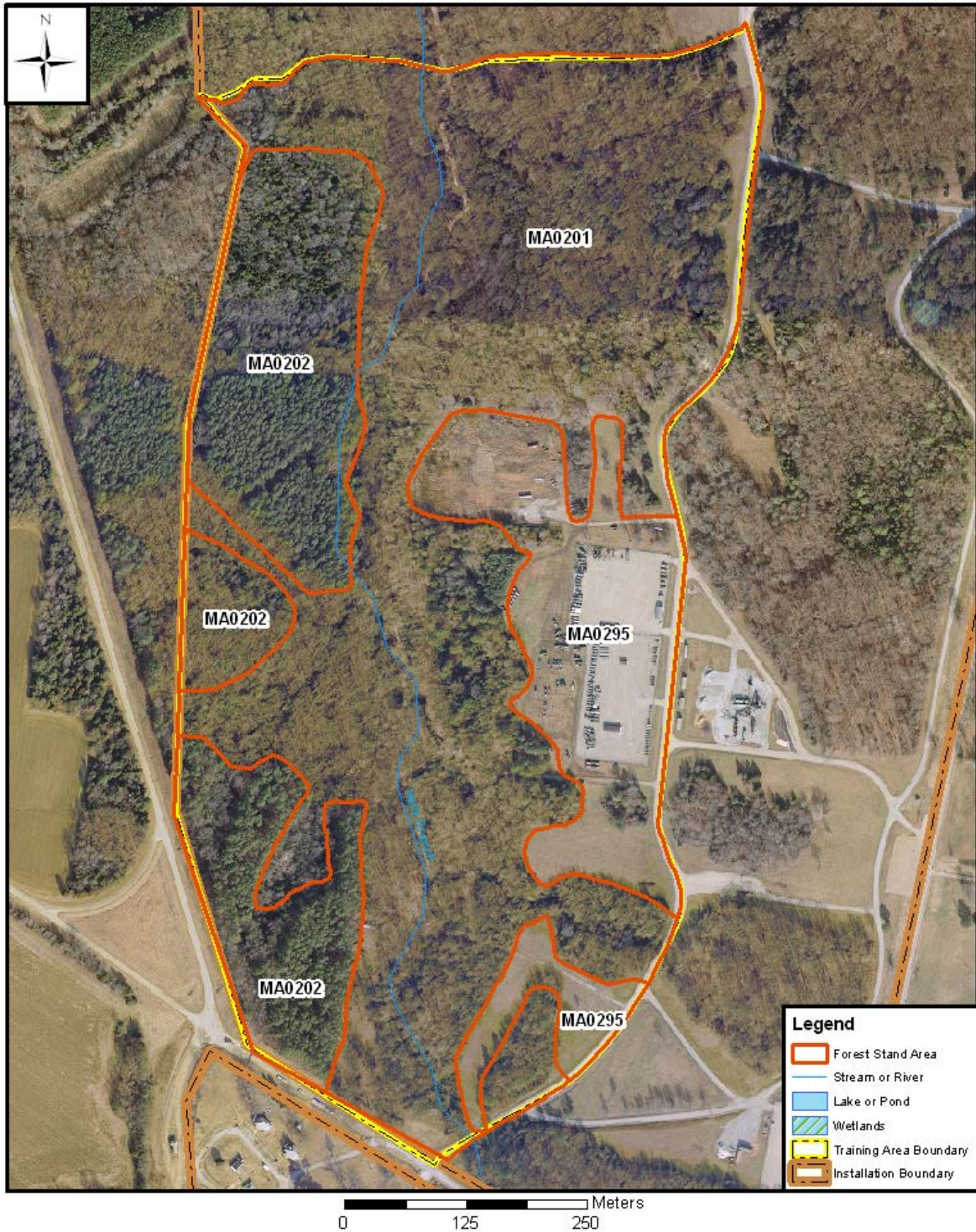


Figure A1.4: Forest stands in Training Area A-2.

5.4 Training Area A-3

The 116-acre Training Area A-3 supports a single 85.36-acre forest stand. The stand is divided into three units by gravel roads and associated open areas that parallel the roads.

Stand Description

Stand ma0301 is a mature upland pine and hardwood forest. The stand is dominated by red oaks and white oaks, with a mix of hickory, poplar, walnut, and a few pines. The trees range in age from 30 to 70 years old. Some of the oaks and poplar are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is good but will only decline in next ten years without some type of management.

Forest Management Prescription

Stand ma0301. This stand will be thinned by removing all trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. During the thinning operation all cedars would be removed regardless of size. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction.

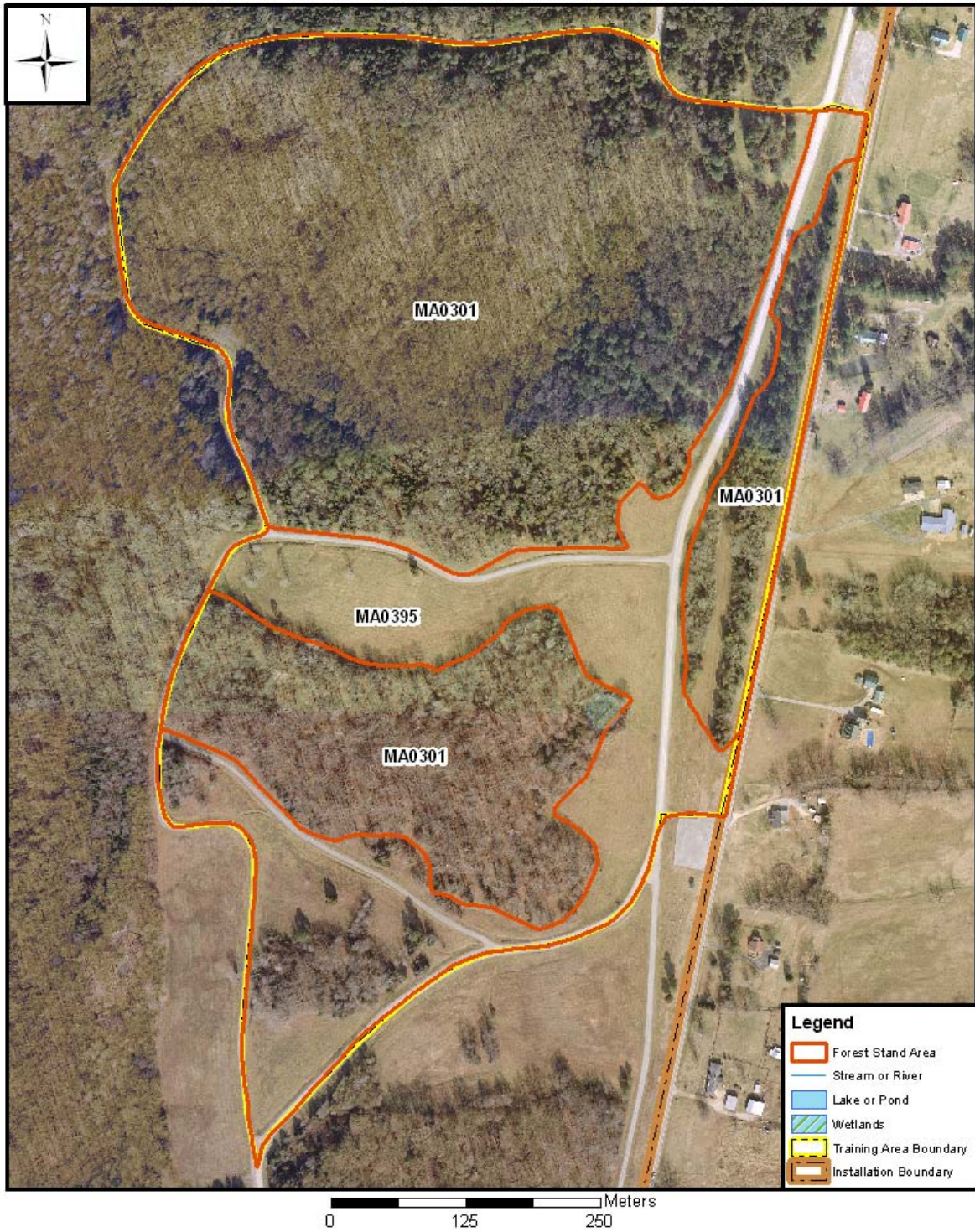


Figure A1.5: Forest stands in Training Area A-3.

5.5 Training Area A-4

The 165-acre Training Area A-4 is almost completely forested. A relatively small open field occurs along its southeastern periphery. A single 158.10-acre contiguous forest stand covers most of the area.

Stand Description

Stand ma0401 is a mature upland pine and hardwood forest. The stand is dominated by red oaks and white oaks, with a mix of hickory, poplar, walnut, and a few pines. The ages range from 20 to 60 years old. The overall health of the stand is excellent, but will only decline in next five years without some type of management.

Forest Management Prescription

Stand ma0401. This stand will be thinned in 4 to 5 years by removing all trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction.

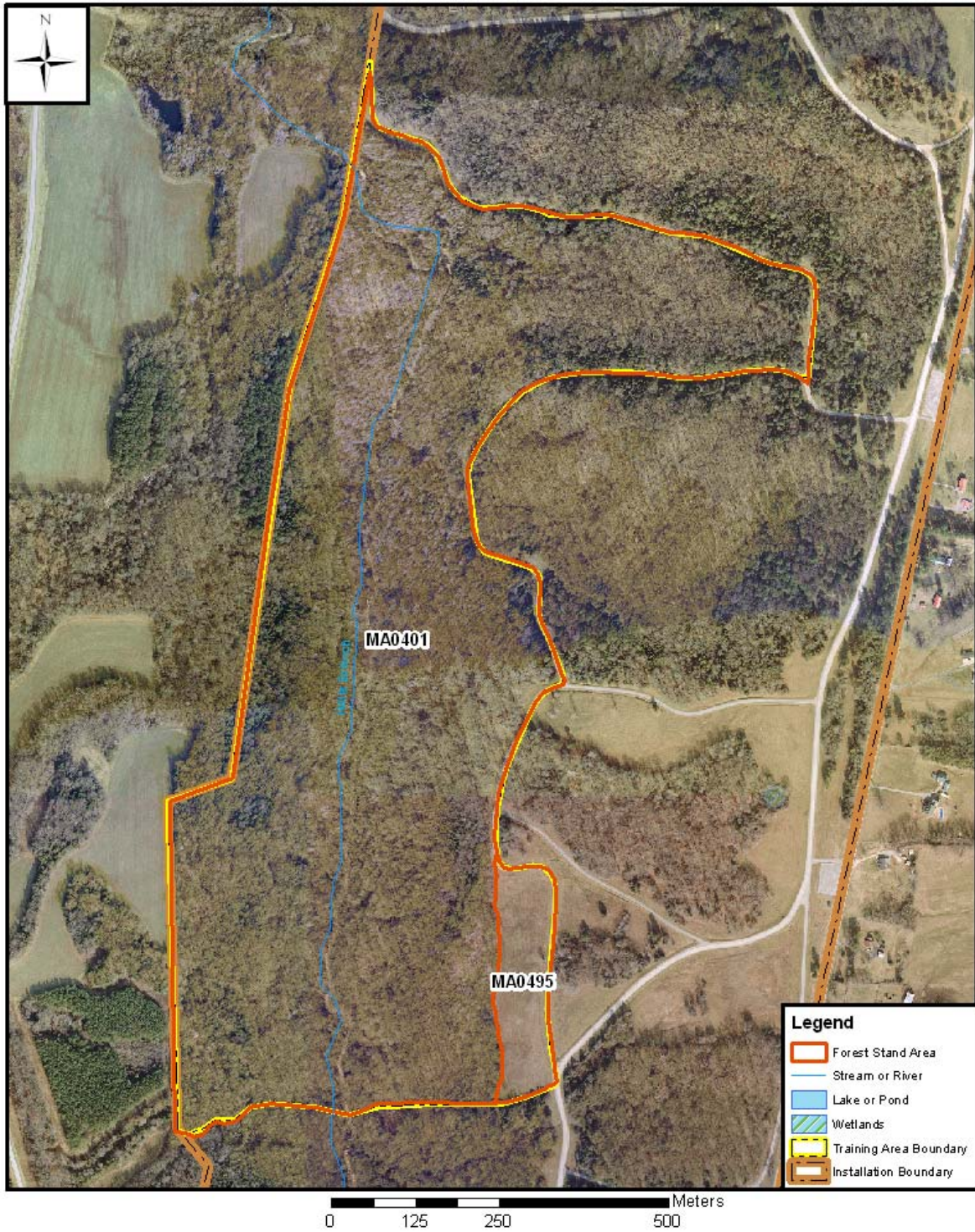


Figure A1.6: Forest stands in Training Area A-4.

5.6 Training Area A-5

Training Area A-5 is 173 acres in size. Most of this area is forested, with the small amount of open areas that do occur being associated primarily with the gravel roads that occur along its eastern boundary. Three forested stands were delineated for this area.

Stand Descriptions

Stand ma0501 is a contiguous 132.03-acre mature pine and hardwood forest that covers much of the training area. The stand is dominated by red oaks and white oaks, with a mix of hickory, poplar, walnut, and pine. The trees range in age from 30 to 75 years old. Some of the oaks are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is good, but will only decline in next ten years without some type of management.

Stand ma0502 is an elongated 14.63-acre young poplar and sweet gum stand occurring along the area's western boundary. This stand developed on part of an old road bed. This stand is of excellent health and ages range from 10 to 20 years old. The terrain is relatively flat and is part of the Halls Branch floodplain. The stand consists mainly of pulpwood size trees, with a few trees starting to reach the sawtimber size.

Stand ma05CC is a 14.46-acre clearcut area (salvage logged in 2003 following a tornado) that has had some site preparation done. Part of this stand is located within the boundary of a proposed new range complex and will be maintained in an open condition for training purposes and to be further developed if the range is constructed.

Forest Management Prescriptions

Stand ma0501. Two acres of this stand will be clearcut for training purposes. The cleared area will not be replanted with trees but with native grasses. The remaining portion of the stand would be thinned by removing all trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars will be removed regardless of size.

The cleared area will be burned once a year for the first 5 to 6 years following clearing and planting to promote native grasses. The area that is maintained in forest cover can be burned once every 6 years for fuel reduction.

Stand ma0502. Stand ma0502 will need a thinning in 5 years. Only the small pulpwood should be removed, leaving the larger sawtimber trees to grow (i.e. called thinning from below). This will allow the sawtimber to remain growing at an acceptable rate.

Prescribed burning should not be undertaken on this stand.

Stand ma05CC. This stand will be maintained in a cleared condition for training purposes. Site preparation and removal of debris will be completed and the area will be replanted with native grasses. Prescribed burning will be needed once a year for the first 5 to 6 years following clearing and planting to promote native grasses; thereafter it will be burned every 2 years.

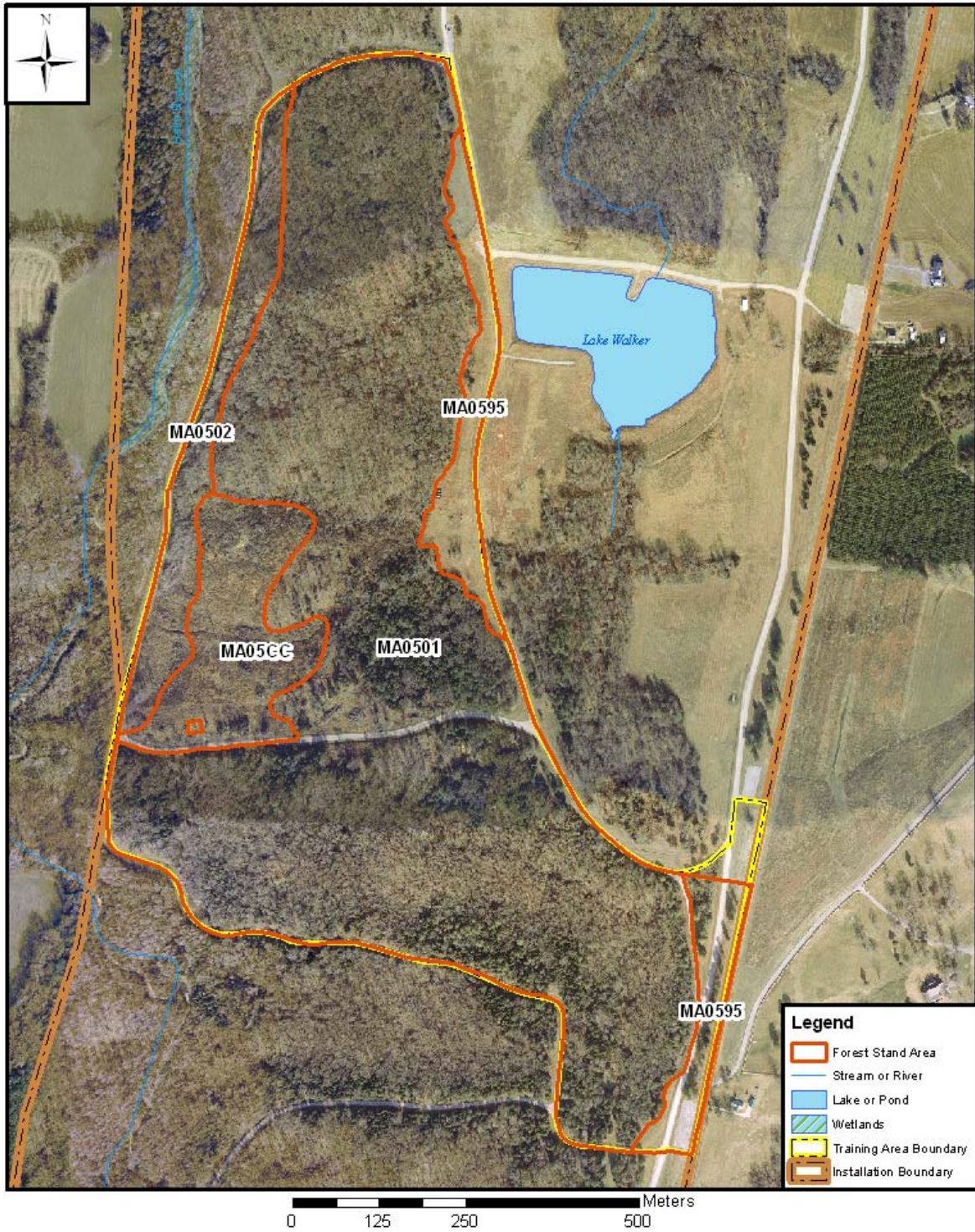


Figure A1.7: Forest stands in Training Area A-5.

5.7 Training Area A-6

Training Area A-6 is 91 acres in size. The area contains a sizable pond and a considerable amount of open lands. A single 32.04-acre forest stand occurs within the training area. The forest stand is divided into a small eastern unit, and a much larger western unit.

Stand Description

Stand ma0601 is a mature upland pine and hardwood forest. The stand is dominated by red oaks, with a mix of hickory, white oak, poplar, walnut, and a few pines. Tree ages range from 40 to 70 years old. The overall health of the stand is excellent for the pine, but poor for the hardwoods due to very hot past fires. The stand will only decline more in next five years without some type of management. Most of the cedars have been blown down by a past tornado.

Forest Management Prescription

Stand ma0601. Fifteen acres of this stand will be clearcut and planted to grass for training purposes. The remaining 17 acres will be selectively harvested to remove all hardwoods, due to poor health. The pine component will be retained for seed trees, and the hardwoods would be allowed to return from stump sprout and natural regeneration. Prescribed burning will be done once every 6 years for fuel reduction.

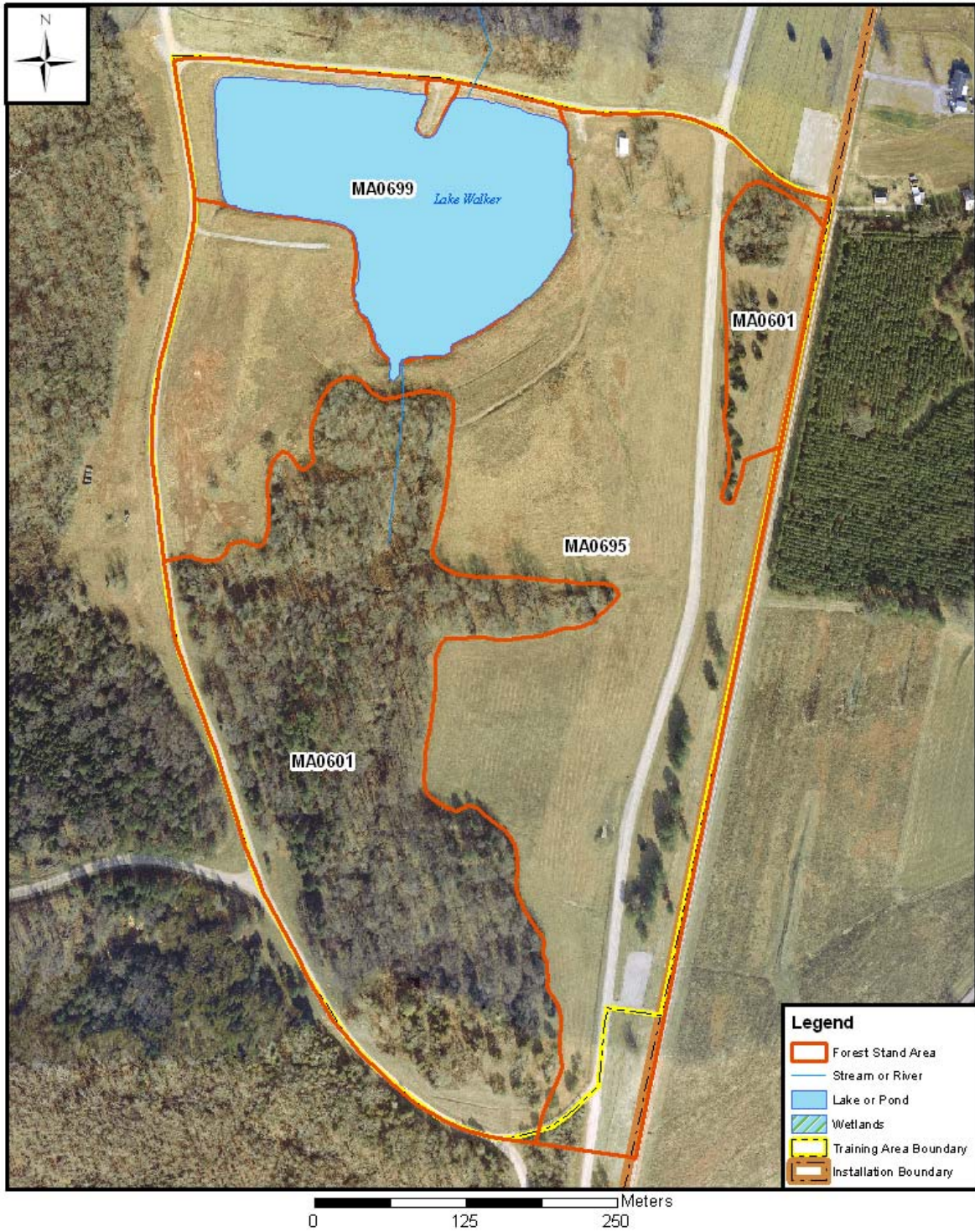


Figure A1.8: Forest stands in Training Area A-6.

5.8 Training Area A-7

At 222 acres, Training Area A-7 is the third largest training area comprising VTS-Milan. The eastern and western boundaries of the area are defined by graveled roads and the associated open areas that parallel these roads. A single 141.07-acre forest stand is located within the area. Most of the forested stand occurs within a contiguous block. A unit of the stand is separated from the larger block and occurs as a small strip of forested land situated between Highway 220 and an installation north-south oriented road.

Stand Description

Stand ma0701 is a mature upland pine and hardwood forest. The stand is dominated by red oaks and white oaks, with a mix of hickory, poplar, walnut, and a very few pines. The trees range in age from 40 to 70 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is good but will only decline in next 10 years without some type of management. This stand shows some signs of fire damage.

Forest Management Prescription

Stand ma0701. This stand will be thinned by removing all trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction. No burning should be attempted before thinning is completed.



Figure A1.9: Forest stands in Training Area A-7.

5.9 Training Area A-8

Training Area A-8 is an elongated 165-acre site that is forested over its entire area. Three forest stands make up this area.

Stand Descriptions

Stand ma0801 is a 63.95-acre mature upland pine and hardwood forest that is separated into two blocks. The stand is dominated by red oaks and white oaks, with a mix of hickory, poplar, walnut, and a very few pines. The trees range from 30 to 60 years in age. Some of the oaks and poplar are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is good but will only decline in next 10 years without some type of management. This area shows signs of fire damage which has allowed erosion of soil and major damage to the hardwood species.

Stand ma0802 is a 70.35-acre immature sawtimber stand of sweet gum, poplar, black cherry and other miscellaneous timber. This stand occurs along the training areas western boundary and appears to be an old abandoned field. There are a few pine scattered in the 10- to 25-year old stand.

Stand ma0803 is a 30.27-acre mature upland pine and hardwood forest that is situated between the two blocks comprising stand ma0801. Stand ma0803 is dominated by pine, with a mix of oaks, hickory, poplar, and walnut. The trees range from 30 to 60 years in age. Some of the oaks and poplar are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is excellent but will only decline in next 10 years without some type of management. This area shows signs of fire damage.

Forest Management Prescriptions

Stand ma0801. This stand will be thinned by removing all trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be accomplished once every 6 years for fuel reduction. No burning should be attempted before thinning is completed.

Stand ma0802. Stand ma0802 will need to be thinned in 10 years. Only the small pulpwood will be removed and leaving the larger sawtimber trees to grow (called thinning from below). This will allow the sawtimber to remain growing at an acceptable rate. Prescribed burning can be done once every 6 years for fuel reduction.

Stand ma0803. This stand will be thinned by removing all hardwood trees that are 18-inch DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction. No burning should be attempted before thinning is completed.

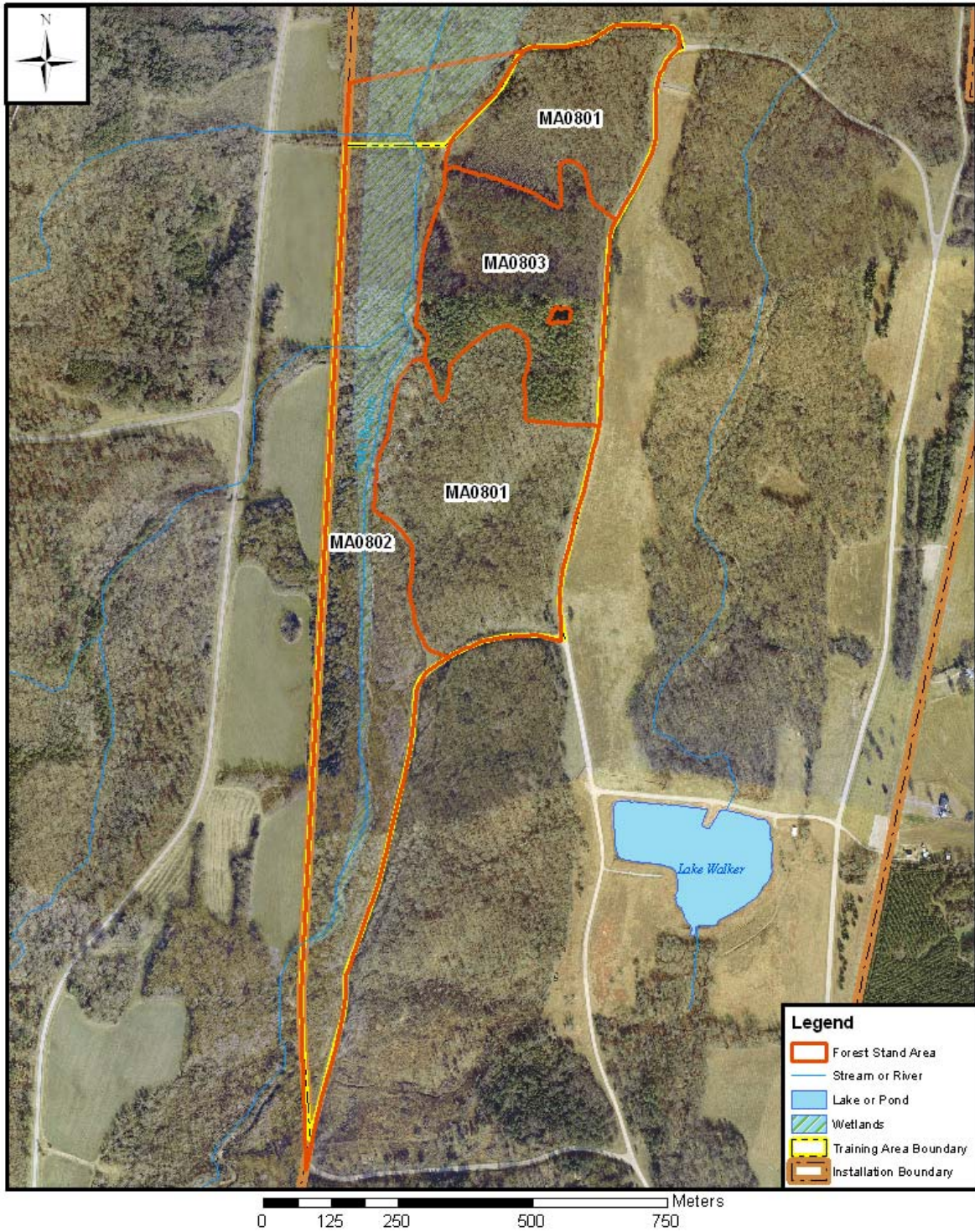


Figure A1.10: Forest stands in Training Area A-8.

5.10 Training Area A-9

Training Area A-9 is the second largest training unit at VTS-Milan. This 300-acre area is mostly forested. Four small open areas associated with ranges and/or roads are scattered along the area's southern and eastern boundaries. The training area supports two large and contiguous forest stands.

Stand Description

Stand ma0901 is a 111.60-acre mature upland pine and hardwood forest dominated by red oaks and white oaks, with a mix of hickory, poplar, walnut, and a few pines. Tree ages range from 30 to 80 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is poor. There is good hardwood regeneration present. Most of the large hardwoods are culls due to rot and hollows in the trees.

Stand ma0902 is 171.69-acre immature sawtimber stand of sweet gum, poplar, black cherry and other miscellaneous hardwood timber. This area appears to have been an old abandoned field and is located on either side of Halls Branch. There are a few pine scattered in the 10- to 25-year old stand. This is one of the wetter stands on VTS-Milan and is in excellent health. Prescribed burning can be done once every 6 years for fuel reduction.

Forest Management Prescriptions

Stand ma0901. This stand will be thinned by removing all trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size.

Stand ma0902. Stand ma0902 will need a thinning in 5 years. Only the small pulpwood should be removed, leaving the larger sawtimber trees to grow (referred to as thinning from below). This will allow the sawtimber to remain growing at an acceptable rate. Prescribed burning should not be conducted before the thinning; thereafter, the stand can be burned once every 6 years for fuel reduction only.

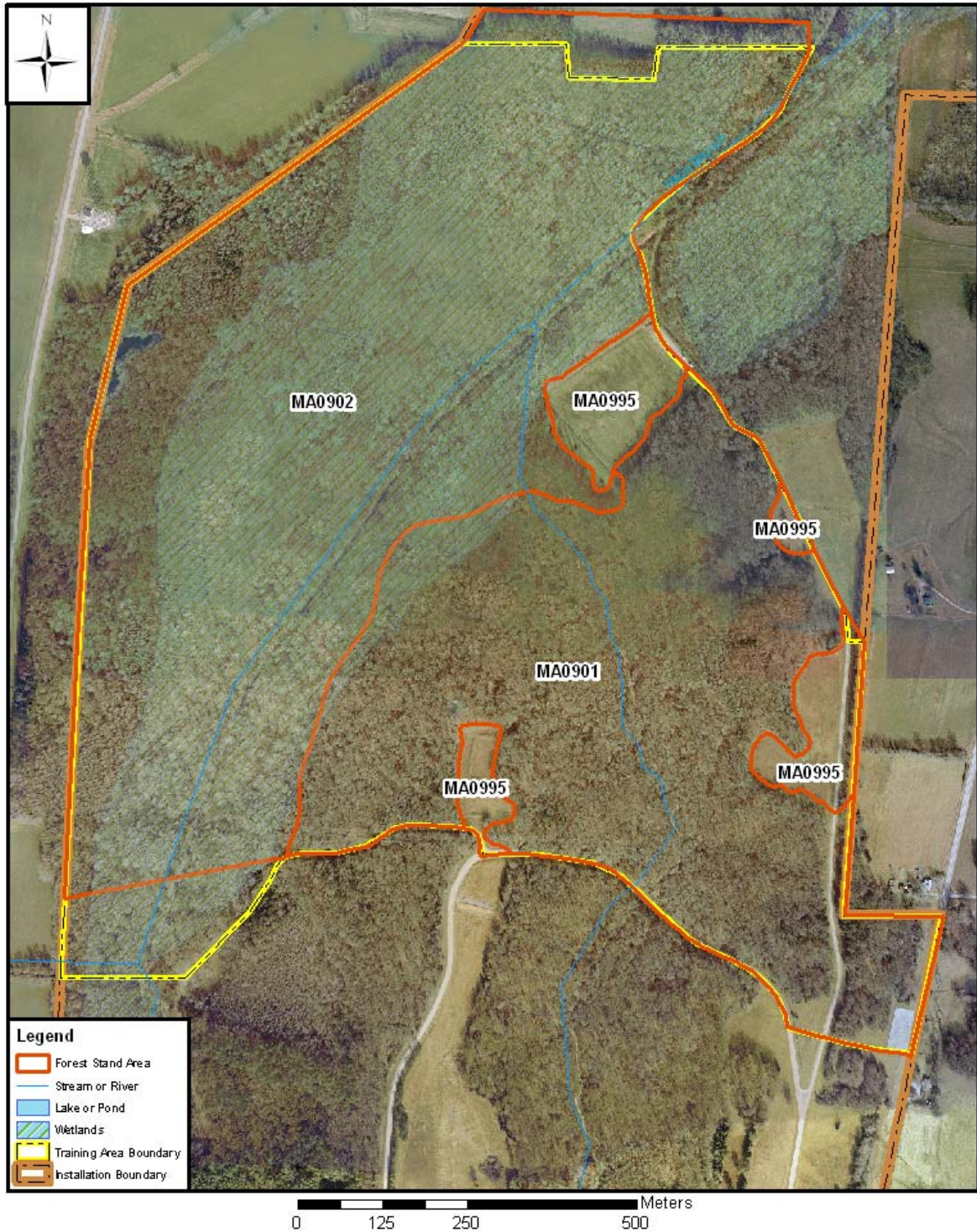


Figure A1.11: Forest stands in Training Area A-9.

5.11 Training Area A-10

Training Area A-10 is the northernmost of the “A” training areas located on the main installation. This 126-acre area contains a small open area on its southern boundary and a larger open field to the northwest. The remainder of the stand supports a single 84.01-acre forest stand occurring in a contiguous block.

Stand Description

Stand ma1001 is an immature sawtimber stand of sweet gum, poplar, black cherry and other miscellaneous hardwood timber. This area appears to be an old abandoned field. There are a few pines scattered in the 10- to 25-year old stand. This is one of the wetter stands on the installation and is in excellent health.

Forest Management Prescription

Stand ma1001. This stand will need a thinning in 5 years. Only the small pulpwood will be removed and leaving the larger sawtimber trees to continue growing (referred to as thinning from below). This will allow the sawtimber to remain growing at an acceptable rate. This stand can be thinned at the same time as stand ma0902. Prescribed burning can be done once every 6 years for fuel reduction only. No burning should be undertaken before the thinning is accomplished.

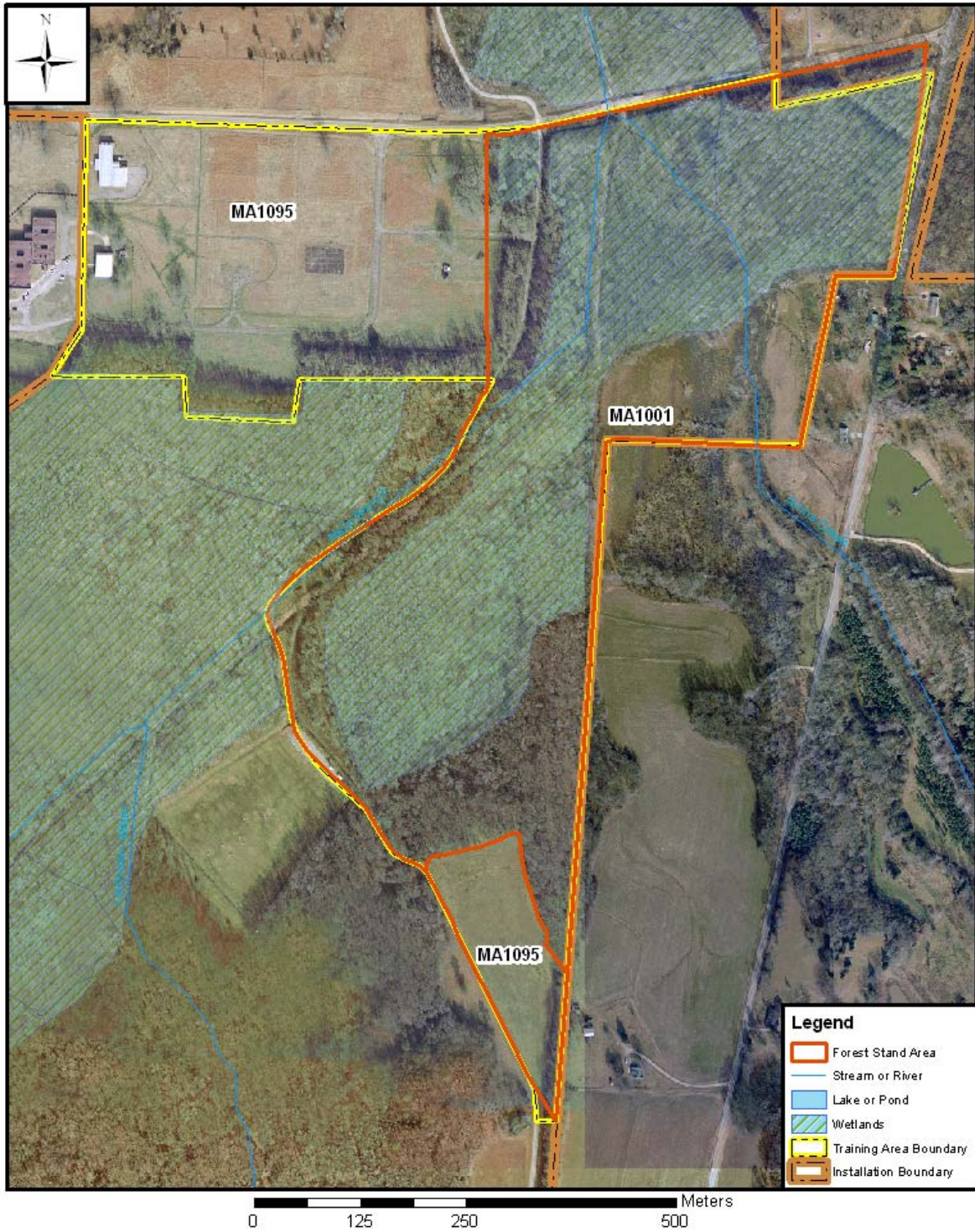


Figure A1.12: Forest stands in Training Area A-10.

5.12 Training Area B-1

Training Area B-1 is 96 acres in size. Its western boundary contains scattered small open areas associated with a graveled road. The area supports a single 89.65-acre stand occurring in a single block.

Stand Description

Stand mb0101 is an immature sawtimber stand of sweet gum, poplar, black cherry and other miscellaneous hardwood timber. This area is low and has wet spots most of the year. There are a few large red oaks scattered in the 10- to 25-year old stand, with all being in excellent health.

Forest Management Prescription

Stand mb0101. The stand needs to be thinned. Only the small pulpwood should be removed, leaving the larger sawtimber trees to grow (referred to as thinning from below). This will allow the sawtimber to continue growing at an acceptable rate. Prescribed burning can be done once every 6 years for fuel reduction only. No burning should be undertaken before thinning is completed.

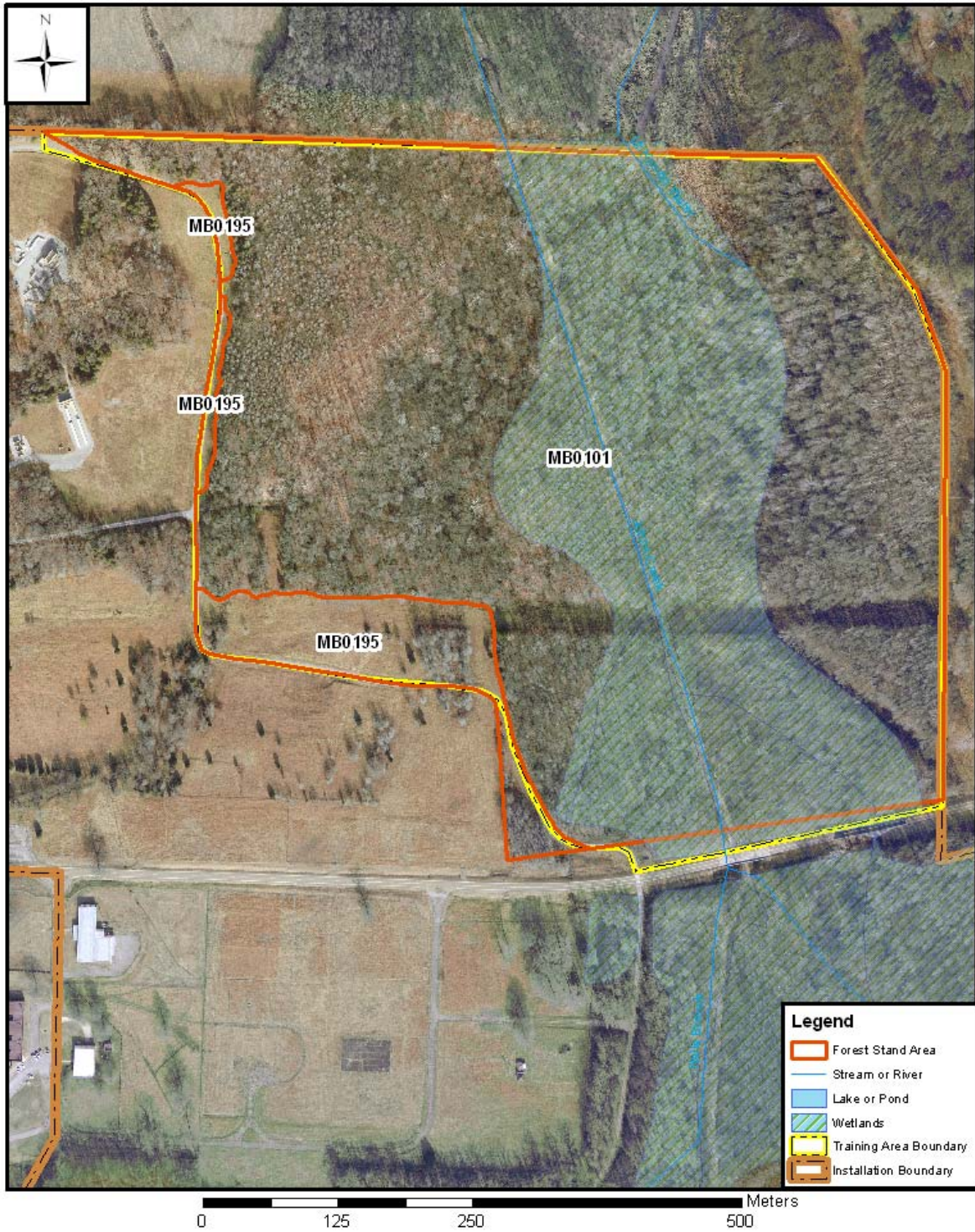


Figure A1.13: Forest stands in Training Area B-1.

5.13 Training Area B-2

The 164-acre Training Area B-2 is almost equally divided between open fields and forested areas. The open areas are divided between nine different fields of varying sizes, some of which are associated with gravel roads that run along the training areas boundaries. The single 77.83-acre forest stand occurring on this training area is highly elongated, with much of it being associated with the drains occurring within the stand.

Stand Description

Stand mb0201 is a mature upland pine and hardwood forest. The stand is dominated by red oaks and white oaks, with a mix of hickory, poplar, walnut, and a few pines. The trees range in age from 30 to 60 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is poor. Most of the large hardwoods are culls due to rot and hollows in the trees, most likely caused by past burning. This stand is oddly shaped, being located in the drains and other areas within the training area that are not used as fields.

Forest Management Prescription

Stand mb0201. This stand will be thinned by removing all hardwood trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction only. No burning should be attempted before the thinning is accomplished.

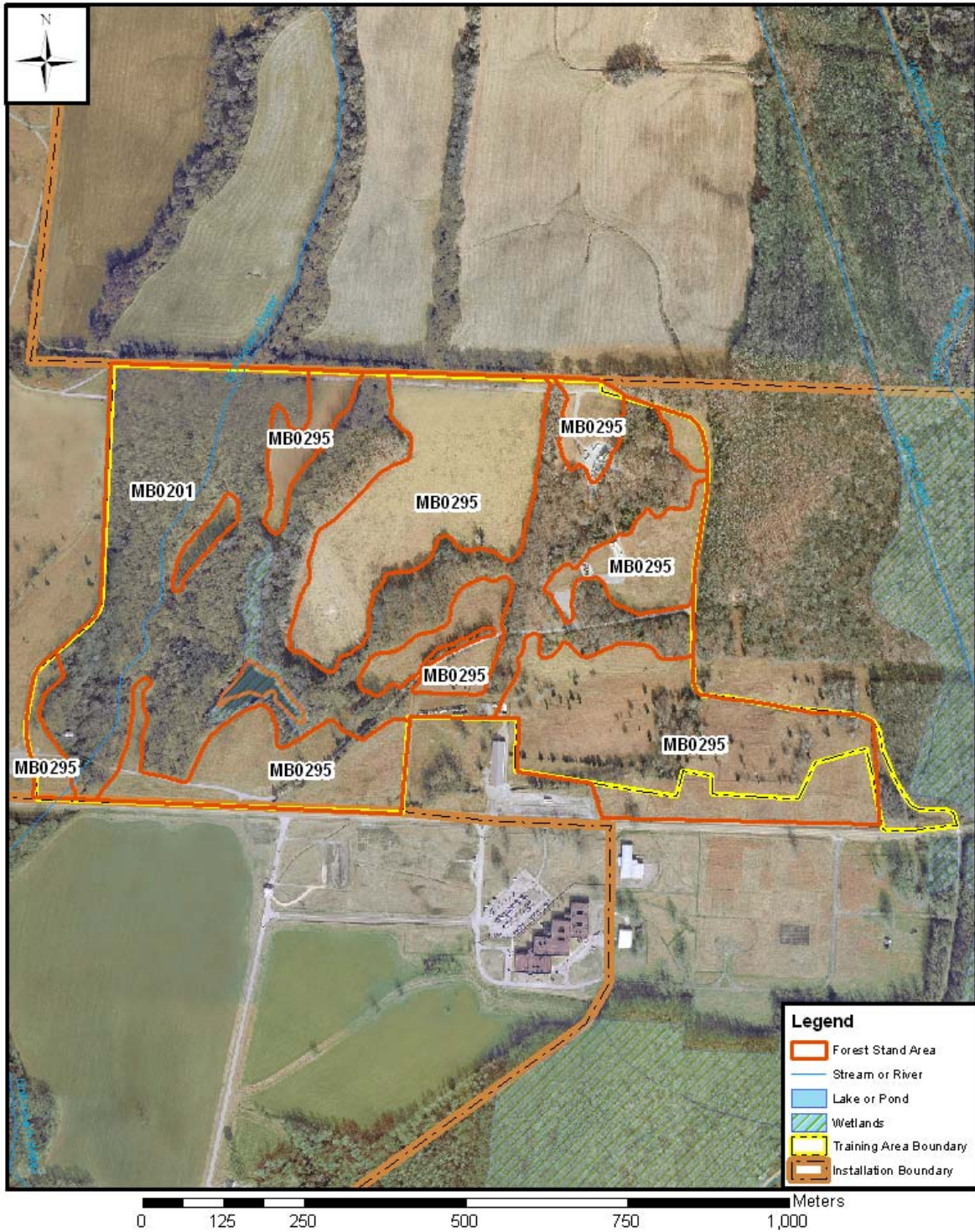


Figure A1.14: Forest stands in Training Area B-2.

5.14 Training Area B-3

At 303 acres, Training Area B-3 is the largest training area on VTS-Milan. Two thirds of the area is characterized as grasslands that are divided between at least four major open fields. A single 93.93-acre forest stand occurs on the site. The forest stand is greatly elongated and oddly shaped and forms the boundaries separating the fields from one another and/or is associated with the drains occurring on the site.

Stand Description

Stand mb0301 is a mature upland pine and hardwood forest. The stand is dominated by red oaks and white oaks, with a mix of hickory, poplar, walnut, and a few pines. The trees range in age from 30 to 60 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is poor. Most of the large hardwoods are culls due to rot and hollows in the trees most likely caused by past burning. This stand is largely located within the drains and other areas within the training area that are not used as fields.

Forest Management Prescription

Stand mb0301. This stand will be thinned by removing all hardwood trees that are 18-inch DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction only. No burning should be done before the thinning is completed.

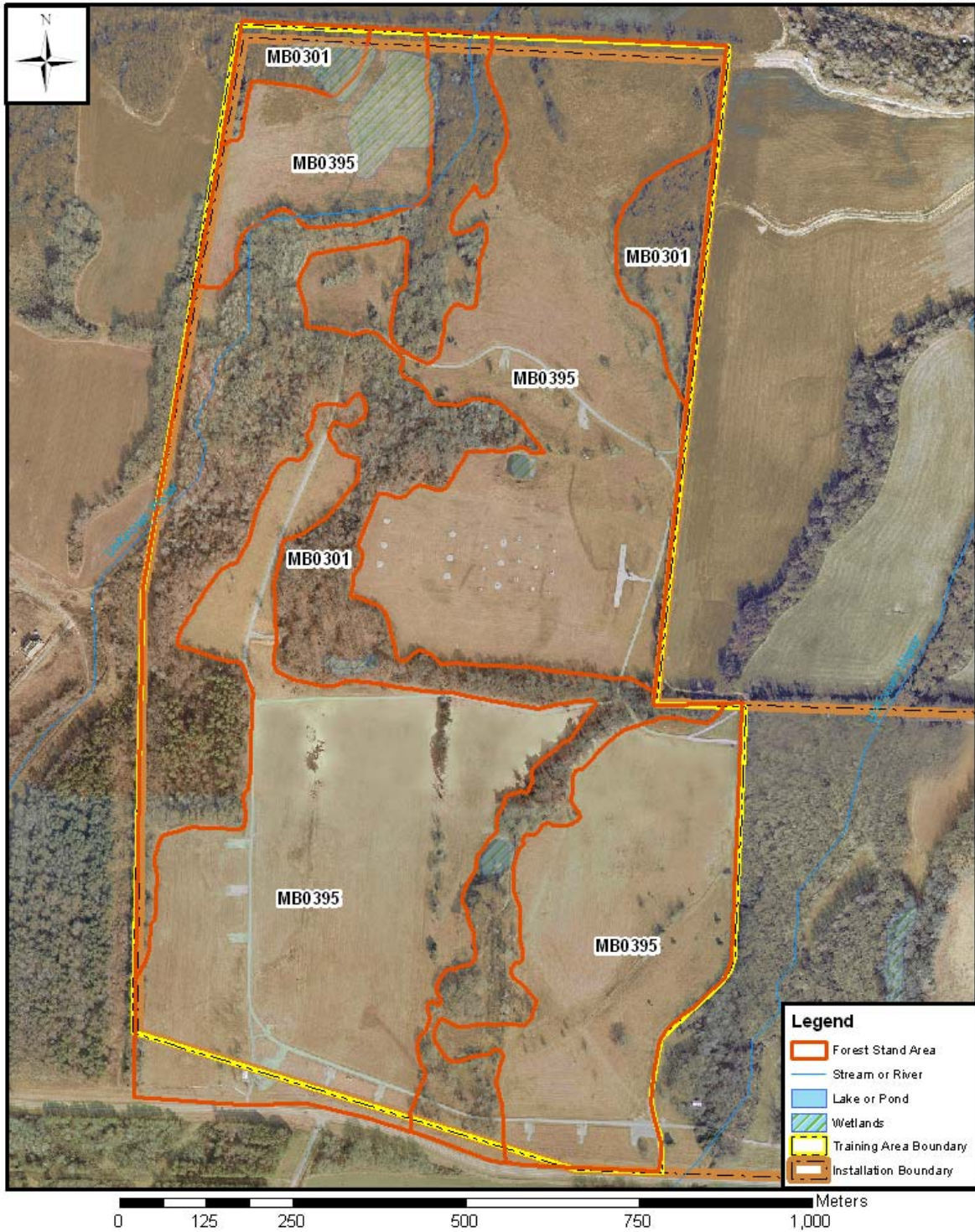


Figure A1.15: Forest stands in Training Area B-3.

5.15 Training Area C-1

Training Area C-1 is 42.04 acres in size and is covered by a single forest stand.

Stand Description

Stand mc0101 is a mature upland pine and hardwood forest that is dominated by red oaks and poplars, with a mix of hickory, white oak, and walnut. The ages of the trees range from 30 to 60 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is excellent, and does not show signs of past hot fires.

Forest Management Prescription

Stand mc0101. This stand will be thinned by removing all hardwood trees that are 18 inches DBH and large. This will allow room for the remaining trees to continue to grow, plus aide in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction only. No burning should be attempted before the thinning is done.



Figure A1.16: Forest stands in Training Area C-1.

5.16 Training Area C-2

Training Area C-2 is 14.46 acres in size and supports a single forest stand over the entire area.

Stand Description

Stand mc0201 is a mature upland pine and hardwood forest. The stand is dominated by red oaks and poplars, with a mix of hickory, white oak, and walnut. The trees range in age from 30 to 60 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is excellent and does not show signs of past hot fires.

Forest Management Prescription

Stand mc0201. This stand will be thinned by removing all hardwood trees that are 18 inches DBH and larger. This will allow room for the remaining trees to continue growing, plus aide in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction only. No burning should be attempted before thinning is completed.



Figure A1.17: Forest stands in Training Area C-2.

5.17 Training Area S-1

Training Area S-1 is a 49-acre tract that is completely separated from the main installation lands. The area supports a single 33.03-acre irregularly shaped forest stand that is intermixed with three open fields of varying size.

Stand Description

Stand ms0101 is a mature upland pine and hardwood forest, dominated by red oaks and white oaks, with a mix of hickory, poplar, and walnut. The trees range from 20 to 50 years in age. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is good to poor, and shows signs of past wind damage.

Forest Management Prescription

Stand ms0101. This stand will be thinned by removing all hardwood trees that are 18 inches DBH and larger. This will allow room for the remaining trees to continue growing, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6 years for fuel reduction only. No burning should be attempted before thinning is completed.

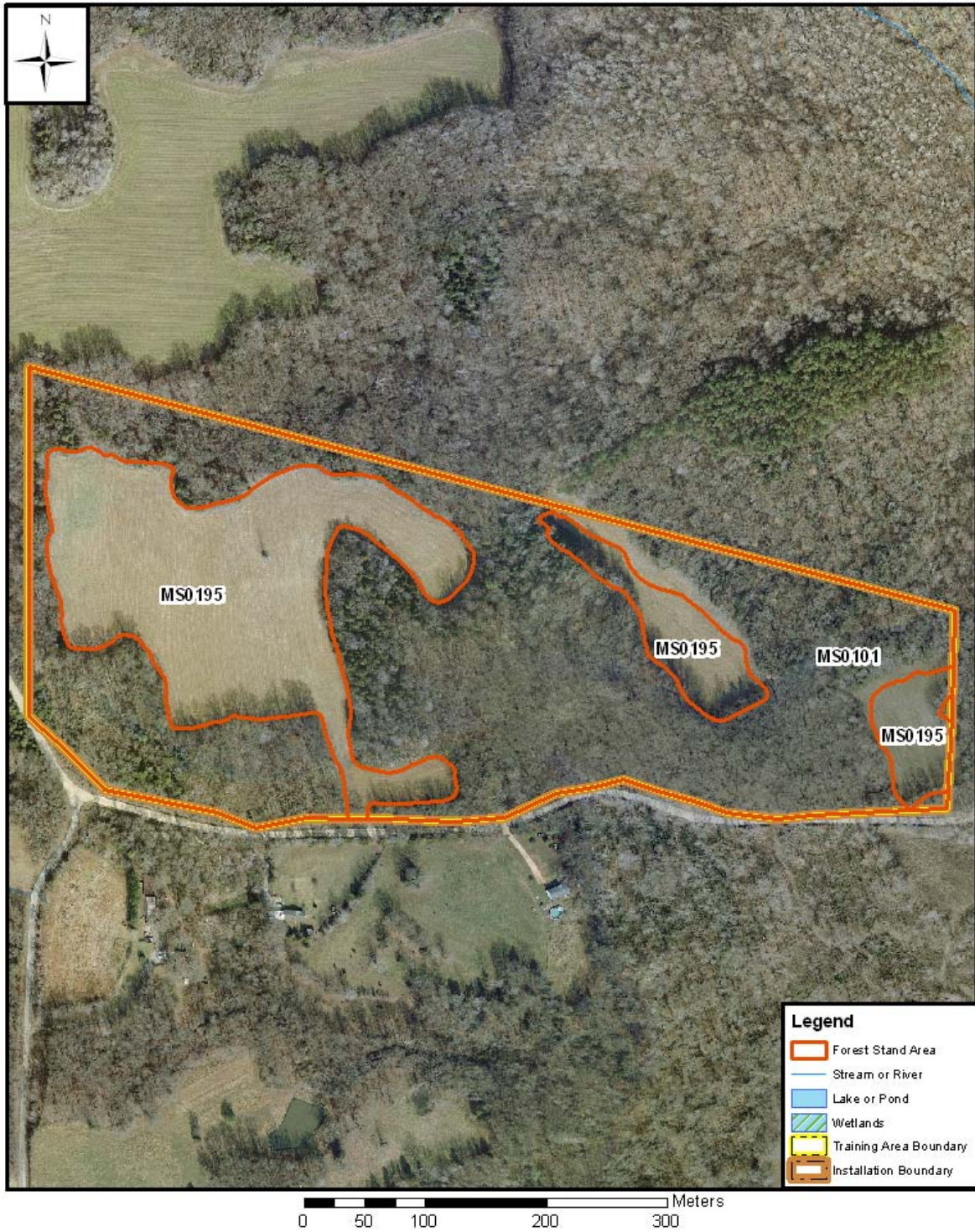


Figure A1.18: Forest stands in Training Area S-1.

5.18 Training Area S-2

Training Area S-2 is 64 acres in size and is also separated from the main installation lands. The area is comprised of two forest stands that surround a small and irregularly shaped open field that snakes its way throughout the forest areas.

Stand Descriptions

Stand ms0201 is a 49.09-acre mature upland pine and hardwood forest. The stand is dominated by red oaks and white oaks, with a mix of hickory, poplar, and walnut. The trees range in age from 20 to 50 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is good to poor. This stand shows signs of past wind damage. This stand occurs on a former home site, with an abandoned curbed water well still being present.

Stand ms0202 is an old 6.44-acre dirt pit that has been planted with loblolly pine. This stand is in good to excellent health, but needs some type of thinning to keep it healthy.

Forest Management Prescriptions

Stand ms0201. This stand will be thinned by removing all hardwood trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 5 to 7 years for fuel reduction only. No burning should be attempted before thinning is completed.

Stand ms0202. This stand will be thinned by removing all trees that are 14 inches DBH and smaller. This will allow room for the remaining trees to grow. Prescribed burning can be done once every 6 years for fuel reduction only. No burning should be accomplished before the thinning is completed due to the very heavy accumulation of fuels.

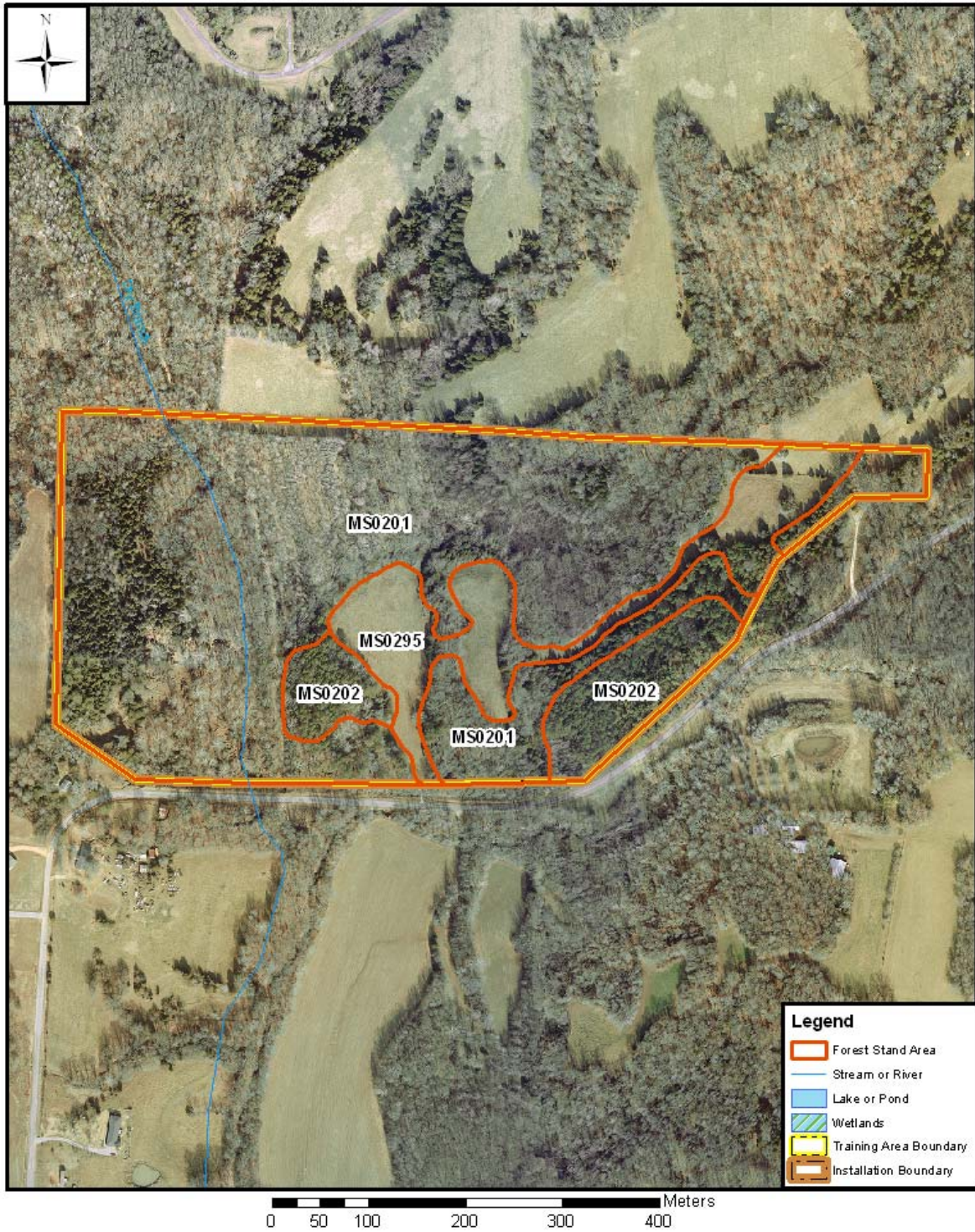


Figure A1.19: Forest stands in Training Area S-2.

5.19 Training Area S-3

Training Area S-3 is a small (16 acres) area that is isolated from the main installation lands. This area is dominated by an open field on its western size, but does support a single 5.87-acre forest stand.

Stand Description

Stand ms0301 is a mature upland pine and hardwood forest dominated by red oak and white oak, with a mix of hickory, poplar, and walnut. The trees range in age from 20 to 50 years old. Some of the oaks and poplars are considered oversized for sawmills, due to the DBH being larger than 30 inches. The overall health of the stand is poor to good. Due to small size of stand, any management actions should be combined with operations in the forest stands comprising the nearby Training Areas S-1 and S-2.

Forest Management Prescription

Stand ms0301. This stand will be thinned by removing all hardwood trees that are 18 inches DBH and larger. This will allow room for the remaining trees to grow, plus aid in training. Some areas are covered in pure cedars. Such areas need to be opened up to allow pines and hardwoods to seed in. During the thinning operation, all cedars would be removed regardless of size. Prescribed burning can be done once every 6years for fuel reduction only. No burning should be undertaken before thinning is completed.

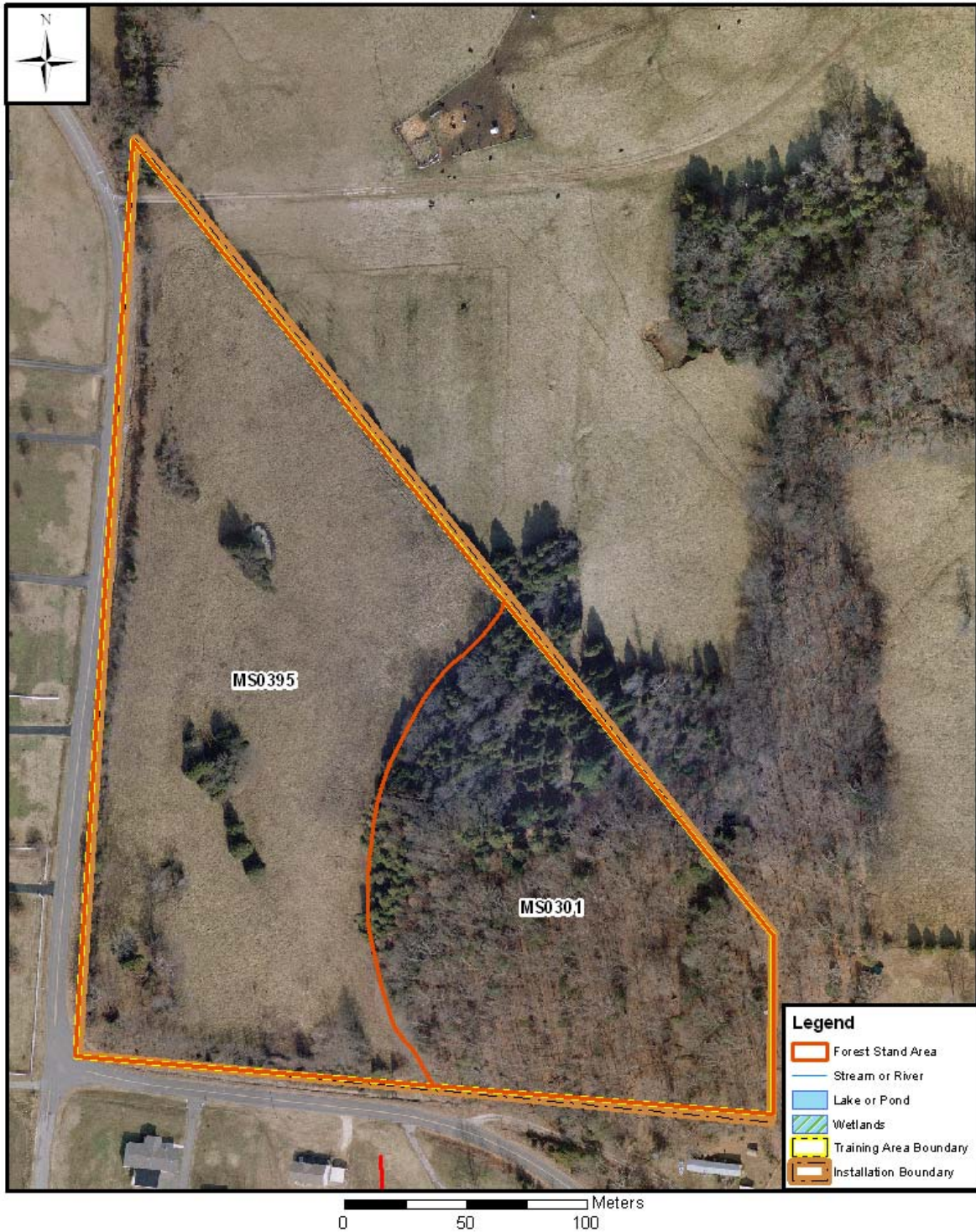


Figure A1.20: Forest stands in Training Area S-3.

5.20 Implementation Schedule

A total of 26 individual forest stands have been designated on VTS-Milan. Many of the stands are dominated by older, overmature trees and are scheduled for thinning to improve conditions in which younger trees can begin to enter the forest canopy and to improve the overall health of such stands. The timber harvests will be scattered across the training site (Figure A2.??) in any given year to create a mosaic of conditions and stand ages over time.

Table A2.3 presents the schedule by which the above described forestry management actions should be implemented over the period 2010-2016. The forest resources will be re-inventoried in 2015 and new prescriptions developed for the forest stands.

Table A2.3: Timber harvest plans for VTS-Milan, 2010-2016.

| Year | Training Area | Stand | Acres | Primary Management Action |
|----------------|---------------|--------|--------|---|
| 2010 250 ac | A-3 | Ma0301 | 78.36 | Thin everything >18" |
| | A-3 | Ma0301 | 7.0 | Clearcut |
| | A-5 | Ma0501 | 130.03 | Thin everything >18" |
| | A-5 | Ma0501 | 2.0 | Clearcut |
| | A-6 | Ma0601 | 17.04 | Selection cut all hardwood |
| | A-6 | Ma0601 | 15.0 | Clearcut |
| 2011 262 ac | A-2 | Ma0202 | 29.95 | Thin all below dominant/co-dominant class |
| | A-8 | Ma0803 | 30.27 | Thin everything >18" |
| | A-9 | Ma0901 | 111.60 | Thin everything >18" |
| | B-1 | Mb0101 | 89.65 | Thin pulpwood |
| 2012 263 ac | A-7 | Ma0701 | 141.07 | Thin everything >18" |
| | A-1 | Ma0101 | 65.54 | Thin everything >18" |
| | C-1 | Mc0101 | 42.04 | Thin everything >18" |
| | C-2 | Mc0201 | 14.46 | Thin everything >18" |
| 2013 239 ac | A-4 | Ma0401 | 158.10 | Thin everything >18" |
| | A-5 | Ma0502 | 14.63 | Thin pulpwood |
| | S-1 | Ms0101 | 33.03 | Thin everything >18" |
| | B-2 | Mb0201 | 77.43 | Thin everything >18" |
| 2014 256 ac | A-9 | Ma0902 | 171.69 | Thin pulpwood |
| | A-10 | Ma1001 | 84.01 | Thin pulpwood |
| 2015 239 ac | B-3 | Mb0301 | 93.93 | Thin everything >18" |
| | A-2 | Ma0201 | 81.28 | Thin everything >18" |
| | A-8 | Ma0801 | 63.95 | Thin everything >18" |
| 2016 132 ac | S-2 | Ms0201 | 49.09 | Thin everything >18" |
| | S-2 | Ms0202 | 6.44 | Thin everything <14" |
| | S-3 | Ms0301 | 5.87 | Thin everything >18" |
| | A-8 | Ma0802 | 70.35 | Thin pulpwood |

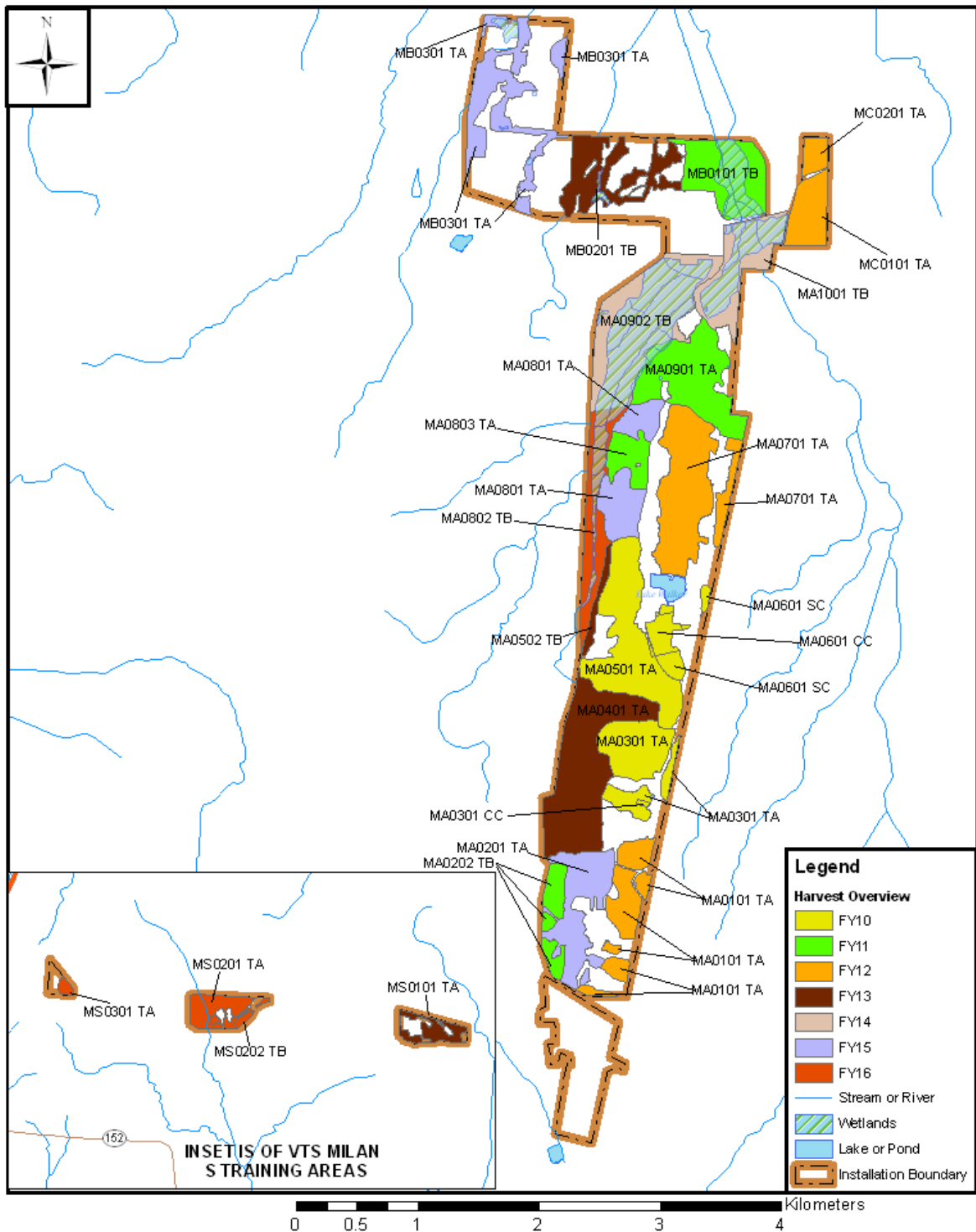


Figure A1.21: Distribution of timber harvests over the 7 year plan for the VTS-Milan. TA = Thinning of the largest trees. TB = Thinning of the understory and sub-dominant trees. CC = Clearcut. SC = Selection harvest of damaged hardwoods. NA = No harvest.

Annex 2

WILDLAND FIRE MANAGEMENT PLAN

Wildland Fire Management Plan

VTS-Milan

Tennessee Army National Guard

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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-Milan 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-Milan was developed to support the following goals:

- Provide for the safety of fire crews on every wildland fire management activity.
- Reduce wildfire potential on the training site and suppress undesired wildfires to protect lives, property, and natural and cultural resources in a cost-effective manner.
- Utilize prescribed fire to maintain and improve the usability of the training site to support all aspects of the military mission.
- Utilize prescribed fire to effectively protect and enhance valuable natural resources and to implement ecosystem management goals and objectives.

1.2 Key Definitions

Wildland. An area in which development is essentially nonexistent, except for roads, railroads, power lines and similar transportation facilities. Structures, if any, are widely scattered.

Wildland Fire. Any non-structure fire occurring in the wildland that is not meeting management objectives and thus requires a suppression response.

Wildland Fire Use. The application of the appropriate management response to naturally-ignited wildland fires to accomplish specific resource management objectives in pre-defined designated areas outlined in Fire Management Plans.

Wildfire. An unplanned, unwanted wildland fire, including unauthorized human caused fires, naturally occurring wildland fires, and escaped prescribed fires, where the objective is to put out the fire.

Prescribed Fire. Controlled, purposeful application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions which allow the fire to be confined to a predetermined area and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

1.3 Location and Physical Features

The VTS-Milan consists of 2,466 acres in the central part of west Tennessee in Carroll and Gibson Counties. The main portion of the installation (A, B, and C training areas) lies in Carroll County, with three small parcels (S training areas) located in Gibson County.

The closest towns are Lavinia to the east, Milan to the northwest, and Humboldt to the west. Jackson, TN, is approximately 20 miles to the south on Interstate 40. State Highway 220 forms the eastern boundary of the main portion of the training site, and Highway 104 separates the A area from the B area. Immediately to the west of VTS-Milan is the Milan Army Ammunition Plant, a 22,000 acre DoD property.

The VTS-Milan consists of 18 training areas, separated into the 4 compartments (A, B, C, and S) and a small cantonment at the southern tip of the main installation.

Topographic change is small across the training site, with elevations ranging from 390 ft above sea level along the creek system to 600 ft. A significant wetland area lies in the northwest portion of A area surrounding the Halls Branch drainage, which runs north-south through most of A area. Johns Creek runs across the eastern side of B area and into A. Several small ponds are scattered around the B area, and one large one, Walker Lake, occupies 13 acres near the middle of A area. Soils, as typical for western Tennessee, are highly erodible on most of the training site.

Approximately 1,735 acres (approximately 70%) of the VTS-Milan are forested, principally with mixed hardwood species. Managed grasslands – ranges and maneuver lands – cover about 683 acres of the training site. There is no unexploded ordinance on the VTS-Milan.

2.0 PROGRAM OVERVIEW

2.1 Organizational Structure and Responsibilities

The wildland fire program on VTS-Milan 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-Milan Range Control is responsible for immediate wildland fire control response on the training site. There is an MOA in place with the Milan Army Ammunition Plant (MAAP), which is located on the west flank of the training site. MAAP has three volunteer fire departments (VFDs) on-site. A unified command will be set up with the VFDs and any qualified VTS-Milan personnel in the event that the MAAP is called in to help control a wildland fire that is beyond the capabilities of the training site staff.

Prescribed fire activities on the VTS-Milan are conducted by training site personnel. Environmental personnel also participate in prescribed burns conducted for ecosystem management goals.

2.2 Interagency Cooperation and Mutual Aid Agreements

There is a verbal MOA in place with the Milan Army Ammunition Plant. The ammunition plant has three volunteer fire departments on-site which will respond to emergency needs on the VTS-Milan. Tennessee Division of Forestry can also be contacted if needed.

2.3 Personnel

VTS-Milan currently has 5 trained wildland firefighters (FFT2) (Table A2.1). Additional firefighters may be requested from other TNARNG facilities to aid in prescribed burning.

Table A2.1: TNARNG personnel with wildland fire training.

VTS-Milan On-Site Personnel:

| Name | Training | Training Date |
|-----------------|-------------------------------------|----------------------|
| Shane Bostick | S130/190 | FEB 2008 |
| Steven Hendrix | S130/190 | FEB 2008 |
| Timothy Madison | S130/190 | FEB 2008 |
| Jerry Snider | S130/190 | FEB 2008 |
| Weldon Tart | ARNG Basic Prescribed Fire Workshop | SEP 2000 |

Other TNARNG Personnel:

| Name | Location | Training | Training Date |
|------------------|-----------------|--------------------------------------|----------------------|
| Laura Lecher | ENV Milan | S130/190, I-100, L-180 S290, S131 | FEB 2006 JAN 2008 |
| James Davis | ENV Nashville | S130/190 | FEB 2008 |
| Carter Honeycutt | VTS-Catoosa | S130/190 | FEB 2008 |
| Robert McArthur | VTS-Catoosa | S130/190 | FEB 2008 |
| Timothy McKee | VTS-Catoosa | S130/190 | FEB 2008 |
| Winston Webb | VTS-Catoosa | S130/190 | FEB 2008 |
| James Watrous | VTS-Smyrna | S130/190 | FEB 2008 |
| James Kennedy | VTS-Tullahoma | S130/190 | FEB 2008 |
| Curtis Strode | VTS-Tullahoma | S130/190 | FEB 2008 |

2.4 Available Equipment

The VTS-Milan maintains a cache of fire equipment for wildland fire suppression and prescribed burning (Table A2.2). 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 A2.2: Available fire equipment at VTS-Milan.

| | |
|---|---|
| Fire rake | 5 |
| Pulaski axe | 5 |
| Shovels | 5 |
| Drip cans | 4 |
| 5 gal Backpack sprayer - metal | 5 |
| | |
| Trailer-type pressure washer 300 gal + 25' hose | 1 |
| 40 gal water tank mounted on Gator | 2 |
| | |
| D-7 dozer | 1 |
| 120-G grader | 1 |
| Gyro-track with brush grinder | 1 |
| 6400 tractor | 2 |
| Back hoe | 1 |
| Track hoe | 1 |
| GMC 4WD diesel pickup truck | 4 |
| | |
| 10' bush hog | 1 |
| 15' bush hog | 2 |

2.5 Funding Requirements

The funding responsibilities for wildland fire are defined in the DA Sustainable Range/ Installation Environmental Activities Matrix (2 Sep 2005). Wildland fire expenses are primarily the responsibility of the Facilities/Real Property Division. Funding for WFMP implementation, wildland fire prevention, fuels management for hazard reduction, wildland fire suppression, prescribed burning, firebreak construction and maintenance, and other wildland fire management is an installation operations and maintenance responsibility.

Integrated Training Area Management funds may be utilized for prescribed burning intended to improve training facilities/environments, as well as for construction and maintenance of fire breaks or other fuel removal directly associated with training-induced fire hazard on ranges and training areas.

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

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

2.6 Public Relations

Appropriate county agencies should be informed to ensure that the burn operation complies with all local government fire regulations. A burn permit must be requested from the Tennessee Division of Forestry, Carroll County Office. The MAAP Fire Department should be informed of the planned prescribed burn and their assistance requested in preventing the fire from escaping containment, if needed. The Terry Volunteer Fire Department, which serves the rural Lavinia community adjacent to VTS-Milan, should also be informed so they will be aware of the burn operation and prepared to act in the event they are called upon for assistance. Local law enforcement agencies should be notified of the burn so that they can react to any traffic difficulties that may be created by unplanned smoke problems. The following list identifies the agencies and organizations that should be notified of a prescribed burn operation:

| | |
|-----------------------------------|--------------|
| TN Division of Forestry | 731-986-5550 |
| Milan Army Ammunition Plant | 731-686-6416 |
| Terry Volunteer Fire Department | 731-987-3780 |
| Gibson County Sheriff Department | 731-855-0277 |
| Carroll County Sheriff Department | 731-986-8947 |
| Tennessee Highway Patrol | 615-251-5175 |

A news release should be considered to inform the public of the planned burn so that the adjacent property owners will understand what is happening when they see smoke on the day of the burn. Lastly, plans should be made to place temporary signage along Highways 220 and 104 on the day of the burn to inform motorists of potential visibility hazards from smoke resulting from the burn.

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 Analysis (EA) for the Integrated Natural Resources Management Plan for the VTS-Milan.

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 MAAP VFD or Tennessee Division of Forestry representative, as appropriate to the nature of the outside aid required.

The on-site Incident Commander will ensure all firefighter and public safety precautions are taken and are the highest priority in all operations. Except in the event of a threat to human life, no wildland fire situation will require placing a firefighter or equipment in extreme danger.

Before fire suppression or prescribed fire activities are initiated, the Incident Commander (or burn boss, in the case of prescribed burning) will go over the plan of operation with all personnel directly participating and ensure all personnel have at least the minimum PPE required.

All TNARNG personnel involved in wildland fire activities will receive appropriate training for their tasks (see Section 3.2). Firefighters will be issued a Fireline Handbook NWCG Handbook (3 PMS-410/NFES 0065) and the Incident Response Pocket Guide (PMS-461/NFES 1077). Each firefighter will be knowledgeable and review the 10 Standard Fire Orders and the 18 Watchout situations. No emergency situation will be approached without the proper safety mitigations in place with the use of Lookouts, Communications, Escape Routes and Safety Zones (LCES).

All safety gear will comply with NFPA 1977 Standard on Protective Clothing and Equipment for Wildland Fire Fighting. This standard specifies the minimum design, performance, testing, and certification requirements for items of wildland fire fighting protective clothing and equipment, including protective garments, helmets, gloves, footwear, goggles, chain saw protectors, and load carrying equipment.

The VTS-Milan does not contain any unexploded ordinance.

3.1 Risk Assessment Process

Safety of TNARNG personnel, firefighters, civilians, and neighbors is of paramount importance in all wildland fire actions. Risk assessment for all emergency response situations will follow the five step process outlined below (from the Incident Response Pocket Guide PMS-461/NFES 1077). Situational awareness must be maintained throughout the changeable conditions of a wildland fire activity and re-assessment conducted whenever there is a significant alteration of circumstances.

3.1.1 The Risk Management Process

Step 1. Situational Awareness

- Gather information
 - Objective(s)
 - Previous fire behavior
 - Communication
 - Weather forecast
 - Who's in charge?
- Any local factors
 - Scout the fire/incident

Step 2. Hazard Assessment

- Estimate potential fire behavior hazards
 - Look Up / Down / Around indicators
- Identify tactical hazards
 - Watch Outs
- What other safety hazards exist?
- Consider severity vs. probability

Step 3. Hazard Control

- Firefighting Orders and LCES Checklist – MANDATORY
 - Anchor point
 - Downhill checklist (if applicable)
- What other controls are necessary?

Step 4. Decision Point

- Are controls in place for identified hazards?
 - NO: Reassess situation YES: Next question
- Are selected tactics based on expected fire behavior?
 - NO: Reassess situation YES: Next question
- Have instructions been given and understood?
 - NO: Reassess situation YES: Initiate action

Step 5: Evaluate

- Personnel: Low experience level with local factors?
 - Distracted from primary tasks?
 - Fatigue or stress reaction?
 - Hazardous attitude?
- The Situation: What is changing?
 - Are strategy and tactics working?

3.1.2 Prescribed Burning Risk Assessment

The above Risk Management Process will be applied during prescribed fire activities. Prescribed burning will not be conducted under any of the following conditions, as based on the Fire Weather information from the Tennessee Division of Forestry (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 A2.3) rating is a classification based on the Burning Index and is available from the US Forest Service (<http://www.wfas.net/content/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:

Table A2.3: Fire Danger Rating.

| Fire Danger | Burning | Description | Recommended Military |
|--------------------|----------------|--------------------|-----------------------------|
|--------------------|----------------|--------------------|-----------------------------|

| Rating and Color Code | Index (BI) | | Considerations |
|------------------------------|-------------------|---|---|
| (1) Low (Green) | 0-20 | Fuels do not ignite readily from small firebrands. Most prescribed burns are conducted in this range. | None. |
| (2) Moderate (Blue) | 21-40 | Fires are not likely to become serious and control is relatively easy. Fires burning in these conditions generally represent the limit of control for direct attack methods. | None. |
| (3) High (Yellow) | 41-60 | Fires may become serious and their control difficult unless they are attacked successfully while small. Machine methods are usually necessary or indirect attack should be used. | Recommend firing pyrotechnics into open drums; altering firing times to hours with lower fire danger. |
| (4) Very High (Orange) | 61-79 | Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. The prospects for direct control by any means are poor at this intensity. | No pyrotechnics or tracer rounds allowed, except with written authorization from Range Control. |
| (5) Extreme (Red) | 80+ | Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. The heat load on people within 30 feet of the fire is dangerous. | No pyrotechnics or tracer rounds allowed. |

3.2 Personnel Training and Certification

Training will adhere to the standards set by NWCG as described in PMS-310 (<http://www.nwcg.gov/pms/docs/docs.htm>). All firefighters need to obtain the basic Firefighter Type 2 (FFT2) qualifications (S130/190 classes) and will need to attend an annual fireline safety refresher provided on-site or off.

The Natural Resource Manager (NRM) for TNARNG, is responsible for maintaining and tracking the training records for VTS-Milan 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-Milan, the moderate level fitness standard is considered sufficient for TNARNG wildland firefighters. The field test will be administered by the Natural Resources Manager and/or the Environmental Program Manager according to the standards in PMS-307/NFES 1109, Work Capacity Test Administrator's Guide (2003). All TNARNG personnel with current firefighter training will be required to pass the test prior to the end of FY2009. New personnel with fire suppression or prescribed fire duties will be tested prior to their first fire activities (unless they already have their Red Card).

4.0 FIRE FACTORS

4.1 Fire History

No significant wildfires have occurred on the training site in the past 25 years. 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-Milan is to support unit requirements for maneuver, range operations, equipment use, and other combat readiness training. Over 90% of training site utilization is by military users, including armored cavalry, artillery, and engineer units. All training activities involve field-training exercises. Tracked and wheeled vehicle training represents a major component of the training program and includes on- and off-road movement through the installation's forested areas. In addition, bivouac, dismounted infantry, and land navigation also occur on the installation. Five active live fire ranges are - located on the VTS-Milan.

This WFMP supports the military mission of the VTS-Milan 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 firing ranges and bivouac sites and controls fuel buildup to minimize wildfire intensity. Prescribed fire can also be a useful management tool to maintain the forested areas in an open condition that is conducive to the movement of vehicles.

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-Milan. 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 survey of VTS-Milan conducted in 1999 found no archaeological sites eligible for the NRHP. Five cemeteries are located on the training site, two in the cantonment area and one each in TA A4, TA A5, and TA A10. These cemeteries as well as other potentially significant sites are considered "no plow" zones, and are included on Figure A2.1 with the natural resources 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. Prior to any prescribed burn, at-risk cemeteries will be protected by a fire line placed outside its perimeter fence.

4.3.2 Natural Resources

The VTS-Milan contains 18.4 miles of intermittent or flowing streams. To protect water quality, the 50 foot Streamside Management Zone on each side of these streams will be a no-plow zone. Firebreaks within riparian corridors must be designed in coordination with the Natural Resource Manager and will be outside of the 50 foot SMZ (Figure A2.1). Prescribed burning within riparian areas will be limited and subject to careful planning to ensure streambanks are not denuded of vegetation.

Similar limitations will be implemented around the multiple ponds on the VTS-Milan. Most of these small, man-made impoundments are located in the northern portion of the A area and in B area. A 50 foot buffer will surround each pond, representing a no-plow zone.

The training site includes a substantial acreage (245 acres) designated as wetland, generally associated with the two major creeks in the northwest portion of A and eastern portion of B areas. The bottomland hardwood communities are very susceptible to damage by fire. In addition, the wet soils are subject to compaction and rutting. Wetland areas will be surrounded by a 50' SMZ buffer and the entire wetland area in addition to the buffer will be a no-plow zone. Prescribed burns may be deemed necessary to control fuel loading in wetland areas. These burns will be planned to burn cool to minimize long-term impact and will be controlled with plow lines located outside of the wetland or with hand lines if a fire break is needed within the wetland boundaries.

The soils on the VTS-Milan are extremely prone to erosion. In order to minimize erosion problems on firebreaks, water control structures to manage surface water movement will be installed during firebreak construction. Permanent fire lines will have water control structures maintained. Temporary firelines will be rehabilitated as soon as practicable after any fire. Existing barriers such as roads and trails will be used whenever possible to reduce the need for fireline construction and to minimize resource impacts.

7.2 Fire Regime

The fire regime classification system is used to characterize the personality of a fire in a given vegetation type, including the frequency that the fire visits the landscape, the type of pattern created, and the ecological effects. The following natural fire regimes are arranged along a temporal gradient, from the most frequent to the least frequent fire return interval. The definitions below are from the General Technical Report, Rocky Mountain Research Station #87 (GTR-RMRS-87).

Fire Regime Frequency Effect to Dominant Vegetation:

| | | |
|-----------------|---------------|-------------------|
| Fire Regime I | 0-35 years | Low Severity |
| Fire Regime II | 0-35 years | Stand Replacement |
| Fire Regime III | 35-100+ years | Mixed Severity |
| Fire Regime IV | 35-100+ years | Stand Replacement |
| Fire Regime V | 200+ years | Stand Replacement |

Fire Regime I: Fires in the under-story fire regime generally do not kill the dominant vegetation or substantially change its structure. Approximately 80 percent or more of the above ground dominant vegetation survives fire. The under-story fire regime occurs primarily in southern pine and oak-hickory forests, including the upland hardwood forest types found at VTS-Milan. 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.

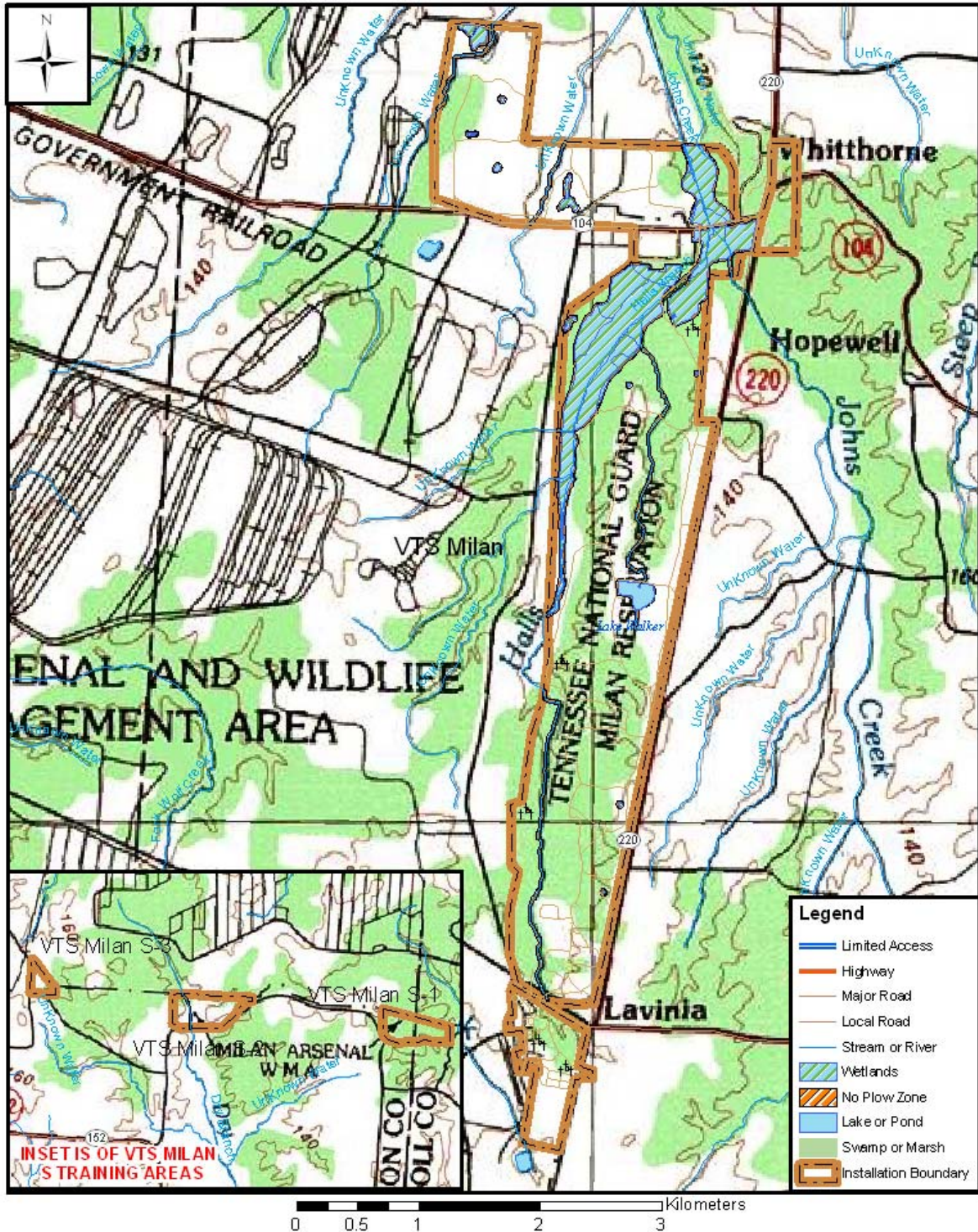


Figure A2.1: No-Plow Zones on VTS-Milan due to significant natural and/or cultural resources.

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-Milan is considered to be approximately 70% forested. Grasslands occupy most of the remainder of the installation. The training site consists of the following fuel models (Figure A2-2). Each group has an approximate acreage that occurs on site and gives a general description of the fuel and the fire behavior typically seen with the given fuels.

4.5.1 Grass Group

These fuels are seen on approximately 680 acres on VTS-Milan. Grasses are generally associated with weeds, ferns and other seasonal plants. During the growing season, they are green with high moisture content. They act as barriers to fire when green rather than as a carrier of fire. As the season advances, they cure and when fully mature, all but the roots will die and dry out. When dry, they have the fastest rate of spread of any fuel. The loading, however, is low and the fire will not be as intense. The intensity of these fires will be closely associated with the rate of spread. Slow moving fires in grass fuel will have very low intensity but high winds can change it to a very fast moving fire of moderate intensity. Moisture content closely follows daily weather changes. It is very sensitive to changes in relative humidity and wind.

- **Fuel Model 1** (1-foot deep) Fire spread is governed by the fine herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area. Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations that meet the above area constraint. Annual and perennial grasses are included in this fuel model.
=> Regularly mowed ranges and lawns on the VTS-Milan.
- **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.
=> Ranges and training areas on the VTS-Milan that are maintained by occasional bush-hogging.

4.5.2 Shrub Group

These fuels are not seen very frequently on VTS-Milan and only make up approximately 20 acres. Red cedar can be a very volatile fuel, especially during a drought or given a significant amount of grasses under and between trees. The volume of available fuel will continue to increase until the crowns begin to close, shading out the weeds and grasses. As this occurs, a smaller percentage of the total fuel loading becomes available to most fires due to the height of the crowns and less “ladder” fuel to carry the fire into them. The fuel available to most fires will generally be the understory fuels that are on the surface.

- **Fuel Model 4** (6 feet deep) Fire intensity and fast spreading fires involve the foliage and live and dead fine woody materials in the crowns of a nearly continuous secondary over-story. Besides

flammable foliage, there is dead woody material in the stand that significantly contributes to the fire intensity. Heights of stands, qualifying for this model, vary with local conditions. There may be also a deep litter layer that confounds suppression efforts. Red cedar is considered in this group.

=> Scattered small redcedar-dominated stands.

- **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.

4.5.3 Timber Litter Group

These fuels are the majority of what will be seen on-site. Approximately 1,730 acres of VTS-Milan is in the timber litter group, and the majority of that falls in fuel model 9. The fuel under most forest stands consists of light to moderate loading of fuel, most of which is compacted on the ground. Fuels of this type are found throughout the Piedmont and Upper Coastal Plain regions of the Southeast. In dense pine stands, the predominant fuel is the matted pine needles. In upland hardwoods, it is compacted hardwood leaves. The amount of brush will vary from almost non-existent to almost solid brush, especially if there is little over-story. This type fuel will generally consist of grasses, pine needles, deciduous shrubs, small saplings, pinecones, twigs and branches. Fires in this type fuel will generally be of low intensity and slow spreading. The surface fuel is compacted and dries out very slowly. Consequently, much of it will not be available. Shrubs and small saplings tend to be more readily available and will add to the intensity where they are present. Most fires will be of rather low intensity and easy to control except during droughts when a larger percent of the fuel will be available. Firefighters can be surprised when this happens if they are not alert because of the increased intensity and rapid spread of the fire.

- **Fuel Model 8** (0.2-foot deep) slow burning ground fires with low flame heights are generally the case, although an occasional “jackpot” or heavy fuel concentration may cause a flare up. Only under severe weather conditions do these fuels pose fire problems. Closed-canopy stands of short needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and some twigs since little undergrowth is present in the stand.

=> Pine-dominated stands scattered across the training site.

- **Fuel Model 9** (0.2 foot deep) Fires run through the surface litter faster than model 8 and have higher flame height. Both long-needle conifer and hardwood stands, especially the oak-hickory types, are typical. Fall fires in hardwoods are representative, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling blowing leaves. Closed stands of long-needled pine like ponderosa, Jeffrey, and red pines or southern pine plantations are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning activity.

=> The hardwood forests that occur throughout the VTS-Milan.

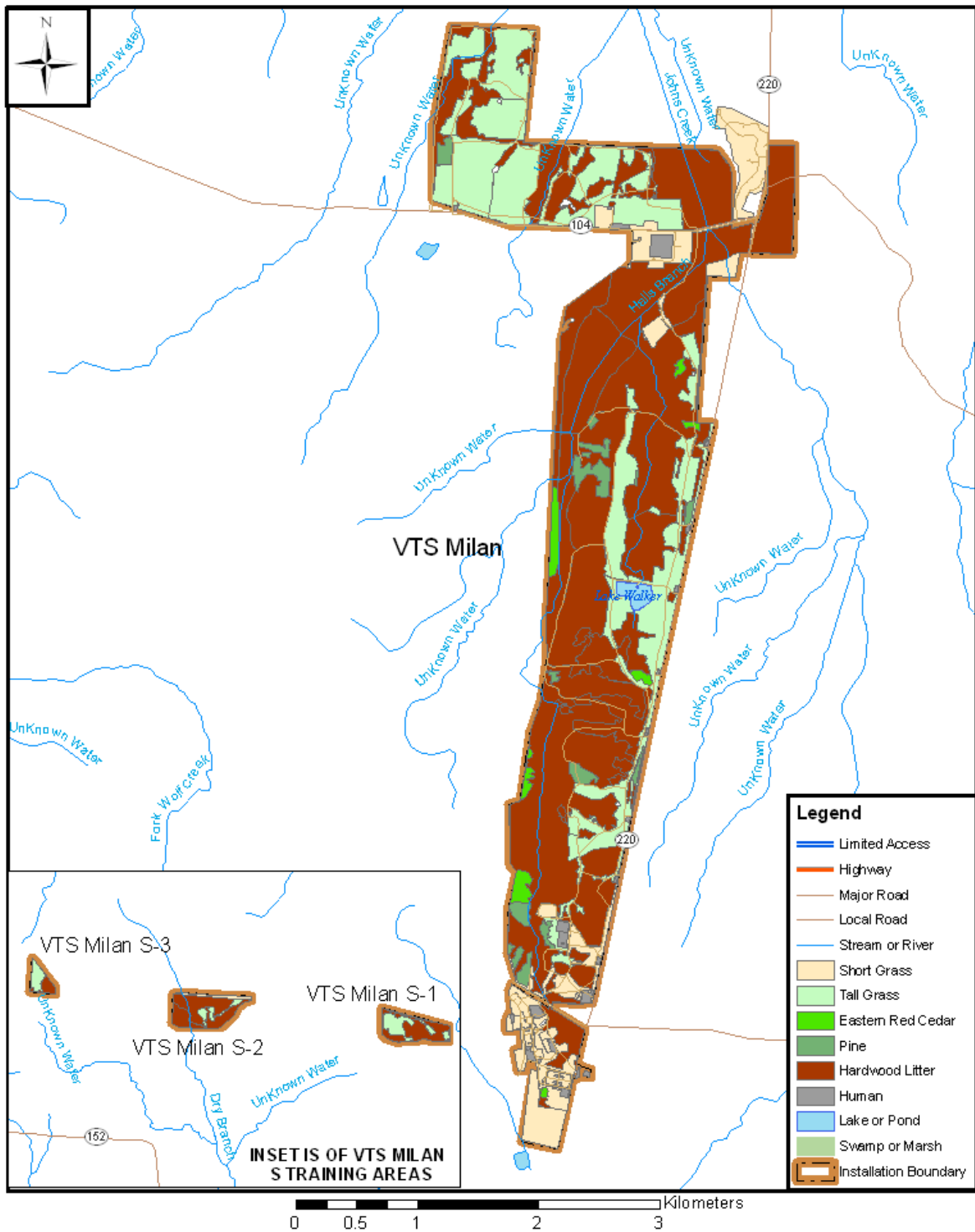


Figure A2.2: Fuel types on the VTS-Milan.

5.0 WILDLAND FIRE CONTROL

Due to its small size, the VTS-Milan 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-Milan firefighters respond to all wildland fires on the training site. At no time will the wildland firefighting assets be used for fighting vehicle, fuel, or structure fires without approval from the Installation Commander or the Range Officer. The MAAP VFDs will be contacted at 731-686-6416 for assistance if needed.

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

5.3 Dispatch Procedures

VTS-Milan Range Control is responsible for wildland firefighting activities on the training site. There is a verbal MOA in place with the Milan Army Ammunition Plant, which is located on the west flank of the training site. The MAAP has three volunteer fire departments on-site. A unified command will be set up with the VFDs and any qualified VTS-Milan 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-Milan 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 notified to assist and help manage the incident.

5.6 Rehabilitation Needs and Procedures

The Natural Resource Manager for TNARNG should evaluate all burned locations and suggest any site rehabilitation measures that may be needed. Rehabilitation costs will be the responsibility of facility maintenance or ITAM budgets

5.7 Records, Reports, and Monitoring

Firefighters call in a fire report to Range Control after every fire. These fire reports should include:

- Incident name
- Date and Time
- Incident Commander
- Location
- Size in Acres
- Fuel Type
- Brief description of the events
- Documented After-Action-Review:
 - What did we set out to do (what was planned)?
 - What actually happened?
 - Why did it happen that way?
 - What should be sustained? What can be improved?

The Range Control Officer will forward copies of these wildfire reports to the Natural Resource Manager for TNARNG who is responsible for maintaining fire records for all wildfires. The NRM will conduct a basic post-burn evaluation of the site to determine the need for rehabilitation and/or further monitoring of fire impact on natural resources.

6.0 PRESCRIBED FIRE MANAGEMENT

Prescribed fire can be used as a land management tool at VTS-Milan. However, because of the dominance of hardwood forests throughout much of the installation, prescribed fire should be used selectively and under a limited set of circumstances. The sensitivity of hardwoods to fire necessitates that the burner be experienced in conducting prescribed burns in hardwood forest communities. In view of the preponderance of hardwoods, the following overall burning guidelines were considered in developing the prescribed fire objectives and the recommended prescribed burn program for VTS-Milan.

- If burning is done in hardwood stands, the fire should be done 2-6 days after good rainfall and when relative humidity is 40 to 50%.
- Prescribed burns should be directed at reducing excessive fuel loads and should consume only the top layer of litter matter when burning under any type timber.
- Open fields should be burned clean to topsoil, but not so hot as to burn the grass roots.

6.1 Objectives

The following are the primary objectives for the prescribed burning program at VTS-Milan 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 control of introduced tall fescue grass and reintroduction of native warm season grasses.
- Utilize prescribed fire to manage pine dominated forest stands in TA A-2.
- Test the use of shelterwood harvest/burn method to regenerate mixed oak-pine forest.

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

Grasslands can be burned on a 2-year rotation. The upland hardwood forests should be burned on a 5- to 7-year interval to reduce fuel loads while minimizing damage to the timber. Burns should be conducted in mid-winter (December – February) under conditions that will produce the coolest fires possible. More frequent burning could damage or stress the trees. Forests on VTS-Milan 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. Open areas and grasslands important to military training may be effectively managed by prescribed burning to control woody species encroachment and to rejuvenate herbaceous and graminoid species.

- Substantial portions of Training Areas B-2 and B-3, as well as portions of Training Areas A-2, A-3, A-6, A-7, and A-9, support open grasslands. This vegetative condition is important for the conduct of specific types of military training, and prescribed fire can be a cost-effective method of maintenance. The grassland areas should be selectively burned on a rotational basis on a two-year schedule. Above-ground biomass should be burned clean to topsoil, but the fire should not be so hot as to burn the grass roots. Burning should take place between late October and late April before spring green-up and the establishment of nests by ground nesting birds. Larger grassed areas should be subdivided into smaller manageable units that are burned separately to promote habitat patchiness and to provide a refuge for wildlife displaced from other areas that are burned. No burning should be allowed between July and September when native plants of particular interest are flowering and developing seeds.
- New clearings for military training are proposed for Training Areas A-5 and A-6. Prescribed fire should be applied 1 to 2 years after clearing the timber to reduce fuel and encourage the establishment of native grasses and should be repeated on a 2-year rotation. Burns should take place between late October and late April, as above. If fescue is found to be infesting the sites, burns should be conducted in late April according to the guidance in 6.1.4 below.
- Prescribed fire will be applied to create openings within upland hardwood forests for bivouac training and other military training missions. The areas should be mechanically cleared, and

fire applied to eliminate slash materials. Thereafter, prescribed burns should be accomplished on a 2-year cycle during spring following the grassland guidelines.

6.1.3 Aid in the control of invasive species. Prescribed fire may be used in combination with mechanical and herbicidal methods to control invasive species that are problematic on VTS-M, including common privet, Japanese honeysuckle, and Chinese lespedeza. Care will be taken to avoid the use of prescribed fire in those locations where fire could stimulate the spread of other invasive plant species.

6.1.4 Aid in control of introduced tall fescue grass and reintroduction of native warm season grasses. Fescue is an invasive cool season plant that is well-established across the installation. Prescribed fire can be used in conjunction with chemical and mechanical methods to control and/or eradicate fescue. Areas with dense growths of fescue should be mowed and burned to remove residual vegetation and herbicides applied subsequently to the new growth. Burns should take place when fescue is actively growing in the spring (March-April). Where native warm season grasses are present, the fire should be applied in the late spring (April 1-20) just as the native grasses begin to emerge. Repeated late spring burning over a 2- to 4-year period may be needed in heavily infested areas to achieve good control of fescue. Utilization of Plateau herbicide in addition to burning/mowing regimes is recommended for preparing a site for native warm season grass establishment.

6.1.5 Manage pine dominated forest stands in TA A-2. Training Area A-2 contains a 30-acre pine dominated stand with trees ranging in age from 30-40 years. This stand is scheduled for a thinning in 2009. One year after thinning, the stand should be burned to control brush, reduce the wildfire hazard, and assist in control of invasive species. The prescribed burn should be conducted in the winter (December-March) before the spring green-up.

6.1.6 Regenerate native mixed oak-pine forest through shelterwood harvest/burn methods. The results of recent research indicate that low intensity backing fire in mature hardwood stands would probably have little adverse affect on the existing timber and could be used in combination with established forestry management methods to favor regeneration of oaks and oak-pine mixtures over less desirable hardwood species that are particularly sensitive to the effects of fire. Under this approach, an initial shelterwood harvest is made to remove roughly half of the basal area of the overstory in a hardwood stand near the end of its rotation. Logging slash must be kept away from the bases of the residual oaks that are not harvested to minimize damage from fires.

The initial partial harvest is followed by a 3- to 5-year waiting period during which time undesirable species such as yellow-poplar will dominate the advance regeneration pool of young trees. At the end of the waiting period, a relatively hot growing-season prescribed fire is conducted that topkills the seedlings and frees the oaks to replace the fire-sensitive species that are killed. The 3- to 5-year waiting period provides the shelterwood overstory trees that remain from the initial harvest sufficient time to recover from the shock of the logging operations before they are shocked again by the burn. If compatible with mission needs, an experimental application of this method will be applied to an appropriate stand in Training Area A-9.

6.2 Constraints

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

6.2.1 Protection of the waterways.

The VTS-Milan has two named streams and numerous tributaries dissecting its training areas. Johns Creek and Halls Branch are both identified by the State of Tennessee as impaired. Soils in the region are highly erodible, and sedimentation is a significant factor in water quality issues throughout much of west Tennessee. It is essential that efforts be made to minimize the risk of erosion and sedimentation. Along the banks of Johns Creek, Halls Branch, and their major tributaries, a 50 foot buffer (or streamside management zone) will be maintained within which vegetation and soils should not be disturbed. This 50' buffer is a "no plow zone" (Figure A2.??); firebreaks should be established further than 50 feet from the stream bank as needed. All efforts should be made also to avoid burning within the buffer zone in order to minimize loss of vegetation cover.

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

6.2.2 Protection of sensitive species.

The VTS-Milan has no known resident federal- or state-listed threatened or endangered species (the endangered interior least tern was sighted once during an avian baseline survey, but there is no evidence that this species routinely utilizes any habitat on the training site, which is outside its expected range). However, several bird species "deemed in need of management" by the State of Tennessee have been identified on the training site (Table 3.?). Scheduling of prescribed burns will take into account breeding season, and efforts will be made to minimize impact on breeding habitat.

In addition, suitable habitat for two plant species of concern to the State of Tennessee (compass plant (*Silphium laciniatum*) and ear-leaved false foxglove (*Agalinis auriculata*)) is present in portions of the installation's grasslands, although neither plant has been found on the training site to date. Both of these plants would benefit from the use of fire to manage the grasslands.

If any federally listed species are identified on the VTS-M, this plan will be revised in coordination with the USFWS 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. As of the preparation of this plan, Carroll and Gibson Counties are classified as being in attainment for these air quality constituents. Nevertheless, the current air quality conditions near the training site will be considered during prescribed burn planning.

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 a requirement 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-Milan that will warrant consideration during the conduct of every prescribed burn:

- Roads – Highways 220 and 104 are major State access routes bordering the installation. Highway 220 runs in a north-south direction along the eastern boundary. Highway 104 runs in an east-west direction in the northern portion of the installation, separating the “A” training areas from the “B” and “C” training areas. The three small “S” training areas are scattered along a rural road, the name of which alternates between Latham Chapel Road and Hope Hill Road. Training Area S-3 is also located near a track of the Illinois Central Gulf Railroad, which could pose a smoke visibility problem at the nearby road crossing. Local law enforcement personnel should be informed of an impending prescribed burn so a determination can be made as to whether an officer(s) should be assigned to the area to aid in directing traffic movement should smoke impede visibility on the roads. Signs may also be placed during prescribed burns to inform motorists of potential smoke hazard issues.
- Scattered along the eastern edge of the VTS-Milan along Highway 220 are a number of rural residences. In addition, the small community of Lavinia is located immediately to the east of the Cantonment Area along the southeastern boundary of the main installation. All burn activities should consider the potential effects of smoke dispersion on the residents located within these areas.

6.4 Use of Fire Breaks

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

To ensure that fire breaks are available when needed, a regular maintenance program must be pursued to maintain the fire breaks in a cleared and open condition, with a minimum of undergrowth and low

hanging limbs. The best maintenance scenario exists when the fire breaks serve dual or multiple purposes (i.e., roads, utility rights-of-way, etc.). In such situations, it is possible to distribute maintenance costs to other installation activities instead of having to assign the total costs to the prescribed fire program.

The existing road system provides the basis of the fire break network on the VTS-Milan. 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 if needed; where possible, these fire breaks will function as and be maintained as tank trails. Temporary fire breaks will be cut, as needed, prior to prescribed burns or during wildfire control, in accordance with the no-plow zones (Figure A2.1). These fire breaks will be reclaimed and revegetated as soon as possible following the fire.

6.5 Training and Crew Requirements

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

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

6.6 Burn Plans

A site specific burn plan is developed for each prescribed burn on the VTS-Milan, containing the elements listed below. The prescribed burn plan format for the TNARNG is located in Section 7.3.

- Burn Objectives
- Acceptable weather and fuel moisture parameters – Spot and General Forecast
- Required personnel and equipment resources
- Burn area map
- Smoke management plan
- Safety considerations
- Pre-burn authorization/notification checklist
- Coordination procedures
- Contingency Plan
- Evaluation and Monitoring plan

6.7 Notification

Agencies and individuals who may play a role in the prescribed burn or may be affected by the burn will be notified prior to the ignition of a prescribed fire.

- The Tennessee Division of Forestry, Carroll County office, will be contacted in advance to obtain a burn permit: 731-986-5550.
- The Milan Army Ammunition Plant will be contacted at 731-686-6416.
- The MAAP Fire Department will be contacted at 731-686-6416 and the Terry VFD at 731-987-3780.
- Local law enforcement agencies will be notified so that they can plan for smoke-induced traffic duties, as needed.
 - Gibson County Sheriff Department 731-855-0277
 - Carroll County Sheriff Department 731-986-8947
 - Tennessee Highway Patrol 615-251-5175

- Temporary signs may be placed along Highways 220 and 104 to inform motorists of potential visibility hazards from smoke resulting from the burn.
- A news release may be utilized to inform the public if the planned burn is extensive or located close to the property line.

6.8 Contingencies for an Escaped Burn

Prior to any prescribed burn, a small test fire will be ignited to confirm that the fire will behave in the desired manner. However, if after conducting a successful test fire and igniting the main burn any of the following conditions develop, burning will be stopped and the fire will be plowed under:

- Fire behavior is erratic
- Fire is difficult to control
- Wind shifts or other unforeseen weather conditions develop
- Weather conditions move outside the prescription range
- Smoke is not dispersing as predicted
- Public road or other sensitive area becomes smoked-in
- Burn does not comply with all laws, regulations, and standards
- Large fuels are igniting and burning
- There are not enough personnel to mop-up before dark and the likelihood exists that smoke will settle in a smoke-sensitive area overnight

Under any of these conditions, Range Control will be notified that contingency actions are being taken. If the contingency actions are successful at bringing the project back within the scope of the Prescribed Fire Plan, the project may continue. If contingency actions are not successful by the end of the next burning period, then the prescribed fire will be converted to a wildfire, and TNARNG will request assistance from the 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?
- Was the crew number, training, and assignments appropriate?
- Did the crew understand what they were doing?
- Were the rate of spread and flame length as predicted in the plan?
- Were public interactions satisfactory?

To answer some of these questions, during the burn, a designated crewmember should be assigned to estimate behavior, establish benchmarks (height and distance), record rate of spread for back, flank, and head fires, record flame heights for back, flank, and head fires stratify for fuel type and topography. Post fire estimates of fire intensity (scorch height and class, char, understory burn severity, and litter consumption), should be recorded after each burn to determine if unit-specific fire management objectives were met. Permanent 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-Milan is presented in Table A2.4, and the prescription for burning the hardwood forest habitat of the training site is presented in Table A2.5.

Table A2.4. Prescription for controlled burns in grasslands, fields, and forest openings.

| | | |
|--------------------|----------------------------|---------------------------------------|
| Stand Description: | Overstory | None to scattered trees |
| | Understory | Grasses |
| | Fuels | 1, 3 |
| | Topography | Gentle rolling hills to flat |
| Weather Range | Surface wind (dir/speed) | 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 A2.5. Prescription for controlled burns in upland hardwoods.

| | | |
|--------------------|----------------------------|---------------------------------------|
| Stand Description: | Overstory | Closed canopy mature hardwood stands |
| | Understory | Open, small areas of brush |
| | Fuels | 8, 9 |
| | Topography | Gentle rolling hills |
| Weather Range | Surface wind (dir/speed) | 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) |

Table A2.6. Prescription for controlled burns in TA A-2 pine stands.

| | | |
|--------------------|----------------------------|---------------------------------------|
| Stand Description: | Overstory | Closed canopy mature stands |
| | Understory | Open, small areas of brush |
| | Fuels | 8, 9 |
| | Topography | Gentle rolling hills |
| Weather Range | Surface wind (dir/speed) | 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 | 35 – 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-Milan are presented in Tables A2.6 and A2.7. Recommended fire frequency is depicted for all burn units in Figure A2.4. 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).

There will be little to no burning within forested portions of the training site. Hardwood timber stands will be burned as needed for fuel control or training area improvement, but no more often than every 7 years. Forest burns will be planned to ensure cool burns – set in December-February and at higher humidity levels – to minimize damage to the trees. There will be no burning in the bottomland hardwood forests along Halls Branch or Johns Creek or the associated wetland areas.

No burns will be conducted within most timbered areas until at least two years after the scheduled harvest is completed. Stands ma0101, ma0201, ma0301, ma0401, ma0601, and ma0802 may be burned prior to thinning. In addition, the areas of TA A-5 and A-6 that are being converted from forest cover to grassland may be burned sooner (1-2 years) following harvest and then begin the 3 year grassland fire rotation; and the pine stand in TA A-2 will be burned one year following thinning and then begin a 3 year fire rotation. Fuel conditions will be assessed each fall/winter to identify stands in need of prescribed fire.

Grassland areas of the training site will be subjected to prescribed fire on a 3-year cycle for maintenance purposes, as well as fuel control, invasive pest plant control, native grass restoration, and habitat improvement. These areas will be burned during the dormant season according to the schedule in Table A2.6. The grassland areas have been broken up into three year groups to ensure that there are non-burned areas adjoining burned areas each year. The new training areas in TA A-5 and A-6 will be added to the schedule after they are clearcut.

The S areas of the training site will not be subject to burning due to the proximity of private property to these relatively small areas of military land. Grassy openings in the S areas will be maintained solely by mowing and chemical weed control, as needed.

Table A2.6: Burn schedule for grasslands on VTS-Milan. New cleared areas in A-5 and A-6 will be added after timber harvest.

| Year | Training Area | Burn Unit | Acreage |
|----------------------|----------------------|-------------------|------------|
| 1 | A-1 | 1 | 3 |
| | | 4 | 3 |
| | A-6 | 2 | 47 |
| | | 1 | 3 |
| | | 2 | 5 |
| | A-9 | 3 | 7 |
| | | 3 | 3 |
| | | 4 | 22 |
| | B-2 | 1 (east of drain) | 42 |
| | | 2 | 10 |
| | Total acreage | | |
| 2 | A-2 | 3 | 5 |
| | A-7 | 2 | 39 |
| | A-10 | 1 | 5 |
| | B-2 | 2 | 5 |
| | | 5 | 4 |
| | | 6 | 14 |
| | B-3 | 1 (west of drain) | 50 |
| | | 4 | 29 |
| Total acreage | | | 151 |
| 3 | A-3 | 1 | 10 |
| | | 3 | 12 |
| | A-7 | 3 | 23 |
| | B-2 | 1 | 34 |
| | B-3 | 3 | 38 |
| | | 5 | 8 |
| | | 6 | 15 |
| Total acreage | | | 140 |

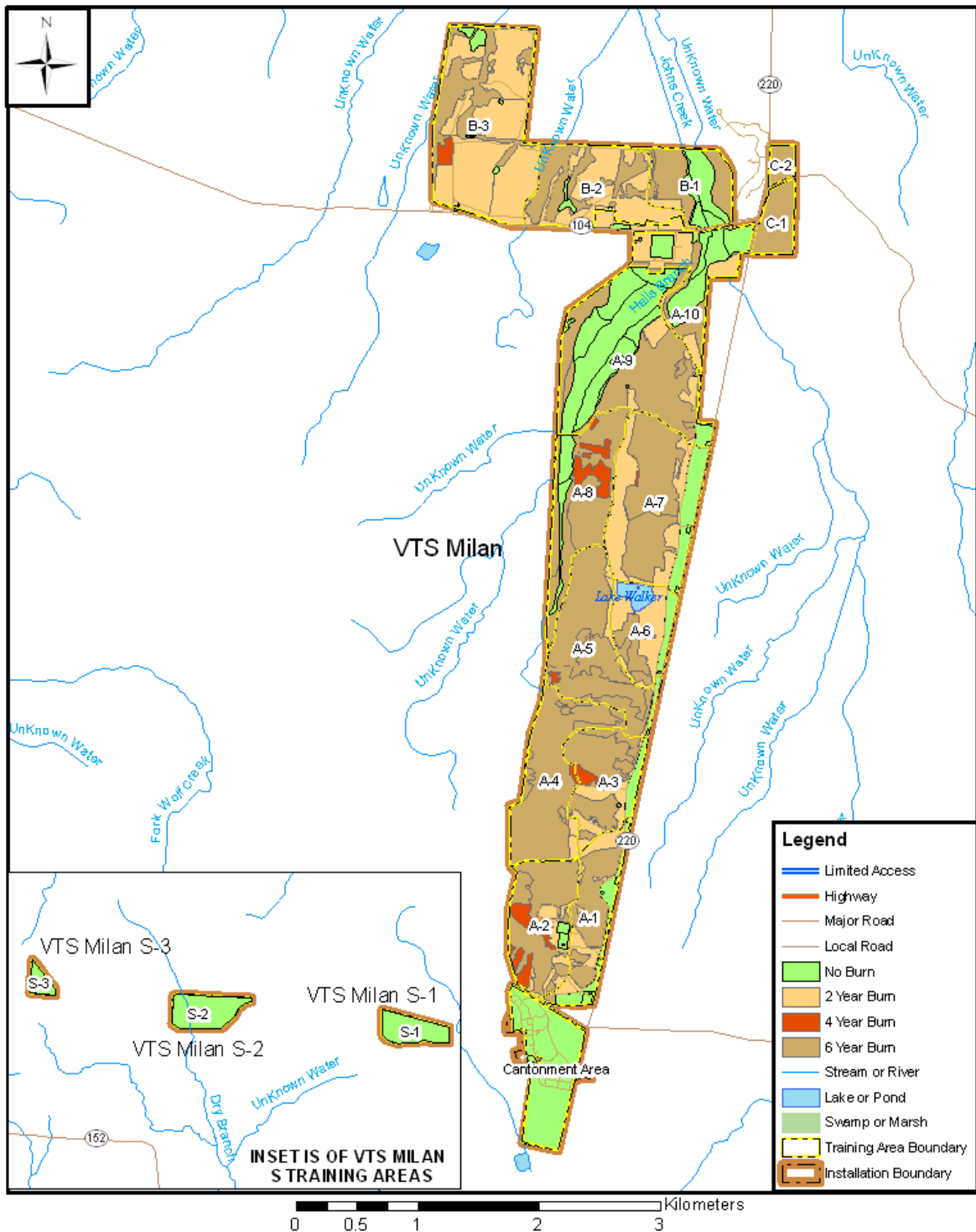


Figure A2.4: Prescribed burn frequency for burn units on VTS-Milan.

6.12 Test application of shelterwood-burn method to regenerate mixed oak-pine forest

Over 90% of the forest occurring on VTS-Milan is classified as hardwood forest, and over 60% of these hardwood stands are classified as mesophytic or upland hardwoods. Traditionally, fire has not been used as a management tool in hardwood stands due to the perceived danger to timber quality and value. Recent research, however, has indicated that frequent burning may create an environment in which oaks can have a competitive advantage over other hardwood species. The shelterwood-burn method described by Van Lear et al. (2000) will be applied to a hardwood stand in Training Area A-9 to test whether this technique will encourage greater oak regeneration in place of the dominant yellow poplar. A small stand will be subject to a shelterwood harvest, followed by a prescribed burn, in accordance with the forestland burn prescription, 3-5 years after the timber is cut. For more information, see the Forest Management Plan in Annex 1 of the INRMP.

7.0 ATTACHMENTS

7.1 Reference Materials

Department of Army. Memorandum 4 Sep 2002, Army Wildland Fire Policy Guidance. 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 424, Prescribed Fire Complexity Rating System Guide (January 2004)
PM 461, Incident Response Pocket Guide (January 2006)

Schmidt, K.M., J.P. Menakis, C.C. Hardy, W.J. Hann, and D.L. Bunnell. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. USDA Forest Service, Rocky Mountain Research Station.

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

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

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

Weather Information

Spot Weather Forecast, <http://spot.nws.noaa.gov/cgi-bin/spot/spotmon?site=ffc>
General Forecast, <http://www.srh.noaa.gov/ffc/html/firewx.shtml>
Tennessee Fire Weather, http://burnsafetn.org/forecasts_links.html

7.2 Burn Plan Format

TNARNG PRESCRIBED FIRE PLAN

Facility: _____

Training Area: _____ Burn Unit Number/Name: _____

Fuel Type: _____ Acres: _____

Burn Permit #: _____

Fire Planner(s):

Name: _____

Title: _____

Signature: _____ Date: _____

Name: _____

Title: _____

Signature: _____ Date: _____

Burn Boss:

Name: _____

Title: _____

Signature: _____ Date: _____

Complexity Rating: _____ (Low, Moderate, High)

Approved By:

Signature: _____ Date: _____

A. Pre-Burn Go/No Go Checklist

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

B. Prior to Crew Briefing:

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

C. Crew Briefing:

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

D. Prior to Ignition:

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

Burn Boss: _____

Date: _____

1. Burn Objectives

2. Location and Physical Description (Attach map)

A. Site_____ **Training Area**_____

B. Size_____

C. Topography / Slope_____

D. Project Boundary_____

E. Complexity_____

3. Vegetation / Fuels Description

A. On-site Fuels

| Vegetation Types | Fuel Models | % of Unit Area | % Slope | Aspect |
|------------------|-------------|----------------|---------|--------|
| | | | | |
| | | | | |
| | | | | |

B. Adjacent Fuels

| Vegetation Types | Fuel Models | % of Unit Area | % Slope | Aspect |
|------------------|-------------|----------------|---------|--------|
| | | | | |
| | | | | |
| | | | | |

4. Description of Unique Features

A. Natural:_____

B. Cultural:_____

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

6. Prescription

A. Environmental Prescription: _____

B. Fire Behavior Prescription: _____

7. Fuel and Weather Prescription (acceptable ranges)

| Fuel Parameters | Prescription MIN/MAX | Forecast* MIN/MAX | Test Fire | Rx Burn |
|---|---------------------------------|------------------------------|------------------|----------------|
| 1-Hour Fuel Moisture (%) | | | | |
| 10-Hour Fuel Moisture (%) | | | | |
| 100-Hour Fuel Moisture (%) | | | | |
| Live Fuel Moisture (%) | | | | |
| Other (e.g., KBDI, live/dead ratio,...) | | | | |
| | | | | |
| Weather Parameters | | | | |
| Air Temperature (°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 | 731-986-5550 |
| Milan Army Ammunition Plant | | Telephone | 731-686-6474 |
| MAAP FD | | Telephone | 731-686-6416 |
| Terry VFD | | Telephone | 731-987-3780 |
| Gibson County Sheriff Dept. | | Telephone | 731-855-0277 |
| Carroll County Sheriff Dept. | | Telephone | 731-986-8947 |
| Tennessee Highway Patrol | | Telephone | 615-251-5175 |

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

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1.0 INTRODUCTION

1.1 Background

Like most regions of the world today, the VTS-M 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 found throughout the training site, in open areas along roadsides and on the ranges, in the forest understory, and all along the creek banks. The most extensive problem species on the VTS-M are privet, Japanese honeysuckle, multiflora rose, Nepalese browntop, Canada thistle, sericea lespedeza, and Johnson grass. Kudzu is present in smaller quantities, but its typical high rate of spread makes this species a high priority for control. A variety of other invasive species are found in isolated occurrences across the site (Table A3.1). Figure A3.1 shows locations of small invasive occurrences; the more extensive populations are not depicted. The infestation information included here is based on the 2006 invasive plant species survey by Dynamic Solutions.

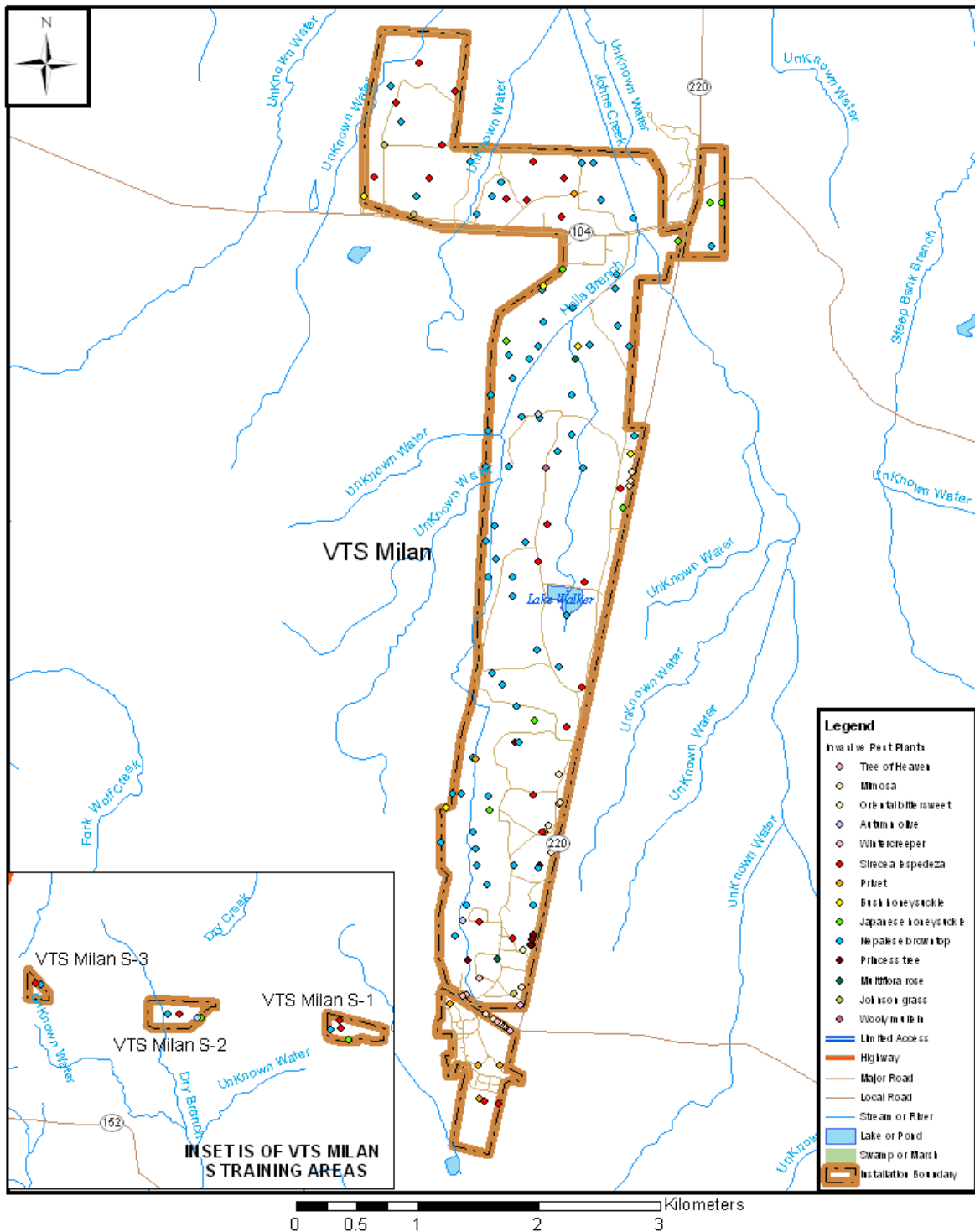


Figure A3.1: Invasive exotic plant occurrences on the VTS-Milan (small groups and individual plants; extensive infestations are not represented). From Dynamic Solutions (2006).

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 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-M will be a two-tiered approach: first, small occurrences (oriental bittersweet, air-potato, tree-of-heaven, mimosa, wintercreeper, princess tree, wooly mullein, periwinkle, autumn olive) will be identified and treated on a training area-by-training area basis, and second, the larger infestations (kudzu, privet, Japanese and bush honeysuckle, Nepalese browntop, multiflora rose, Johnson grass, sericea lespedeza, Canada thistle) will be treated on a species basis in manageable sections. The spatial occurrence of the invasive species is described in more detail below. Control methods will typically be a combination of mechanical (cutting, mowing) and chemical (herbicide) and will follow US Forest Service and TN Exotic Pest Plant Council (TN-EPPC) control recommendations (Miller 2003; TN-EPPC 1997).

1.2 Objectives

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

Important guidelines for the control 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 stream banks, soil, or the ecosystem present;
- Only herbicides labeled for application to water will be applied within 50 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. The roads and openings of the forested and woodland portion of the VTS-M have provided many places for invasive plant species to seed into and dominate.

The Tennessee Exotic Pest Plant Council (TN-EPPC) has 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-M is noted in Table A3.1 below, which summarizes the invasive species observed at the VTS-C site during the 2006 invasive species survey. The table is organized alphabetically by species observed. Abundance of the invasive species in the aggregation was coded Dominant, greater than 50%, Present, 10 to 50 %, and Sparse, less than 10%.

Table A3.1: Invasive exotic plant species observed on VTS-Milan (from Dynamic Solutions 2006).

| Scientific Name | Common Name | TEPPC Ranking | Abundance at VTS-M |
|--|--------------------------------|------------------------------|---|
| <i>Ailanthus altissima</i> | tree of heaven | Rank 1: Severe Threat | Present at isolated locations in TA-A2 and A5. |
| <i>Albizia julibrissin</i> | mimosa | Rank 1: Severe Threat | Present at isolated locations in TA-A1, A3, A5, A7, A8, B2, B3, and the Cantonment. |
| <i>Celastrus orbiculata</i> | oriental bittersweet | Rank 1: Severe Threat | Sparse at one isolated location in TA-A1. |
| <i>Cirsium arvense</i> | Canada thistle | Rank 2 -- Significant Threat | Present along edges and in openings in TA-A3, A5, A6, A7, A8, B2, B3, and S. |
| <i>Dioscorea oppositifolia</i> | Air potato, Chinese yam | Rank 1: Severe Threat | Sparse at one isolated location in the Cantonment |
| <i>Elaeagnus umbellata</i> | autumn olive | Rank 1: Severe Threat | Sparse but observed in TA-A2, A3, A9, C1, and S2. Present in the southern part of TA-B2 and B3 |
| <i>Euonymus fortunei</i> | wintercreeper | Rank 1: Severe Threat | Present at one isolated location in TA-A1. Dominant in several locations in wooded area on eastern side of the Cantonment. |
| <i>Lespedeza cuneata</i> | sericea lespedeza | Rank 1: Severe Threat | Present pervasively in TA-A, B, C, S, and the Cantonment |
| <i>Ligustrum sinense</i> &/or <i>Ligustrum vulgare</i> | privet | Rank 1: Severe Threat | Sparse to present in TA-A3, A4, A5, A6, A7, A8, A9, A10, B, C1, and S. Pervasively present to dominant in TA-A1, A2, and less heavily developed portions of the Cantonment. |
| <i>Lonicera japonica</i> | Japanese honeysuckle | Rank 1: Severe Threat | Present pervasively in all training areas. Dominant in sunny edges of roads and openings. |
| <i>Lonicera maackii</i> , <i>Lonicera morrowii</i> , <i>Lonicera x bella</i> , &/or <i>Lonicera tatarica</i> | bush honeysuckle | Rank 1: Severe Threat | Sparse in TA-A4, A7, A8, A9, AND B |
| <i>Microstegium vimineum</i> | Japanese grass; microstegium | Rank 1: Severe Threat | Dominant in forested and shaded areas in all training areas and the Cantonment. |
| <i>Paulownia tomentosa</i> | princess tree, royal paulownia | Rank 1: Severe Threat | Present at isolated locations in TA-A1, A2, A3, A4, and B3. |
| <i>Pueraria montana</i> | kudzu | Rank 1: Severe Threat | Dominant at isolated locations in TA-A10, TA-C1, TA-S2, and Cantonment. Present in isolated population in TA-B3. |

| Scientific Name | Common Name | TEPPC Ranking | Abundance at VTS-M |
|--------------------------|-------------------|------------------------------|---|
| <i>Rosa multiflora</i> | multiflora rose | Rank 1: Severe Threat | Present in TA- A2, A4, A6, A8, B, S and the Cantonment. |
| <i>Sorghum halepense</i> | Johnson Grass | Rank 1: Severe Threat | Present in open sunny places in TA-A1, A2, A3, A4, A5, A6, A7, B1, B2, B3, and the Cantonment |
| <i>Verbascum thapsus</i> | wooly mullein | Rank 2 -- Significant Threat | Sparse at one isolated location in TA-A7 |
| <i>Vinca minor</i> | common periwinkle | Rank 2 -- Significant Threat | Sparse at one isolated location in the TA-A2 |

2.0 CONTROL PLAN

2.1 Small Infestations

The species which occur in small patches in only a few locations will be treated first, with the goal of completely eradicating these species on VTS-M:

Oriental bittersweet occurs in one location in training area A-1, while Chinese yam was found on one site in the Cantonment. Both are small occurrences but have the potential to spread rapidly. They will be treated with a foliar spray of Garlon 3A or Garlon 4 in July to October. Any vines that are too tall for foliar application will be cut and the stump treated with Garlon 4. Chinese yam fruits will be collected and burned.

Tree-of-heaven and mimosa will be treated at the same time. A crew will travel the road system and trails of the training site during the late summer or mid-winter and treat all individuals of these species that they encounter. Tree-of-heaven has previously been found in training areas A-2 and A-5, but mimosa occurs in training areas A-1, A-3, A-5, A-7, A-8, B-2, and B-3, as well as the Cantonment. Large trees will be stem-injected or felled and the stump treated with Garlon 3A. Saplings will be basal-bark treated with Garlon 4. The following summer, a crew will return to treat all sprouts and seedlings with a foliar spray of Garlon 4.

Princess tree, bush honeysuckle, and autumn olive occurrences will be treated at the same time. Princess tree has been noted in training areas A-1, A-2, A-3, A-4, and B-3. Bush honeysuckles were found in training areas A-4, A-7, A-8, and A-9. Autumn olive occurs sparsely in A-2, A-3, A-9, C-1, and S-2 and is common in B-2 and B-3. Large trees will be stem injected or cut-stump treated with Arsenal AC or a glyphosate herbicide. Saplings will be basal bark treated with Garlon 4. The following summer, the crew will treat all sprouts and seedlings with a foliar spray of Garlon 4.

Wooly mullein has been found in multiple locations in training areas A-7 and B-2. It will be treated by hand pulling in May-June. Flowering plants will be bagged for disposal; immature plants will be dispersed on a surface on which they cannot re-root. These areas will be scouted and treated annually for several years until the seed bank is exhausted.

Wintercreeper occurs at one location in A-1 and in several patches in the eastern portion of the Cantonment. Common periwinkle occurs at one location in training area A-2. Both of these vines will be treated in late summer to fall with a foliar application of Garlon 4. This will be repeated annually for

several years. In August, prior to spraying, the patch should be inspected and all vertical climbing stems and any visible flowering stems will be cut to minimize fruit development.

2.2 Extensive Infestations

A number of invasive species have become thoroughly established on the VTS-C and are unlikely to ever be completely removed. The goal of this program is to bring those infestations under control, reducing the numbers of exotic plants, rehabilitating native communities that have been affected, and limiting further spread of the invasives. The principle species are kudzu, privet, Japanese honeysuckle, Nepalese browntop, and an open-areas conglomeration of sericea lespedeza, Canada thistle, and Johnson grass.

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

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

2.2.1 Kudzu

Kudzu infestation on the VTS-M is limited to a few relatively small areas in training areas A-10, C-1, S-2, and the Cantonment. This fast-growing vine can be very difficult to eliminate because of an extensive root system that can repeatedly re-sprout following top-kill. Areas which are largely devoid of desirable plant species due to the kudzu will be treated with a foliar spray of Tordon K (2% solution) or Escort (3-4 oz per acre). Patches which still retain desirable species will be treated with Transline (0.5% solution). Either of these treatments will be made in July-September. In areas where the kudzu infestation has completely hidden the ground surface and made traverse hazardous, it may be necessary to controlled burn the site in the spring prior to treating in the summer.

2.2.2 Privet

Privet occurs in virtually every training area on the VTS-M and the Cantonment. It is found within a wide range of environmental conditions from wet lowlands along the creeks and up onto the drier upland portions of the site. It is particularly common along roadsides and forest edges; although it can be found quite a distance into closed canopy stands in some places. Privet is most dominant in training areas A-1, A-2, and the Cantonment.

Treatment will begin at the less heavily infested northern end of the training site in training areas B and C and then work southward. Roadsides, forest/field boundaries, forest openings, and creek banks will be treated. Individuals less than 5" dbh will be treated with a basal bark spray of Garlon 4. Larger stems will be cut and immediately stump treated with Arsenal AC. This process will be repeated in manageable chunks moving south through the A training areas and then to the S areas. This effort should be conducted in winter. The following late summer, a return visit will be made to treated areas to foliar spray sprouts with Arsenal.

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

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

2.2.3 Nepalese browntop

Nepalese browntop occurs in low-lying and moist, shaded areas throughout the VTS-M. It dominates the understory in most of the bottomland forests on the site. Management will be concentrated along the creeks and drainages, beginning at the southern end of the training site and moving northward.

Treatment will consist of foliar application of herbicide: glyphosate where there is little desirable vegetation mixed with the Nepalese browntop. Vantage or Select 2EC (grass-specific post emergent herbicide) will be applied in locations where native herbaceous vegetation is still present. Treatment will be made in early June, with a second application in late July to ensure complete kill. Care will be taken to avoid drift onto the waterways. Infestations on shorelines will be treated with a glyphosate herbicide labeled for aquatic use. Sites will be inspected the following June for new germination. Complete removal will require several years to exhaust the seedbank.

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

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

2.2.4 Japanese honeysuckle

Japanese honeysuckle is also present throughout the training site, and is especially dominant along sunny roadsides and forest/field edges. The first stage of control will be to treat infestations along roads. Foliar spray with Garlon 3A will be conducted in the late fall. Areas will be checked the following summer to determine the need for retreatment. Additional infestations of honeysuckle that are documented during the course of other work will be treated the following winter.

2.2.5 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 Garlon 3A when found in these areas. Johnsongrass clumps will be spot treated with glyphosate or Arsenal when found.

Less manicured open areas such as the tank range impact area may be treated for invasive pest plants in preparation for reseeding native warm season grasses (NWSG). The standard site preparation for conversion to NWSG involves a combination of herbicide treatments, mowing, and burning prior to sowing the NWSG seed. Glyphosate or triclopyr herbicides in conjunction with Plateau herbicide are used to control fescue and should control the other exotic species in these areas. Establishment of native

grasses requires several years of effort before a good stand is present. Repeated area treatments and spot treatments may be required during this time to control the exotic plant species.

2.3 Environmental Precautions

The VTS-M heavily dissected by Johns Creek and Halls Branch and their tributaries. The two named creeks are both identified as impaired by the State of Tennessee. 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 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 banks are more than 50% invasive species, revegetation and bank stabilization will be conducted immediately following IPP control

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

2.4 Personal Protective Equipment (PPE)

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

2.5 Treatment Methods

2.5.1 Cut stump

The cut stump method is a method used for trees and woody shrubs greater than 5" dbh. The tree is cut down, leaving a stump 2 to 6 inches high (excessive stump height can limit the effectiveness of this method). The appropriate herbicide solution is applied to the outer 20% of the freshly cut surface within a few minutes, if possible. (After 2 hours, a basal bark treatment with penetrant will have to be applied.) Apply the appropriate herbicide 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 May and continue through the summer. Cut stump can also be applied during the dormant season.

2.5.2 Stem injection

Stem injection is another method for use on large trees and shrubs. Incision cuts are made downward into the stem, and herbicide is applied into the cut. With hard to control species, the cuts should completely frill the stem. There is less physical effort required for this method as opposed to completely cutting

down the tree, but it leaves a dead snag standing, which may or may not be acceptable, depending on the situation.

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

2.5.3 Basal bark spray

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

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

2.5.4 Foliar spray

The foliar spray method can be used for all target species not in close proximity to environmentally sensitive areas. This method is most effective in areas where there is a low density of desirable vegetation. Care must be taken to use appropriate spray equipment with sufficient droplet size to minimize drift to nontarget plants. Handheld sprayers can only treat plants up to about 6' in height. Leaves should be wet thoroughly but not to the point that herbicide runs off and impacts non-target species. Air temperature should be above 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 long as they retain a significant portion of their leaf cover.

2.6 Herbicides

Table A4.2 reflects the recommended herbicide and standard concentration to use per plant species and the primary method of control. These recommendations must be corroborated with the concentrations approved on each product label. **The label is the law.**

Table A4.2: Herbicide concentrations for use on VTS-C invasive pest plants.

| Species | Season | Method | Chemical | Concentration | Additive |
|------------------|-------------------|------------|------------|---------------|-----------------------|
| Autumn olive | Summer | Foliar | Arsenal AC | 1% | Surfactant |
| | Mid-winter/Summer | Basal bark | Garlon 4 | 20% | Basal oil + penetrant |
| | Fall/winter | Cut stump | Glyphosate | 20% | Surfactant |
| Bush honeysuckle | Late summer/fall | Foliar | Glyphosate | 2% | Surfactant |
| | Fall/winter | Basal bark | Garlon 4 | 2% | Basal oil + |

| Species | Season | Method | Chemical | Concentration | Additive |
|----------------------|---------------------|-----------------|------------------------|---------------|-----------------------|
| | | | | | penetrant |
| | Fall/winter | Cut stump | Arsenal AC | 10% | Surfactant |
| Canada thistle | Summer (pre-flower) | Foliar | Garlon 3a | 2% | Surfactant |
| Johnsongrass | Summer | Foliar | Arsenal | Label | Surfactant |
| Japanese honeysuckle | Late fall | Foliar | Garlon 3A | 5% | Surfactant |
| Kudzu | Summer/fall | Foliar | Tordon K | 2% | Surfactant |
| | Sumer/fall | Foliar | Escort | 3-4 oz/acre | Surfactant |
| | Summer | Cut stump | Garlon 4 | 4% | Surfactant |
| Nepalese browntop | June & July | Foliar | Glyphosate | 2% | Surfactant |
| | June & July | Foliar | Sethoxydim | Label | Surfactant |
| | June & July | | Clethodim | 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 | April-June | Foliar | Arsenal AC | 1% | surfactant |
| | Fall/winter | Cut stump | Arsenal AC | 10% | |
| | Summer/winter | Basal bark | Garlon 4 | 20% | Basal oil + penetrant |
| Oriental bittersweet | Summer | Foliar | Garlon 4 or Garlon 3A | 3% | Surfactant |
| | Fall/winter | Basal bark | Garlon 4 | 20% | Basal oil + penetrant |
| | Fall/winter | Cut stump | Garlon 4 | 4% | Surfactant |
| Periwinkle | July-October | Foliar | Garlon 4 | 4% | 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 |
| Sericea lespedeza | Summer | Foliar | Garlon 4 or Glyphosate | 2% 2% | Surfactant |
| Tree-of-heaven | Fall/winter | Cut stump | Garlon 3A | Label | |
| | Fall/winter | Basal bark | Garlon 4 | 20% | Basal oil + penetrant |
| | Summer | Sprout – Foliar | Garlon 4 | 2% | Surfactant |
| Wintercreeper | August | Hand cut | N/A | N/A | N/A |
| | Summer/fall | Foliar | Garlon 4 | 4% | Surfactant |
| Woolly mullein | May-June | Hand pull | N/A | N/A | N/A |

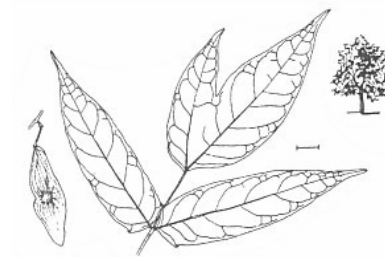
3.0 INVASIVE SPECIES DETAILS

Ailanthus altissima (tree of heaven)

- Description:** Tree of heaven is a rapidly growing small tree but can reach up to 80 feet in height and 6 feet in diameter. It has pinnately compound leaves that are 1-4 feet in length with 10-41 leaflets. Tree of heaven resembles the sumacs and hickories, but is easily recognized by the glandular, notched base on each leaflet. It is extremely tolerant of poor soil conditions and has been known to grow even in cement cracks. It cannot grow in shaded conditions but thrives in disturbed forests or edges. Dense clonal thickets displace native species and can rapidly take over fields and meadows.
- Specific Control Prescription:** Small trees may be effectively controlled by hand pulling. Pulling may be done any season. Moist soil facilitates pulling. During growing season, re-inspect pulled sites in 30 days for regrowth from unpulled roots.



Larger trees should be cut at the stump during the growing season. Treat the cut stump immediately with Garlon 3A. As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.



| | |
|--------------------------|--|
| Present in Training Area | |
| 3 | |

***Albizia julibrissin* (mimosa)**

- **Description:** Mimosa is a small tree that is 10 to 50 feet in height, often having multiple trunks. It has delicate looking bi-pinnately compound leaves that resemble ferns. Mimosa has very showy, pink flowers that are fragrant, giving way to small, flat bean-pod like fruits. Mimosa invades any type of disturbed habitat. It is commonly found in old fields, stream banks, and roadsides. Once established, mimosa is difficult to control due to the long-lived seeds and its ability to re-sprout vigorously.



- **Specific Control Prescription:** Small trees may be effectively controlled by hand pulling any time of year. Areas where pulling has been done should be re-inspected during the growing season after 30 days to look for sprouts.

Larger trees should be cut at the stump. Treat the cut stump immediately with Garlon 3A, mixed in accordance with the label.

As a follow-up when and if stump sprouting occurs, apply Garlon 4 in a 2% solution of herbicide and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.



| Present in Training Area | |
|--------------------------|---|
| 2 | 3 |
| 7 | 9 |
| Cantonment | |

***Celastrus orbiculata* (oriental bittersweet)**

- **Description:** Oriental bittersweet is a deciduous, climbing, woody vine that can grow to lengths of 60 ft. The alternate, elliptical leaves are light green in color. Small, inconspicuous, axillary flowers give way to round green fruit which ripen and split to reveal showy scarlet berries that persist into winter. It closely resembles American bittersweet (*Celastrus scandens*) but can be distinguished because American bittersweet has flowers and fruits in terminals rather than axillary along the stem. Oriental bittersweet is commonly found through the southern Appalachians in old house sites, fields, and road edges. Some shade tolerance allows it to also grow in open forests. Prolific vine growth allows it to encircle trees and girdle them. It also can completely cover other vegetation and shade, out-compete and kill even large trees. It can be dispersed widely and quickly due to the berries being eaten and spread by birds.



- **Specific Control Prescription:** Treat this species as soon as is feasible. Treating it before the fruit falls off of the vines in the fall will minimize retreatment due to restricted seed fall. Cut climbing or trailing vines as close to the root collar as possible. Cut the stem 2 inches above ground level. Immediately apply a 4% solution of Garlon 4 to the cross-section of the stem. This procedure is effective at low temperatures.

The following summer foliar treat all sprouts with a 3% solution of Garlon 3A or Garlon 4. Bag for disposal or burn all seeds, to reduce the spread of seeds.



| |
|-----------------------------|
| Present in Training Area |
| A |

***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.



- Specific Control Prescription: Canada thistle control can be achieved through hand cutting, mowing, and controlled burning, and chemical means, depending on the level of infestation and the type of area being managed. Due to its perennial nature, entire plants must be killed in order to prevent regrowth from rootstock. Hand cutting of individual plants or mowing of larger infestations should be conducted prior to seed set and must be repeated until the starch reserves in the roots are exhausted. Because early season burning of Canada thistle can stimulate its growth and flowering, controlled burns should be carried out late in the growing season for best effect.

In natural areas where Canada thistle is interspersed with desirable native plants, utilize a targeted application of a 2% solution of Garlon 3A with surfactant. For extensive infestations in disturbed areas with little desirable vegetation, broad application of this type herbicide may be the most effective method. Repeated applications are usually necessary due to the long life of seeds stored in the soil.



| Present in Training Area | |
|--------------------------|---|
| 3 | 4 |
| 5 | 7 |

***Elaeagnus umbellata* (autumn olive)**

- **Description:** Autumn olive is a deciduous shrub from 3 to 20 feet in height. Autumn olive is easily recognized by the silvery, dotted underside of the leaves. Small, yellowish flowers or red, juicy fruits are abundant and occur on clusters near the stems. 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. Autumn olive is native to China and Japan and was introduced into America in 1830. Since then it has been widely planted for wildlife habitat, mine reclamation, and shelterbelts.



- **Specific Control Prescription:** Small plants may be effectively controlled by hand pulling any season. Plants should be pulled as soon as they are large enough to grasp, but before they produce seeds. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may re-sprout. These species are well attached to the soil by their roots and 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 are most easily treated by cutting at ground level with saws. Cutting is most effective when trees have begun to flower to prevent seed production. 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 a glyphosate 20% solution applied to the outer 20% of the cut stump.



Follow-up with a foliar application to sprouts of a 1% solution of Arsenal AC plus surfactant. If possible, bag seeds for disposal.

| Present in Training Area | |
|--------------------------|----------|
| A | B |
| C | S |

***Euonymus fortunei* (wintercreeper)**

- Description: Wintercreeper, also known as climbing euonymus, is an evergreen, clinging vine.

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



- Specific Control Prescription: For small populations, like those observed in TA-A1, individual vines should be pulled up by the roots or cut off at ground level and removed from the area. Follow-up with a foliar application to resprouts: a 4% concentration of Garlon 4 with a surfactant is reported to be effective. Treatment should be in late winter when most native vegetation is dormant and prior to the emergence of spring wildflowers.



| Present in Training Area | |
|--------------------------|----|
| 3 | 5 |
| 9 | 10 |
| Cantonment | |

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

- **Description:** Sericea lespedeza is an upright semi-woody forb, 3 to 6 feet in height with one to many slender stems. It has thin, alternate, abundant, three-parted leaves. Flowers are small and whitish-yellow. It is an extremely aggressive invader of open areas, out competing native vegetation. Once it is established is very difficult to remove due to the seed bank, which can remain viable for decades. Native to Asia and introduced into the United States in the late 1800s, sericea lespedeza has been widely planted for wildlife habitat, erosion control, and mine reclamation.
- **Specific Control Prescription:** The best control of lespedeza combines both mechanical and chemical treatments. Hand pulling is impractical due to its extensive perennial root system, but mowing plants at the flower bud stage for two to three consecutive years can significantly reduce the vigor of stands as well as control further spread. Mowing followed by an herbicide treatment is likely the most effective option for the successful control.



Herbicide should be applied in mid- to late-summer, July through September. Apply Garlon 4 as a 2% solution. Note that lespedeza and Johnson grass were observed to be growing together and any treatment of one will harm or benefit the other, so plan accordingly.



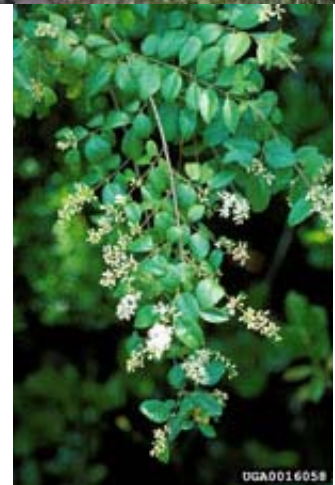
| Present in Training Area | |
|--------------------------|---|
| 2 | 3 |
| 5 | 7 |
| Cantonment | |

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

- **Description:** Privet is a thick, semi-evergreen shrub to 30 feet in height. Trunks usually occur as multiple stems with many long, leafy branches attached at near right angles. Leaves are opposite, oval and .5 to 1.5 inches long. White flowers are very abundant and occur at the end of branches in clusters. Fruits ripen to a dark purple to black color and persist into winter. Although several species occur, they are hard to distinguish. It commonly forms dense thickets in the fields or in the understory of forests. It shades and out-competes many native species and, once established, is very difficult to remove.



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



Mowing or other mechanical reduction of plant mass is effective for providing safer spraying access but is not an effective control by itself. Foliar Spraying can be effective for large thickets of privet where risk to non-target species is minimal. Timing applications for late fall or early spring when many native species are dormant will help minimize damage to non-target species. Generally foliar

herbicides offer better control in warmer weather, as plants are growing faster, but privet keeps its leaves which can make it easier to locate when most other plants don not have leaves. To spray, apply a 1% solution of Arsenal AC plus a surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray-drift damage to non-target species.

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

Treat the cut stump immediately with Arsenal AC applying a 10% solution of herbicide and water to the cut stump. As a follow-up when and if stump sprouting occurs, apply a 1% solution of Arsenal AC plus a surfactant as a foliar spray.

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

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



- Specific Control Prescription:** Mowing and fire are effective at reducing the aboveground mass of plant material, but require herbicide follow-up for effective control of honeysuckle.

Foliar spraying with a 5% solution of Garlon 3A is may be effective for controlling Japanese honeysuckle. Timing applications for late fall or early spring when many native species are dormant will help minimize damage to non-target species. Generally foliar herbicides offer better control in warmer weather, as plants are growing faster, but honeysuckle keeps its leaves, which can make it easier to locate when most other plants do not have leaves.



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***Lonicera maackii*, *Lonicera morrowii*, *Lonicera x bella*, &/or *Lonicera tatarica* (bush honeysuckle)**

- **Description:** Exotic bush honeysuckles are upright, generally deciduous shrubs that range from 6 to 15 feet in height. The 1-2 ½ inch, egg-shaped leaves are opposite along the stem and short-stalked. Older stems are often hollow. Pairs of fragrant, tubular flowers less than an inch long are borne along the stem in the leaf axils. Flower color varies from creamy white to pink or crimson. Flowering generally occurs from early to late spring, but varies for each species and cultivar. The fruits are red to orange, many-seeded berries.
- **Specific Control Prescription:** Small plants may be effectively controlled by hand pulling. Plants should be pulled as soon as they are large enough to grasp, but before they produce seeds. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may re-sprout. Smaller bush honeysuckles are usually easy to pull; larger individuals are likely to require mechanical assistance in pulling with tools.



Mowing or other mechanical reduction of plant mass is effective for providing safer spraying access but is not an effective control by itself. Foliar sprays may be effective on dense, low growing stands. Apply a 2% solution of glyphosate plus a non-ionic surfactant to thoroughly wet all leaves.

Larger plants may be cut at ground level and stump treated with 10% Arsenal AC with a surfactant. Or small stems may be treated by basal bark spray of 2% Garlon 4.



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***Microstegium vimineum* (Japanese grass, Nepalese browntop)**

- **Description:** Japanese grass, also known as Nepalese browntop and other names is an annual plant. It has a sprawling habit and grows slowly through the summer months, ultimately reaching heights of 2 to 3 1/2 ft. (6-10 dm.). The leaves are pale green, lance-shaped, asymmetrical, 1-3 in. (3-8 cm.) long, and have a distinctive shiny midrib. Slender stalks of tiny flowers are produced in late summer (August - September). The fruits or achenes mature soon after flowering and the plant dies back completely by late fall.
- **Specific Control Prescription:** Mow plants as close to the ground as possible using a weedeater or similar grass-cutting tool. Treatments should be made when plants are in flower and before seeds are produced. Treatments made earlier may result in plants producing new seed heads in the axils of lower leaves.



Herbicide treatments should be made late in the growing season (June-July) but before the plants set seed. Treatments made earlier in the growing season may allow a second cohort of plants to produce seeds. Apply a 2% solution of glyphosate and water plus a 0.5% non-ionic surfactant to thoroughly wet all foliage. Do not spray to the point of runoff. Ambient air temperature should be above 65°F to ensure translocation of the herbicide to the roots. Do not apply if rainfall is expected within two hours following application. Additional treatments are likely to be necessary to exhaust the supply of seed in the soil.



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An alternative chemical treatment is to use the grass killer clethodim (Select). Apply 12 oz/ac of Select plus a crop oil concentrate according to the label. Do not spray to the point of runoff. Ambient air temperature should be above 65°F. Do not apply if rainfall is expected within one hour following application.

***Paulownia tomentosa* (Princess tree, royal paulownia)**

- **Description:** Princess tree, also known as royal paulownia or empress tree, is a small to medium sized tree that may reach 30-60 feet in height. The bark is rough, gray-brown, and interlaced with shiny, smooth areas. Stems are olive-brown to dark brown, hairy and markedly flattened at the nodes (where stems and branches meet). Leaves are large, broadly oval to heart-shaped, or sometimes shallowly three-lobed, and noticeably hairy on the lower leaf surfaces. They are arranged in pairs along the stem. Conspicuous upright clusters of showy, pale violet, fragrant flowers open in the spring. The fruit is a dry brown capsule with four compartments that may contain several thousand tiny winged seeds. Capsules mature in autumn when they open to release the seeds and then remain attached all winter, providing a handy identification aid.



- **Specific Control Prescription:** Princess tree can be controlled using a variety of mechanical and chemical controls. Hand pulling may be effective for young seedlings. Plants should be pulled as soon as they are large enough to grasp. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may resprout. Trees can be cut at ground level with power or manual saws. Cutting is most effective when trees have begun to flower to prevent seed production. Because Princess tree spreads by suckering, resprouts are common after cutting. Cutting should be considered an initial control measure that will require either repeated cutting of resprouts or an herbicide treatment.



Princess tree seedlings and small trees can be controlled by applying a 2% solution of Garlon 4 and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce damage from spray drift on non-target species.

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The cut stump method can be used with a glyphosate herbicide; see label for concentration. Basal bark applications are also effective on small saplings; utilize Garlon 4 in a 20% solution plus basal oil and penetrant. Girdling is effective on large trees where the use of herbicides is impractical. Using a hatchet, make a cut through the bark encircling the base of the tree, approximately six inches above the ground. Be sure that the cut goes well below the bark. This method will kill the top of the tree but resprouts are common and may require a follow-up treatment with a foliar herbicide.

***Pueraria montana* (kudzu)**

- **Description:** Kudzu is a climbing, semi-woody, perennial vine in the pea family. Deciduous leaves are alternate and compound, with three broad leaflets up to 4 inches across. Leaflets may be entire or deeply 2-3 lobed with hairy margins. Individual flowers, about 1/2 inch long, are purple, highly fragrant and borne in long hanging clusters. Flowering occurs in late summer and is soon followed by production of brown, hairy, flattened, seed pods, each of which contains three to ten hard seeds.



- **Specific Control Prescription:** For successful long-term control of kudzu, the extensive root system must be destroyed. Any remaining root crowns can lead to reinfestation of an area. Mechanical methods involve cutting vines just above ground level and destroying all cut material. Close mowing every month for two growing seasons or repeated cultivation may be effective. Cut kudzu can be fed to livestock, burned or enclosed in plastic bags and sent to a landfill.

If feasible, cutting should be followed with immediate application of 4% Garlon 4 to cut stems. Re-treatment the following year will almost certainly be necessary.

Alternatively, foliar treatments of Tordon K (if no desirable vegetation remains) or Escort (if desirable vegetation is present) may be made during the growing season. However, foliar applications are not as effective at destroying the root system, and more repeated applications will be necessary.



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***Rosa multiflora* (multiflora rose)**

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



Three methods using herbicides are practical for different plant situations. Foliar spray is appropriate for large thickets of multi-flora rose where risk to non-target species is minimal. It is most effective during April to June, around the flowering period. Apply a 1% solution of Arsenal AC thoroughly wetting all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.



If non-target plants are in close proximity, a 4% solution of glyphosate can be applied May through October to avoid soil contamination.

The cut stump method should be considered when treating individual bushes or where the presence of desirable species precludes foliar application. This treatment remains effective at low temperatures as long as the ground is not frozen. Horizontally cut multiflora rose stems at or near ground level. Immediately apply a 10% solution of Arsenal AC to the cut stump making sure to cover the entire surface.

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The basal bark method is effective throughout the year as long as the ground is not frozen. Apply a mixture of 20% Garlon 4 plus basal oil to the bark of the shrub to a height of 30-38 cm (12-15 in) from the ground. Thorough wetting is necessary for good control; spray until run-off is noticeable at the ground line.

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

- Description:** Johnson grass grows as tall as six feet and is a rhizomatous perennial grass that invades open areas throughout the United States. The two-foot long, lanceolate leaves are arranged alternately along a stout, hairless, somewhat upward branching stem. Flowers occur in a loose, spreading, purplish panicle. Johnson grass is adapted to a wide variety of habitats including open forests, old fields, ditches, and wetlands. It spreads aggressively and can form dense colonies, displacing native vegetation and restricting tree seedling establishment.
- Specific Control Prescription:** Johnson grass reproduces through rhizomes and seeds. It cannot be controlled simply by mowing or cutting. It is recommended that mowing followed by herbicide treatment, several times during the growing season for several seasons, utilizing Arsenal and a surfactant as directed on the label.



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***Verbascum thapsus* (wooly mullein)**

- **Description:** Woolly or common mullein is an erect herb. First year mullein plants are low-growing rosettes of bluish gray-green, feltlike leaves that range from 4-12 inches in length and 1-5 inches in width. Mature flowering plants are produced the second year, and grow to 5 to 10 feet in height, including the conspicuous flowering stalk. The five-petaled yellow flowers are arranged in a leafy spike and bloom a few at a time from June-August. Leaves alternate along the flowering stalks and are much larger toward the base of the plant. The tiny seeds are pitted and rough with wavy ridges and deep grooves and can germinate after lying dormant in the soil for several decades.
- **Specific Control Prescription:** Common mullein can be very difficult to eradicate. There are a variety of management methods available, depending on the particular situation. Because mullein seedling emergence is dependent on the presence of bare ground, sowing sites with early successional native grasses or other plants may decrease seed germination and the chance of successful emergence of mullein seedlings.



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

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***Vinca minor* (common periwinkle)**

- Description: Common periwinkle, a common invader throughout most of the United States, is an evergreen to semi-evergreen, trailing vine that reaches length up to 3 feet. The stems are slender, somewhat woody and green in color. The opposite, glossy leaves are approximately 1 inch long and narrowly elliptical in shape. Some varieties have variegated leaf colors. Flowers are violet to blue (possibly white) in color, 1 inch wide, and 5-petaled. Common periwinkle invades open to shady forests, often around former plantings at old homesites. It forms dense and extensive mats along forest floors that exclude native vegetation. It is native to Europe and was first introduced into America in the 1700s as an ornamental. It is still commonly sold as an ornamental ground cover.



- Specific Control Prescription: Periwinkle can be removed by digging, raising the runners with a rake, and mowing the plants. All of the plant must be removed.

Alternatively, it can be controlled with a late summer foliar treatment of 4% Garlon 4 with surfactant. Cutting any climbing vines and flowering stalks prior to spraying will minimize seed production.



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