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Silviculture Prescription
Willis Road North - Softwood Plantations

Massachusetts Department of Conservation and Recreation
Bureau of Forestry

Mid State District
Lawton State Forest
Athol, MA

Prepared by:

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Approved by:

Management Forestry

Program Supervisor ___ _____Date:__3/4/2022_____

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INTRODUCTION & SITE DATA

Cultural and Historical

Lawton State Forest is a 365 acre property, accessed by Willis Road, Townsend Road, and Chestnut Hill Avenue in Athol, Massachusetts. It is comprised of two separate acquisitions. The first purchase was made in 1987 and the final acquisition made in 2001. The original acquisition encompassed a large portion of the Lawton Tree Farm. The Commonwealth purchased the parcel from the Mount Grace Land Conservation Trust, who had pre-acquired it using the Chapter 61 right of first refusal. At the time, the property was being threatened by a 200-lot housing development.

The parcel was owned by the Lawton family for over 200 years and operated originally as a dairy farm until the early 1900's, followed by a tree farm. Beginning in 1932, what originally started as a boy scout fundraiser for his son, Robert Lawton began planting Christmas trees, primarily spruce (*Picea spp*.) and fir (*Abies spp*.) species, throughout the abandoned open fields on the property. Additional plantings for sawlogs included red pine (*Pinus resinosa*), eastern white pine (*Pinus strobus*), Scots pine (*Pinus sylvestris*), Norway spruce (*Picea abies),* and ponderosa pine (*Pinus ponderosa).*

With advice from forestry textbooks, UMASS Amherst extension foresters, and foresters from the Department of Natural Resources, now the Department of Conservation and Recreation, he learned how to manage a tree farm. In the first 9 years, he raised and planted 200,000 seedlings on the property. Much of those plantings were for sawlogs and Christmas trees. In addition to the plantings, he invested time in re-establishing brushed in logging/farm roads to access many parts of the property that were being planted, as well as created two fire ponds on the property, just north of Willis Road. From 1950-1990, the family sold commercial Christmas trees and lumber sourced from the property. Weeding and thinning operations were very common during this time. Excess hardwood trees were either sold off as firewood or were girdled and left to die and rot on the stump. In some cases, firewood was offered free from the property to anyone who needed it as long as the trees were cut in accordance with Robert Lawton's management plan. On October 5, 1948, Lawton Tree Farm was the first tree farm to enter the American Tree Farm system in Massachusetts and in New England.

During Robert Lawton's ownership, much of the harvested pine and eastern hemlock (*Tsuga canadensis)* ended up in house framing, finishing, and paneling. Most of the oak (*Quercus spp.)* went into flooring and firewood and the spruce for Christmas trees. Many excess hardwoods were also sold for firewood.

Once the Commonwealth took ownership of the property in 1987, several commercial timber sales were implemented thereafter. Two separate harvesting operations were implemented north of Willis Road and within the harvest area. They were commercial sales focused on removing red pine, white pine, hemlock, and Norway spruce sawtimber along with firewood and softwood pulp between 2003-2006. The Christmas tree plantation was located on the east side of Townsend Road and does not overlay with management being proposed by this prescription. However, approximately 15 acres of the Christmas tree plantation continued to be managed through a lease by two private citizens for a few years before ceasing operation. In 2008, the Christmas tree plantation consisted of 10-15 foot tall spruce and fir and was mowed with grant money from the Ruffed Grouse Society for wildlife habitat purposes.

There are many cultural features on the property, including stonewalls and natural springs that were used by many local residents. The presence of these features is a testament to the land use history of the property during the 19th and 20th centuries. All cultural features that are identified during future field work will be GPS'd, mapped, and reviewed with the DCR Archaeologist prior to work commencing.

Geology, Soils, & Site Productivity

There are three soil types that underly the project area. The Montauk-Scituate-Canton association (927C = 3 to 15 percent slopes, extremely stony) underlies 56.2% of the project area, followed by the Montauk-Canton association (915E = 15 to 35 percent slopes, extremely stony) at 33.9%. Both of these soils are well drained and are comprised of coarse-

loamy lodgment till derived from gneiss, granite and/or schist. The final soil type is the Ridgebury-Whitman association (918B = 0 to 8 percent slopes, extremely stony) which underlies 9.9% of the project area. This soil is classified as poorly drained and is mapped on the very outer edges of the project area. However, field observations do not indicate the presence of poorly drained soils within the project area. Based on the soil types present, site productivity will favor the development of upland plant species that grow and compete best on well drained, droughty soil types, particularly eastern white pine and oak species. The soil descriptions and maps were derived from the USDA-NRCS Web Soil Survey (Appendix, Soils Map).

Climate

For this area, the United States Department of Agriculture's Natural Resource Conservation Service (USDA-NRCS) gives a mean annual temperature between 43 and 54 degrees Fahrenheit with a mean annual precipitation between 45 and 54 inches annually. There have been no significant disturbances of the project area due to weather.

As is typical for New England, wind and therefore weather patterns in Massachusetts vary greatly from season to season and even day to day. It is typical in the summer and spring for winds to come from the southeast and southwest. It is common for weather patterns to come down from the north and northeast in fall and winter. These weather patterns can contain both high or low pressure systems and any form of weather historically common to New England. Weather can cause both major and minor forest disturbance in this area of Massachusetts. Hurricanes, various types of wind storms, and ice have had impacts on this landscape in the past and will continue to do so in the future.

Hydrology and Watershed

The project area is located centrally within the Millers River Watershed. The watershed encompasses nearly 310 square miles and is in north central Massachusetts, extending slightly into southern New Hampshire. The headwaters of the Millers River are in Ashburnham, MA and the river continues through several towns including Athol, among others, and westward until it reaches the Connecticut River, which flows into Long Island Sound. The project area is located less than one mile from the Millers River, and the East Branch of the Tully River, which is a major tributary of the Millers River.

There are several wetlands, two small ponds, one perennial stream, and one intermittent stream located within or adjacent to the project area. The perennial stream flows south through both small ponds near Willis Road. This stream eventually flows in a southerly direction into Sportsman's Pond, located to the southwest of the Lawton State Forest. An outlet stream for Sportsman's Pond appears to flow west into the Tully River, another main tributary of the Millers River. There are no potential vernal pools located within the project area.

All wetlands and streams will be mapped and have appropriate buffers and filter strips as indicated in the Massachusetts Forestry Best Management Practices Manual (BMPs). Buffers and filter strips will be delineated in the field prior to harvesting. This will aid in directional felling away from these resource areas. No equipment will operate in streams or wetlands except on pre-existing woods roads and trails or at designated crossings approved by a forest cutting plan. The perennial stream is crossed on a pre-existing interior forest road and will be utilized for this harvest. Extensive planning efforts will reduce site impacts and avoid stream and wetland crossings at all opportunities.

Full consideration has been given to any impacts that this particular timber harvesting operation will have within the Millers River Watershed. Appropriate measure will be taken in order to mitigate and prevent erosion (i.e. water bars, seeding, slashing of skid roads, etc.). Slash will be left on site not only to provide nutrients to the soil and for habitat purposes, but to also slow overland flow of water and to promote percolation of water into the soil.

Wildlife

A review of the Natural Heritage and Endangered Species Program (NHESP) atlas shows that there are no habitat restrictions located within the project area. NHESP will review the project prior to any harvesting to determine if any limitations or modifications will be required. Deer browse is present, particularly on some of the hardwood regeneration throughout the property. Concerns for over browsing are currently moderate but should not affect or alter forest management planning at this time.

Forest management treatments prescribed at this time will create two small patches of early successional habitat, totaling 12.2 acres. Early successional habitat, also referred to as young forests, are a medium scale habitat type that is listed in the Massachusetts State Wildlife Action Plan that is important for species of greatest conservation need (SGCN) in Massachusetts. There are 28 SGCN assigned to young forests in Massachusetts at this time, including reptiles, birds, mammals, and plants (Massachusetts SWAP, 2015). This habitat type will provide opportunities for some of these species for up to 10-15 years post harvest, whereas the habitat type will change into a state that will be less suitable.

As outlined in the DCR Management Guidelines (Commonwealth of Massachusetts, 2012), selected large trees will be reserved as wildlife trees for future snag and den trees. Snags, dead trees, and coarse woody debris will be retained for habitat as well. A minimum of two cords of coarse woody debris (256 cubic feet) will be maintained per acre. Browse for wildlife will be enhanced during the harvest and for many years after the harvest as regeneration becomes established. Mast and fruit producing trees such as oak and black cherry (*Prunus serotina*) will be retained whenever possible.

Recreation

All aesthetic considerations will be made to legal recreational users of the state forest. Slash will be disposed of according to BMP's. Larger trees along the edges of trails will be retained. As mentioned in the DCR Management Guidelines for roads and trails, hazard trees will be harvested along woods roads, skid trails, and hiking trails (Commonwealth of Massachusetts, 2012). Directional felling to protect residual trees, wetlands, woods roads, and trails will also be implemented. Removal of potentially hazardous trees to aid in public safety will be implemented.

There are many passive recreational uses of the state forest. Hiking, mountain biking, cross country skiing, snowshoeing, hunting, equestrian use, among others, are potential uses of this state forest. Many of the interior forest roads are utilized as hiking trails and will be used as skid trails. The project area will be closed to the public during active logging hours for safety reasons.

Current Vegetation

This project consists of three forest stand types. Stand 1 is 6.8 acre red pine plantation, stand 2 is 5.4 acre mixed softwood plantation, and stand 3 is a 6.3 acre white pine-red pine plantation (Appendix, Harvest Map). The most common overstory species is red pine, eastern white pine, Norway spruce, and Scots pine. Other associated species include northern red oak (*Quercus rubra)*, red maple (*Acer rubrum)*, and eastern hemlock.

The species composition within these three stands are a direct result of field reclamation plantings performed by the Lawton Family during the mid 1930's – early 1940's. A mixture of softwood species were planted on this acreage with intent of commercial sawlog production. While the plantations were tended early in their growth with weeding, thinning, and pruning practices, growth has stagnated significantly and insect and disease are now taking advantage of the plantations declining health and vigor. These secondary stressors are most notable amongst the red pine trees, which are infested with red pine scale (*Matsucoccus matsumarae*). Native eastern white pine needlecast diseases are also problematic, creating low live crown ratios in overstory trees. Scots pine and Norway spruce growth have slowed considerably; the Scots pine are rapidly declining, with mortality present in some portions of the plantation.

Forest composition is even aged, with a uniform structure. Past forest management techniques include the even aged shelterwood regeneration method. These management efforts are appropriate for regenerating native species that are well suited for the growing conditions of this site. Additional pockets of natural mortality have created some increased vertical complexity within the stands, but it is a slight variation overall.

Project Objectives

The overall goal of this prescription is to provide a range of ecosystem services as well as demonstrate and provide educational examples of excellent forestry to the general public. More specifically, this silvicultural prescription seeks to:

1. Implement even aged management (shelterwood method) to prepare even-aged plantations of red pine, white pine, Norway spruce, and Scots pine to regenerate a diverse mixture of native species.
2. Mitigate public safety risk by implementing silvicultural treatments that work to proactively harvest trees which are rapidly failing in condition.
3. Implement harvesting techniques and best management practices that protect and enhance forest productivity, soil, and water resources.
4. Provide an opportunity to educate the public on forest resource management.

STAND DATA

Stand Descriptions

Stand 1 – Red Pine Plantation

Stand 1 is a 6.8 acre red pine plantation located in the western portion of the property (Appendix, Harvest Map). The dominant overstory species is red pine. This stand is estimated to be 87 years old. Using LiDAR data and data analysis by the DCR Forest Biometrician, it is estimated that the basal area is 175.8 square feet per acre, with 215 trees per acre and a quadratic mean stand diameter of 12.2 inches. Volumes are estimated at 9,648 net board feet (BF) per acre.

This plantation contains mature stocking of overstory red pine trees that are uniform in structure and stagnated in growth. Additionally, this stand is currently infested with red pine scale. Previous forest management efforts in 1985 aimed at removing a portion of the overstory to improve the growing conditions of the residual stand. By interpreting growth response in tree cores from the stand, it appears that there was a slight response in growth from the increased growing conditions but overall was not as robust as what was hoped for. Another thinning in 2006 saw virtually no response, indicating that stand growth was stagnated by this time. The purpose of the 2006 entry was to begin the process of regenerating the stand by mitigating the amount of light reaching the forest floor. It proved successful in regenerating various native species, particularly eastern white pine. There are an estimated 6,555.7 stems per acre in the understory of the stand, of which 4,889 are white pine (Appendix, Table 1). Other species present in the understory include eastern hemlock, red maple, black birch (*Betula lenta*), American beech (*Fagus grandifolia)*, white oak (*Quercus alba),* and northern red oak (Appendix, Table 1). Regeneration presence is uniform and consists mostly of stems less than 1 inch diameter at breast height. Ground species present in this stand are associated with upland forest ecosystems and include mostly wintergreen (*Gaultheria procumbens),* bracken fern (*Pteridium aquilinum*), low bush blueberry (*Vaccinium angustifolium)*, and high bush blueberry (*Vaccinium corymbosum)*, among others. By using LiDAR to estimate the overstory, snag estimates were not able to be acquired for this prescription. There is an estimated 623.6 cubic feet per acre of coarse woody material present within the stand. This stand is in the beginning stages of mortality from red pine scale and is therefore beginning to pose a safety risk to the public. Typically stands that are infested with red pine scale fully succumb to mortality within 3-5 years after initial infestation.

Stand 2 – Mixed Softwood Plantation

Stand 2 is a 5.4 acre mixed softwood plantation located south of stand 1 in the western portion of the property (Appendix, Harvest Map). Dominant overstory species include white pine, red pine, Norway spruce, and Scots pine. This stand is estimated to be approximately 87 years old. The basal area is estimated at 112.9 square feet per acre. There are 118.8 trees per acre with a quadratic mean diameter of 13.2 inches. There is an estimated 13,705BF per acre within the stand (Appendix, Tables 2&3).

Previous forest management efforts are similar to stand 1, being treated in 1985 and 2006. Overstory growth response was negligent as well, however advanced regeneration successfully became established in the understory of the stand. There are an estimated 4,785.8 stems per acre of native tree species growing in the understory. The dominant understory species is white pine with 2,000 stems per acre in the understory followed by red maple, northern red oak, American beech, Norway spruce, eastern hemlock, yellow birch (*Betula alleghaniensis),* black birch, and white oak. Most of the regeneration is less than one inch diameter at breast height (82%) (Appendix, Table 4). Areas that were thinned or died naturally have the highest density of growth. Ground species present in this stand include wintergreen,

partridgeberry (*Mitchella repens)*, high bush blueberry, low bush blueberry, and bracken fern. There are 5.8 snags per acre inventoried in this stand with an estimated volume of 1,307.2 cubic feet per acre of coarse woody debris.

Red pine in this plantation is infested with red pine scale. There is a low live crown ratio on the overstory eastern white pine and it is suspected that this is a result of native needlecast diseases that have been affecting stressed white pine in the region due to increased wet weather conditions in recent years. Scots pine has been declining in the stand for many years, likely a result of stagnation.

Stand 3 – White Pine–Red Pine Plantation

Stand 3 is a white pine-red pine plantation located just west of Willis Road (Appendix, Harvest Map). Dominant overstory species are white pine and red pine. Other species include eastern hemlock, red maple, Norway spruce and northern red oak. This stand is estimated to be approximately 87 years old. The basal area is estimated at 133.8 square feet per acre with 140.8 trees per acre and a quadratic mean stand diameter of 13.2 inches at breast height. There is an estimated 16,242BF per acre within the stand (Appendix, Tables 5&6).

Previous forest management efforts are similar to stands 1 and 2. As a result, advanced regeneration is dominated by black birch stems that are under 1 inch in diameter (Appendix, Table 7). There is also a high prevalence of dead white pine regeneration that was overtopped and outcompeted by black birch in recent years. The density of black birch regeneration and presence of dead eastern white pine regeneration are a combined result of low density overstory thinning and low impact logging in the past harvests. Ground species include an assortment of fern species, low bush blueberry, wintergreen, and partridgeberry, among others. There is an estimated 740.8 cubic feet per acre of coarse woody debris and 2.0 snags per acre.

Red pine trees within the plantation are infested with red pine scale. The condition of the white pine varies from individuals with a high live crown ratio, to individuals with a low live crown ratio. There are a handful of Norway spruce located within the stand, but many are in the intermediate or suppressed crown classes.

EVALUATION OF DATA AND PROJECTED RESULTS

Silvicultural Prescription and Desired Results

Stands 1 & 2 – Red Pine & Mixed Softwood Plantation (Partial Overstory Removal)

Given the abundant amount of desirable regeneration in the understory, stands 1 and 2 will be treated with a partial overstory removal. This treatment is the final harvest of the even aged shelterwood regeneration system. The shelterwood regeneration system applies a series of harvests to an area intended to be regenerated which alters the amount of light available to the understory over time to create the optimal growing conditions to regenerate the site with desirable species. The purpose of this treatment is to harvest the majority of the overstory to allow an increase in resource availability to the advanced regeneration that grew because of previous shelterwood cuttings. The future desired condition is a young, rapidly growing forest that is dominated by drought tolerant species which are well suited to the site conditions. Removal of the red pine plantation will allow a native forest to take its place.

By implementing a partial overstory removal, DCR will purposefully retain portions of the overstory for wildlife habitat. Per the DCR Management Guidelines (Commonwealth of Massachusetts, 2012), 1-3 live, large diameter (>18” dbh) trees per acre and 4 live, 12” to 18” dbh trees per acre will be retained for future snag and den trees for wildlife. Native tree species that meet these requirements will be preferred, while red pine will be the least preferred.

Thinning along interior roadways and recreational trails will also be implemented for user safety. Interior forest roads and trails will be brushed back to allow logging equipment to operate efficiently and safely.

Stand 3 – Red Pine–White Pine Plantation (Shelterwood)

Another shelterwood harvest will be implemented for this stand. While the advanced regeneration is adequate by stems per acre, it contains a high portion of black birch stems, which is undesirable. The purpose of this harvest is to remove the dying overstory red pine while further thinning the eastern white pine so that an increase of light can permeate to the understory to partially release desirable advanced regeneration (drought resistant species, such as eastern white pine and oak) as well as to provide the conditions suitable for species to seed onto the site. Desirable advanced regeneration, particularly eastern white pine and oak will be protected where present. The basal area of this stand will be thinned to an average of 60-80 square feet per acre. Trees that are in poor health, have small crowns, and are poorly formed will be targeted for removal while maintaining the healthiest and best formed trees. All red pine trees will be removed from the stand regardless of residual stand density goals and spacing efforts. The future desired condition is a young, rapidly growing forest that is dominated by drought tolerant species which are well suited to the site. Site preparation, including soil scarification and the cutting of undesirable advanced regeneration, will be implemented.

EXPECTED RESULTS

Partial Overstory Removal

This harvest will create a very drastic change to the aesthetics of the area. There will be few overstory trees in the forest and the advanced regeneration will be flooded with sunlight. At this point, the regeneration will be competing for sunlight, nutrients, water, and growing space. Trees will be rapidly allocating their resources for increased height growth while slowly beginning to grow larger in diameter. White pine is likely to outcompete most native species on this site. Some areas that are void of white pine regeneration will grow a mixture of hardwoods and hemlock if present. The residual overstory trees are unlikely to benefit from the increased growing space and will be sporadically oriented on the landscape, it is likely that blow down will occur during high wind weather events. Future entries may focus on improving the growing stock present into the future and could include pruning of white pine and pre-commercial or commercial thinnings. However, this will be several decades into the future. Monitoring of regeneration growth and the presence of invasive species will be necessary to ensure that the management goals are being achieved.

Shelterwood

There will be a considerable amount of light and growing space available for regeneration to become established and for the release of advanced regeneration present in the area treated. It is hoped that more drought tolerant species will seed into the understory under the shelter of the overstory eastern white pine that will remain. As stated above, white pine is expected to outcompete most native species on this site. However, the success of the eastern white pine is dependent on the prevalence of black birch. Monitoring of regeneration growth, overstory decline, and invasive species will be implemented to ensure management goals are being achieved and an overstory removal is implemented at an appropriate future time.

Timber Harvest Schedule

This silvicultural prescription is for the first harvest to be implemented north of Willis Road at the Lawton State Forest. Additional management planning will occur in the future for the remainder of the site, under the proposal “Willis Road North” prepared by DCR Forester Joelle Vautour and posted on the DCR website on June 30, 2021.

Logging System Requirements

This harvest will be completed using a fully mechanized operation and will be limited to the use of a cut to length harvester/processer. This type of harvesting equipment allows for a level of efficiency that is well suited for processing low value products. It is especially well suited for operating in plantations. The cut to length system will allow for increased levels of slash and woody material to be left on site, effectively replenishing nutrients to the forest soil, providing cover and habitat for wildlife, protecting advanced regeneration, and mitigating erosion by slowing the overland flow of water.

Marking Guidelines

General

1. Unless pre-existing, skid roads will be flagged and delineated clearly with paint.
2. Triple striping with paint will indicate the timber harvest edge, wetland buffer edges, stream filter strip edges, and any other areas which machinery should not travel beyond.
3. All trees marked with triple striping will be harvested.
4. Triple striping may be used to protect pockets of advanced regeneration where appropriate.
5. Trees which exhibit excellent form, regardless of species and size class will be retained to encourage species diversity.
6. Sawtimber trees will be marked with a horizontal strip that wraps 360 degrees around the tree's bole at breast height.
7. Cordwood and pulpwood trees will be marked at breast height by a vertical slash that is visible on all sides of the tree to be removed.
8. Thinning along skid trails and interior forest roads will be implemented.

Partial Overstory Removal

1.) 1-3 live, large diameter (>18" dbh) trees per acre and 4 live, 12" to 18" dbh trees per acre will be retained for future snag and den trees for wildlife.

2.) Retention trees should be native species where present, followed by the healthiest, best formed, most wind firm red pine trees present (located a tree length distance from any interior forest roads/trails).

Shelterwood

1.) This area will be thinned to a residual basal area between 60-80 square feet per acre. Effort will be made to maintain an even spacing, except for the harvesting of red pine trees. Trees to be retained should be native, have a dominant and/or co-dominant size class, exhibit large and healthy crowns, and are wind firm.

2.) All red pine trees will be harvested from the stand, followed by white pine or Norway spruce that are declining in health and have poor form and vigor.

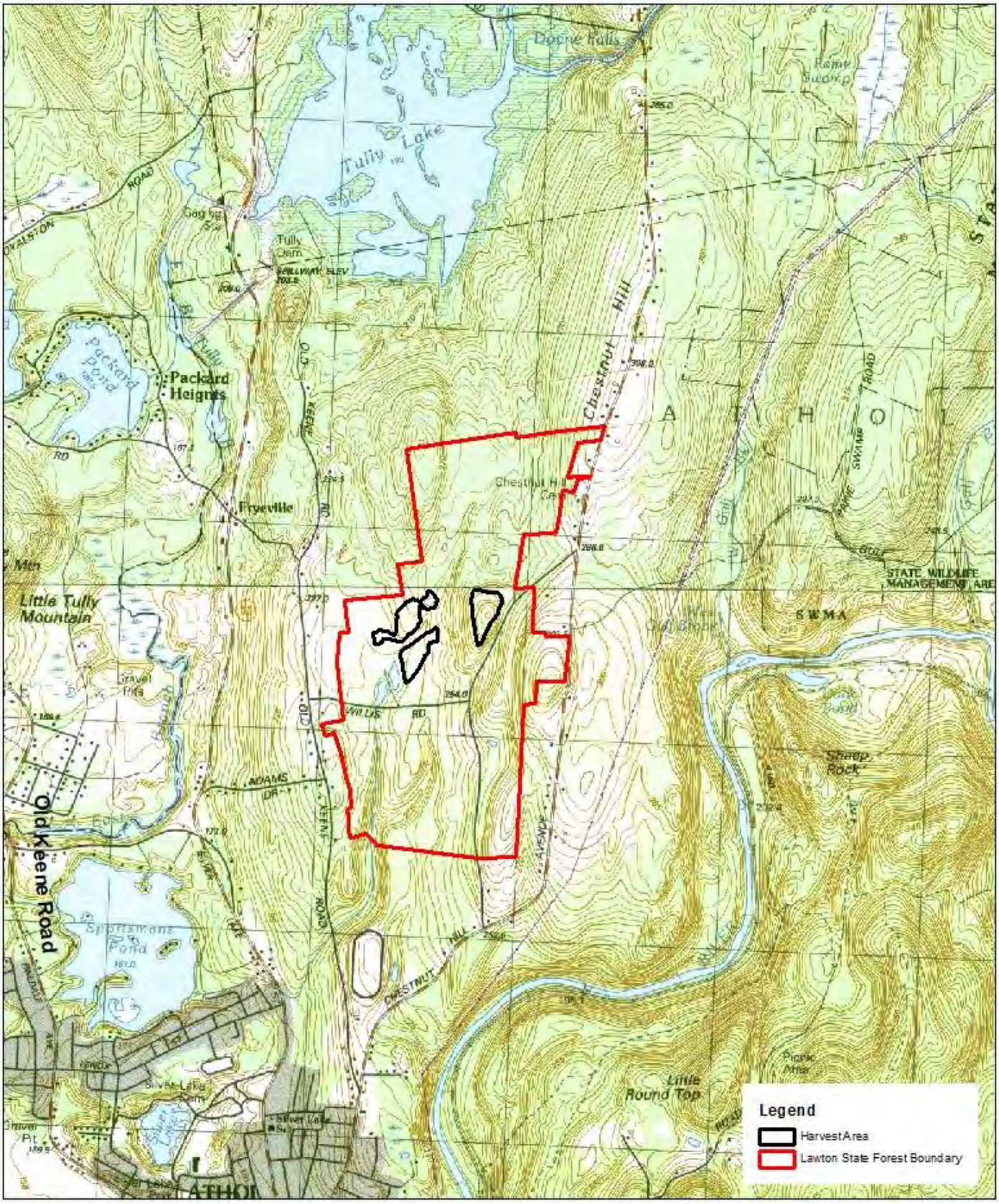
APPENDIX

Locus Map
Lawton State Forest
Willis Road North (Softwood Plantations)
Willis Road & Townsend Road - Athol, MA

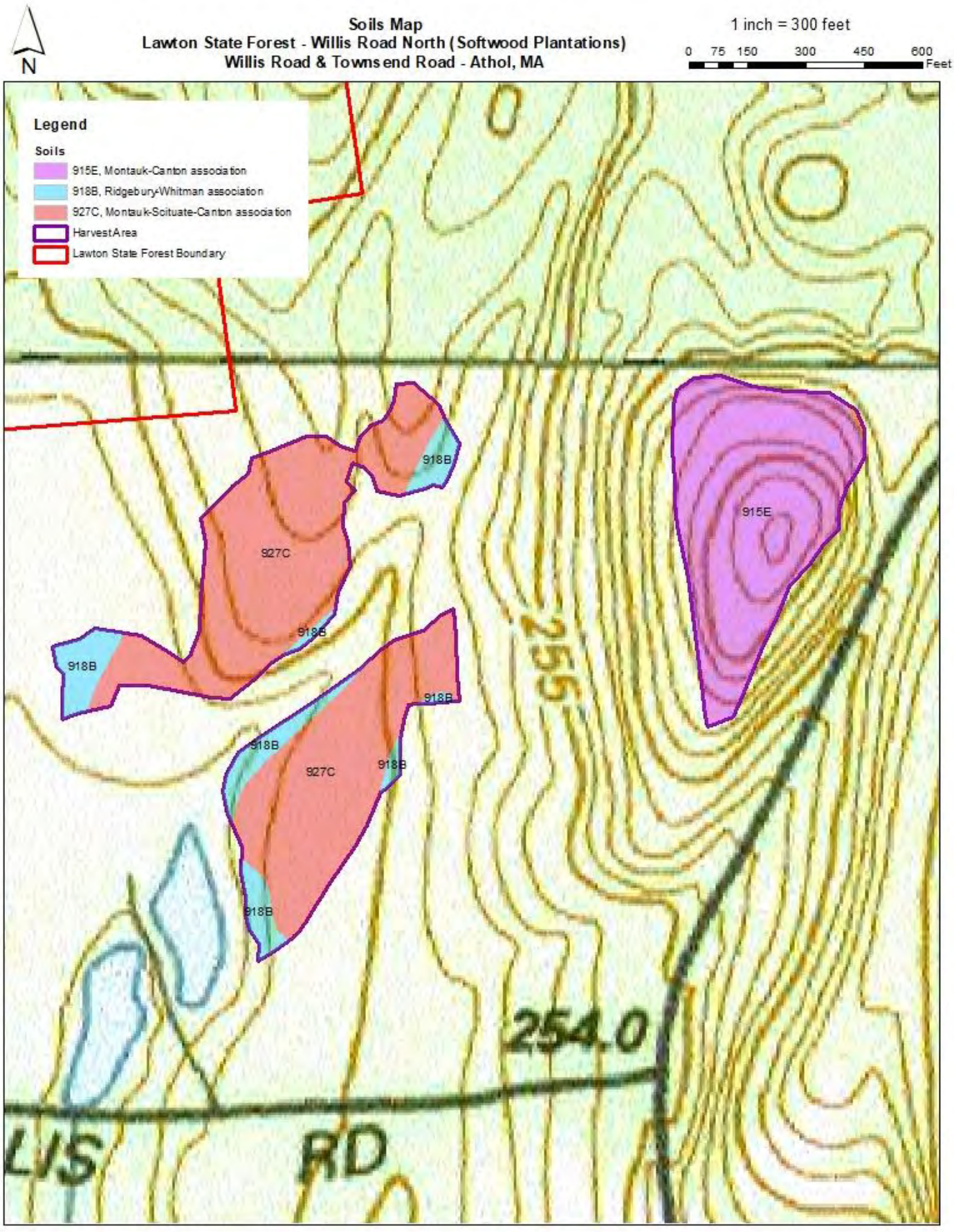
N

1 inch = 2,000 feet

0 500 1,000 2,000 3,000 4,000 Feet



Map Prepared By: Joelle Vautour, DCR Forester - March 3, 2022



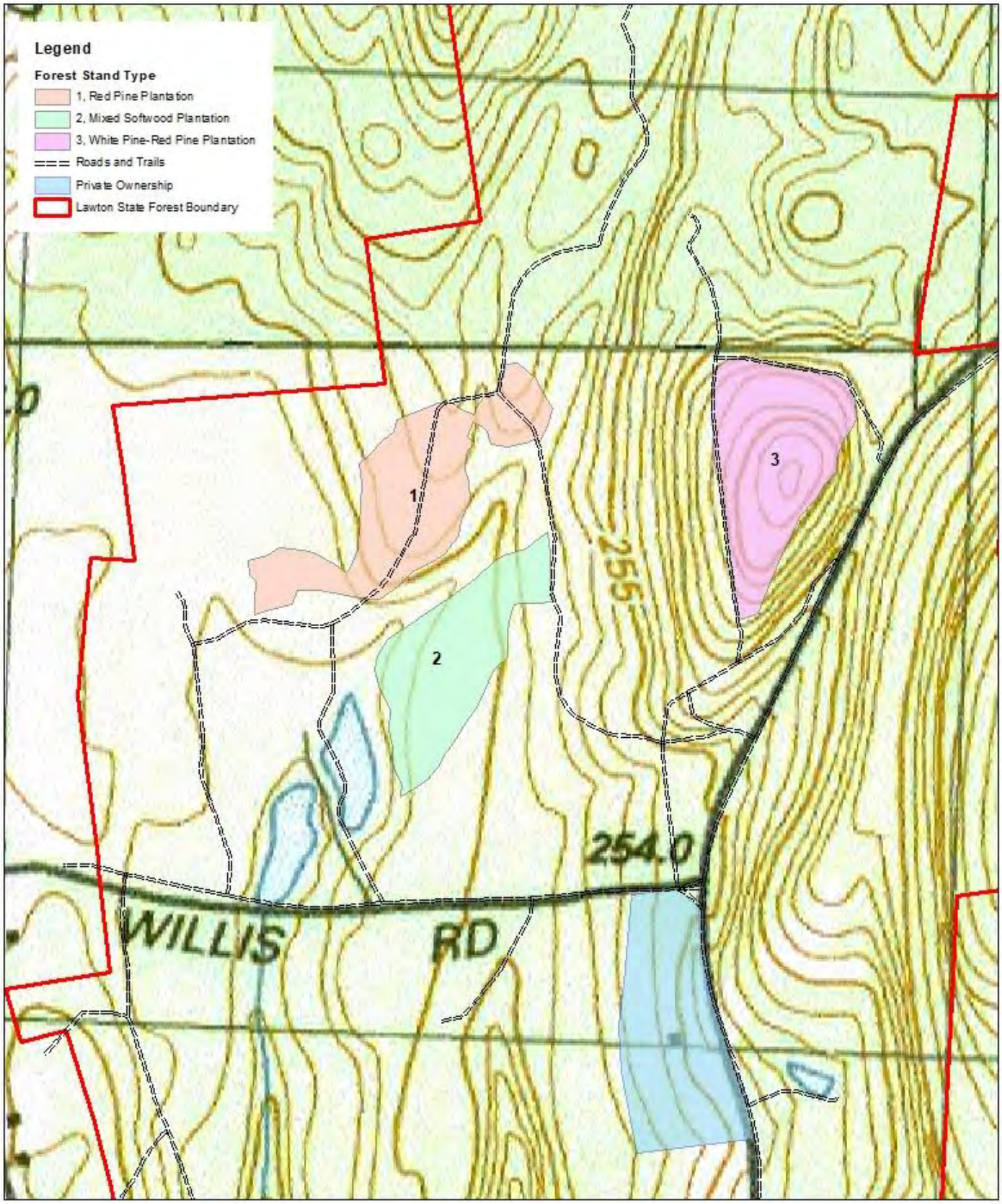
Map Prepared By: Joelle Vautour, DCR Forester - February 9, 2022

Harvest Map
Lawton State Forest
Willis Road North (Softwood Plantations)
Willis Road & Townsend Road - Athol, MA

N

1 inch = 425 feet

0 105 210 420 630 840 Feet



Map Prepared By: Joelle Vautour, DCR Forester - March 3, 2022

Table 1. Stand 1 – Red Pine Plantation Understory Data Table – Tree Species Stems/Acre (Stems < 1.0' tall to 5" dbh)

Common name	3.0 IN. ≤ HT < 1.0 FT.	1.0 FT. < HT < 4.5 FT.	4.5 FT. HT - < 1.0 IN. DBH	1.0 IN. ≤ DBH < 5.0 IN.	TOTAL
eastern white pine	611.1	2,222.3	1,555.6	500.0	4,889.0
eastern hemlock	0.0	0.0	166.7	0.0	166.7
red maple	277.8	55.6	0.0	0.0	333.3
sweet birch	0.0	0.0	55.6	388.9	444.5
American beech	55.6	55.6	0.0	111.1	222.2
white oak	55.6	55.6	0.0	0.0	111.1
northern red oak	0.0	166.7	111.1	111.1	388.9
ALL	1,000.0	2,555.6	1,888.9	1,111.1	6,555.7

Table 2. Stand 2 - Mixed Softwood Plantation Overstory Data Table - (Stems ≥ 5" dbh)

Common name	Total trees/ac	Total trees/ac std. err. (% of mean)	Total basal area (ft^2/ac)	Total basal area std. err. (% of mean)	% basal area by species	QMD	% AGS
spruce spp.	4.6	83.5%	5.7	75.0%	5.1%	15.1	100.0%
red pine	14.4	48.9%	17.1	48.8%	15.2%	14.8	100.0%
eastern white pine	89.1	19.5%	82.9	16.4%	73.4%	13.1	62.1%
eastern hemlock	2.4	116.4%	1.4	100.0%	1.3%	10.4	0.0%
northern red oak	8.3	65.6%	5.7	64.5%	5.1%	11.2	100.0%
ALL	118.8	9.6%	112.9	9.0%		13.2	70.9%

Table 3. Stand 2 - Mixed Softwood Plantation Overstory Data Table – (Stems ≥ 5" dbh)

Common name	Sawlog BF/ac	sawlog BF std. err. (% of mean)	Pulp cords/ac	Pulp cords/ac std. err. (% of mean)	Total BF (stand)	Sawtimber mean height (logs)	Total cords (stand)	Topwood cords (stand)
spruce spp.	734	90.2%	0.17	125.0%	3,961	2.0	0.9	1.7
red pine	3,739	48.8%	0.02	76.1%	20,162	2.6	0.1	4.3
eastern white pine	8,100	21.1%	2.71	26.2%	43,679	1.5	14.6	31.8
eastern hemlock	54	-	0.10	110.2%	290	0.8	0.5	0.6
northern red oak	1,078	65.5%	-	-	5,813	1.9	-	2.0
ALL	13,705	9.4%	3.01	20.5%	73,904	2.4	16.2	40.3

Table 4. Stand 2 – Mixed Softwood Plantation Understory Data Table – Tree Species Stems/Acre (Stems < 1.0' tall to 5" dbh)

Common name	3.0 IN. ≤ HT < 1.0 FT.	1.0 FT. < HT < 4.5 FT.	4.5 FT. HT - < 1.0 IN. DBH	1.0 IN. ≤ DBH < 5.0 IN.	TOTAL
Norway spruce	71.4	0.0	0.0	0.0	71.4
eastern white pine	1,000.0	714.3	285.7	0.0	2,000.0
eastern hemlock	71.4	0.0	0.0	0.0	71.4
red maple	857.2	142.9	0.0	0.0	1,000.0
yellow birch	0.0	0.0	71.4	0.0	71.4
sweet birch	0.0	0.0	71.4	0.0	71.4
American beech	0.0	214.3	214.3	71.4	500.0
white oak	0.0	214.3	142.9	0.0	357.1
northern red oak	285.7	357.1	0.0	0.0	642.9
ALL	2,285.7	1,642.9	785.7	71.4	4,785.8

Table 5. Stand 3 – White pine-Red pine Plantation Overstory Data Table – (Stems ≥ 5" dbh)

Common name	Total trees/ac	Total trees/ac std. err. (% of mean)	Total basal area (ft²/ac)	Total basal area std. err. (% of mean)	% basal area by species	QMD	% AGS
red pine	32.8	33.0%	37.5	32.9%	28.0%	14.5	
eastern white pine	96.7	21.6%	86.3	18.8%	64.5%	12.8	90.0%
eastern hemlock	2.2	116.4%	1.3	100.0%	0.9%	10.2	87.7%
red maple	1.5	77.7%	3.8	70.1%	2.8%	21.4	100.0%
northern red oak	7.6	54.7%	5.0	53.5%	3.7%	11.0	100.0%
ALL	140.8	9.5%	133.8	8.9%		13.2	87.3%

Table 6. Stand 3 – White pine-Red pine Plantation Overstory Data Table – (Stems ≥ 5" dbh)

Common name	Sawlog BF/ac	sawlog BF std. err. (% of mean)	Pulp cords/ac	Pulp cords/ac std. err. (% of mean)	Total BF (stand)	Sawtimber mean height (logs)	Total cords (stand)	Topwood cords (stand)
red pine	7,525	33.0%	0.06	67.0%	47,316	2.0	0.4	19.9
eastern white pine	7,757	23.1%	3.24	27.8%	48,778	2.6	20.3	10.4
eastern hemlock	43	-	0.10	110.2%	272	1.5	0.6	0.2
red maple	50	122.1%	0.17	75.3%	313	0.8	1.1	0.4
northern red oak	868	54.6%	-	-	5,456	1.9	-	1.9
ALL	16,242	9.3%	3.57	20.4%	102,135	2.4	22.4	32.8

Table 7. Stand 3 – White pine-Red Pine Plantation Understory Data Table – Tree Species Stems/Acre (Stems < 1.0' tall to 5" dbh)

Common name	3.0 IN. ≤ HT < 1.0 FT.	1.0 FT. < HT < 4.5 FT.	4.5 FT. HT - < 1.0 IN. DBH	1.0 IN. ≤ DBH < 5.0 IN.	TOTAL
eastern white pine	437.5	125.0	62.5	0.0	625.0
eastern hemlock	0.0	187.5	62.5	0.0	250.0
red maple	125.0	0.0	0.0	62.5	187.5
sweet birch	625.0	62.5	937.5	312.5	1,937.5
American beech	0.0	62.5	125.0	0.0	187.5
northern red oak					
ALL	1,187.5	437.5	1,187.5	375.0	3,187.5

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