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Silviculture Prescription
Tannery Road

Massachusetts Department of Conservation and Recreation
Bureau of Forestry

Northern Berkshire District
Savoy Mountain State Forest
Savoy, MA

Prepared by:

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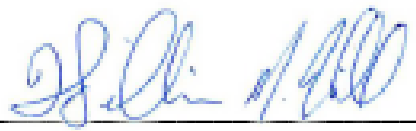
Program Supervisor  Date: January 13, 2017

William N. Hill, CF

Site Data

Geology

This project is located in the Hoosac Mountain Range, with Spruce Hill to the north, and Lewis Hill to the south. The project area is generally sitatuated on a ridge with slopes ranging from 1% - 25% with the northern and northeastern section of the sale being the steepest. The parent materials of the soils within this harvest area consist of granite, mica, schist, and phyllite formed on loamy lodgment glacial till. Within the context of this harvest, the slopes and elevations are not expected to have adverse effects on logging, the post-harvest stand; i.e.: wind throw outside of the Norway spruce plantations, erosion, etc.; or site recovery.

Soils

The primary soil associations included within the project area are Peru-Marlow – 74%, Tunbridge-Lyman – 15%, and Lyman-Turnbridge 10%. The Peru-Marlow and Lyman-Turnbridge series are found on slopes of 3% - 15%, while the Tunbridge-Lyman is found on those slopes between 15% and 60%. These soil associations are very similar in texture (sandy loam), all are extremely stony, share the same parent materials, are located within the same climate (31" – 95"/year precipitation; 27^0F – 52^0F), are set among hilly and/or mountainous terrain, and have site indices between 50 and 67 depending on species and microsite. The major difference between the associations are in soil depth; with the Peru-Marlow exceeding 65", and the Lyman-Tunbridge /Turnbridge-Lyman presenting bedrock between 16" and 28". Within the sale area slopes rarely exceed 25%, with a majority being between 5% and 15%. According to the Forest Productivity and Stand Complexity Model (Goodwin, Hill. 2012) this is a generally productive site and should support a variety of harwoods and conifers. Loss of site quality and productivity is not anticipated due to harvesting operations, as the soils are well-drained and moderately resistant to compaction. Also since the soils are productive, and more sunlight will be hitting the forest floor after harvesting operations; the density, diversity, and occurance of groundcover is expected to increase.

Climate

The mean annual temperature for the sale area is 41^oF with an average of 46" of preciptation. Tropical storm systems do not typically affect this area but occasionally make impacts with the most recent being Tropical Storm Irene in 2011. Noreasters and strong cold fronts from Canada have the potential for major impacts, and occur more regularly. Other erratic weather events such as ice storms, early season blizzards, microbursts, and even tornados are not uncommon. These weather events are the primary forces influencing the disturbance ecology of the area, and are expressed in the landscape as gaps in the forest canopy. Some of the silvicultural systems used in this sale are variable density thinning and gap-expansion irregular shelterwood, are designed to mimic these disturbances .

Hydrology

All of the wetland resources identified on MAP 1 have been located. This is to include a certified vernal pool, intermittent streams, upland wetlands, and a perennial stream (Ross Brook). Also indicated on MAP 1, are the potential locations of filter strips that will be used for water and wetland resource protection, and will be in compliance with current Massachusetts Forestry Best Management Practices. Typical water resources encountered during the marking phase of the project, that do not currently appear on MAP 1, include small intermittent streams and wooded wetlands that were too small to detect during the initial DEP wetland mapping project. If additional wetlands such as non-certified vernal pools, additional intermittent streams, upland wetlands, etc. are encountered; standards outlined in the most recent edition (currently 2013 2nd edition) Massachusetts Forestry Best Practices Manual will be followed as they relate to harvesting requirements, filter strips, water bars, slash management, etc.

Potential Vegetation

The project area currently supports the majority of vegetation that would be considered potential vegetation. One of the goals of this project is to begin the conversion of Norway spruce plantations, and recruit more of the potential vegetation. The most common native tree species present are sugar maple *(Acer saccharum*), red maple *(Acer rubrum)*, white birch *(Betula papyrifera),* yellow birch *(Betula alleghaniensis ,* and American beech *(Fagus grandifolia)*; however there are over 10 different tree species present within the area. The primary ground cover species encountered during stand exams in both the hardwood stand and Norway spruce plantation were striped maple *(Acer pensylvanicum*), ferns, and Canada mayflower *(Maianthemum canadense*).

Site Productivity

An analysis was conducted across all properties managed by the Bureau of Forestry to assess site productivity and complexity using Geographic Information System (GIS) data layers of Prime Forest Soils, Potential Vegetation Complexity, Late Successional potential, Forest Diversity, Early Successional potential, CFI Site Index, and CFI Stand Structure (Goodwin, Hill, 2012). The analysis found that 80% of the area ranked in the top 1/3 of the productivity scale. Due to the high productivity of the hardwood area and the existing even aged condition, a gap-expanding irregular shelterwood method will be employed to mimic natural disturbance and begin the process of converting an even-aged stand to an uneven-aged stand. Within the Norway spruce plantations; which are low productivity, even age management techniques will be employed, primarily third row thinning.

Archeological and Cultural Resources

- MHC MACRIS # SAV.1, #SAV.4, and #SAV.10 - These sites are listed within the DEM cultural resource inventory, they consist of a saw mill and tannery associated with Tannery Falls and Tannery Brook

- Stone Walls – Located within the project area, and identified, during the initial project reconnaissance.

Actions that are intended to protect cultural resources include:

- GPS, photograph, flag/protect and avoid cellar holes, stone walls, wells, trash pits and other associated cultural features located within the project area.
- Existing breaks in stone walls will be utilized to protect the integrity of the stone walls.
- Existing roads, landing areas and skid trails will be re-used during operations.
- Trees will be felled away from the road.
- Timber Sale Contract language designed to protect cultural resources requires timber harvesters immediately report any undocumented cultural resources.

Stand Data

Forest Stand Attributes

The Tannery Road project area is approximately 101 +/- acres of mainly upland habitat comprised primarily of hardwoods. The project area will be completed in a single entry. The hardwood stand has approximately 93% relative density[1] while the Norway spruce plantations are 63% relative density. The probable reasons for this are the following:

- The area was most likely cleared for agriculture and when natural reforestation occurred most of the softwoods that seeded in were out-competed by hardwood. Since the site is productive, hardwoods continued to grow and seed in which has led to the very high densities.

  Norway spruce was hand planted, most likely by the CCC. Theses specific plantations were never properly maintained for growth, production, and/or diversity and are now in a state of decline. Root diseases coupled with severe weather events have caused significant blow-down. Soils under Norway spruce plantations are often more acidic than soils under other species. Soil acidity appears to increase with stand age as soil buffering capacity decreases with age. (Binkley, Dan; Valentine, David. 1991) Due to the acidic soils, the rate at which other species can colonize the site is reduced leaving relative densities moderate with a significant amount of growing space unoccupied.

The following are descriptions of the forest types located within the entire sale area (MAP 1).

Norway Spruce Plantations: Composed of 5 different plantations totaling 19 +/- acres. They are even-aged with little or no understory or ground cover, save the areas with canopy gaps. The

[1] *Relative density is the absolute density expressed as a percentage of a referenced level. For example, in this prescription the hardwood stand has an absolute basal area per acre of 129.2 ft^2 which is 93% of full site occupancy. Full site occupancy would be approximately 138.9 ft^2. At this relative density level there is a high level of completion between trees which often results in poor tree vigor and mortality.*

canopy gaps have been caused by weather events and tree mortality, and are being colonized by native hardwoods, native softwoods, and Norway spruce regeneration.

These sites are in the lowest categories of the site productivity complex analysis developed in 2012. The plantations are in decline, and showing evidence of root disease and wind-throw. Based on low productivity and current conditions, even-aged techniques that retain portions of the existing canopy may be most appropriate.

Northern Hardwoods: This stand is approximately 82 +/- acres in size, and even-aged. Tree densities range between 110 ft^2/acre - 140 ft^2/acre of basal area across the stand.

Those species associated with the northern hardwoods in these stands are primarily American beech,red maple, sugar maple, yellow birch, and white birch. There is also small white pine plantation,as well as, red spruce and eastern hemlock inclusions.

The stand is healthy and would be considered young mature. They are in the highest tiers of the productivity analysis developed in 2012, have the deep soils, and are vigorously growing. Since the area is considered productive, movement towards uneven-aged conditions may be most appropriate.

Land Use History

The hardwood stand and Norway spruce plantations demonstrate typical land-use patterns consistent with the northeast. The area may have had homesteads that cleared areas for firewood and livestock, and after the homesteads were abandoned the area reforested naturally. More recently, the young mature; even-aged hardwoods indicate that the land was cutover at some point within the last 100 years and was again left to reforested naturally. The fact that the area had been completely deforested within the same time frame as the efforts by the Civilian Conservation Corps to perform reforestation work, likely drove the decision install the Norway spruce plantations in the 1930's. Since that time active harvesting has occurred on Savoy Mountain State Forest, and surrounding private lands.

A stand exam of this project was completed in July of 2016, with the following results:

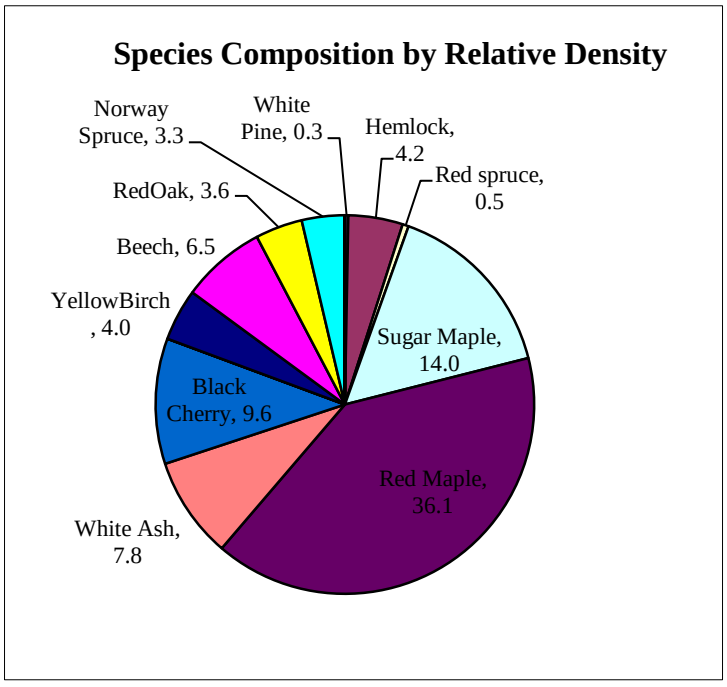
Hardwood Stand:

The overstory consists of red maple (32%), white ash (14%), sugar maple (12%), black cherry (9%), Norway spruce (7%), and hemlock (6%). Other species present within the stand include American beech, red oak, yellow birch, red spruce, and white pine; but in densities that represent less than 5%.

Table 1 – Stocking Diagnostics of the Hardwood Stand

Species	Total Trees/Acre	Total BA/Acre	% BA/ac by Spp	Rel Density	% AGS	
White Pine	0.2	0.8	1%	0.3	0%	
Hemlock	12.4	9.2	7%	4.2	91%	
Red Spruce	1.2	1.7	1%	0.5	100%	
Sugar Maple	18.2	17.5	14%	14.0	81%	
Red Maple	37.5	45.8	35%	36.1	67%	
White Ash	6.6	10.0	8%	7.8	92%	
Black Cherry	6.6	12.5	10%	9.6	73%	
White Birch	4.6	5.0	4%	0.0	100%	
Yellow Birch	4.8	5.0	4%	4.0	83%	
Beech	19.2	7.5	6%	6.5	22%	
Red Oak	2.6	4.2	3%	3.6	100%	
Norway Spruce	10.0	10.0	8%	3.3	58%	
Total	123.9	129.2	100%	90	73%	
			Median Stand Diameter	16.3	93	*<<- Estimated Relative Density*

Figure 1 – Hardwood Stand Species Composition



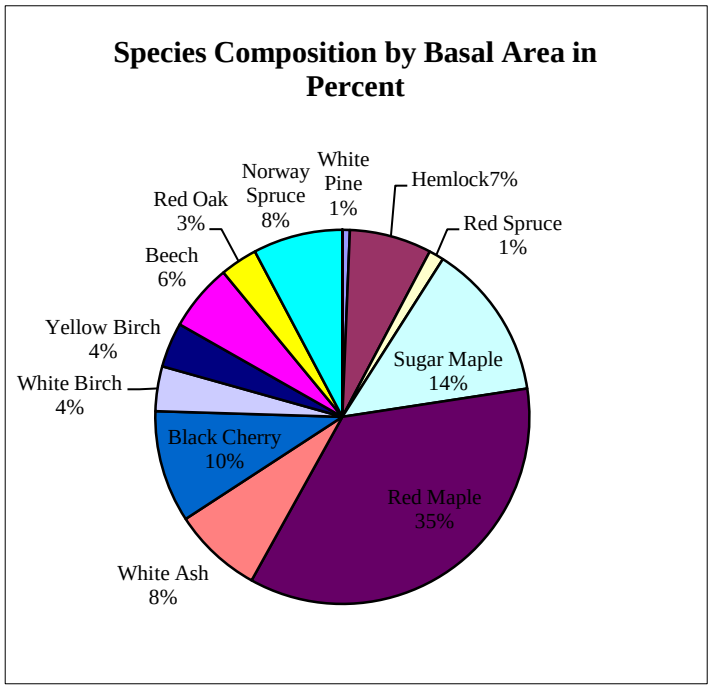


Table 2 – Hardwood Stand Advanced Regeneration

Species	Avg Stems/Ac	Species	Avg Stems/AC
Red Maple	1650	Red Oak	168
Beech	609	Sugar Maple	159
Yellow Birch	309	Black Cherry	46
White Ash	197	Red Spruce	28

Table 3 – Hardwood Stand Ground Cover

Species	Percent Cover	Species	Percent Cover
Striped Maple	16	False Solomon's Seal	2
Ferns	15	Hobblebush	5
Canada Mayflower	15	Grasses	<1
Jewelweed	1	Teaberry	<1
Lycopodium spp.	1	Starflower	1
Rubus	<1	Indian Cucumber	<1
Sarsaparilla	2		

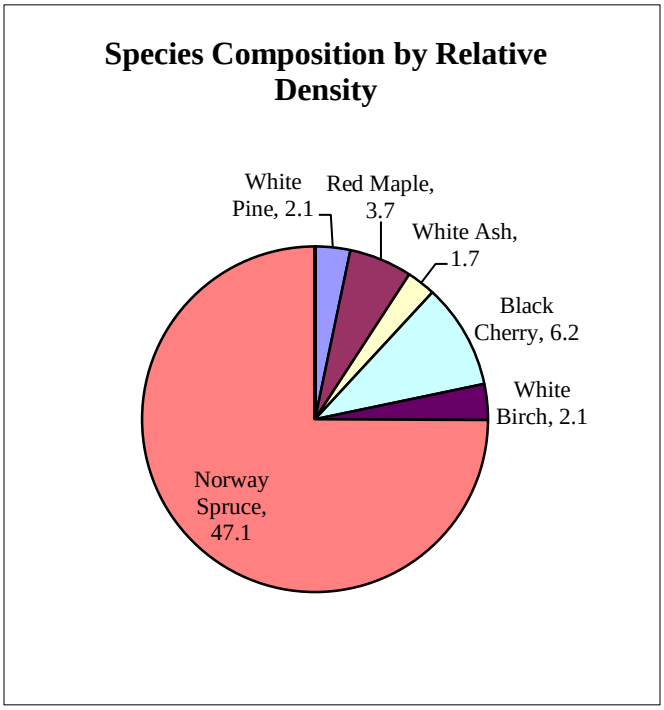
Norway Spruce Stand:

The overstory is primarily composed of Norway spruce (92%), and less than 5% of each of the following species: white pine, red maple, white ash, black cherry, white birch.

Table 4 – Stocking Diagnostics of the Norway Spruce Plantations

Species	Total Trees/Acre	Total BA/Acre	% BA/ac by Spp	Rel Density	% AGS	
White Pine	**5.0**	**5.6**	**3%**	**2.1**	**80%**	
Red Maple	**7.9**	**4.4**	**3%**	**3.7**	**50%**	
White Ash	**0.9**	**2.2**	**1%**	**1.7**	**100%**	
Black Cherry	**7.6**	**7.8**	**5%**	**6.2**	**57%**	
White Birch	**2.0**	**2.2**	**1%**	**2.1**	**100%**	
Norway Spruce	**155.7**	**140.0**	**86%**	**47.1**	**91%**	
Total	**179.2**	**162.2**	**100%**	**63**	**88%**	
			Median Stand Diameter ->>	**14.2**	**63**	***<<- Estimated Relative Density***

Figure 2 – Norway Spruce Plantations Species Composition



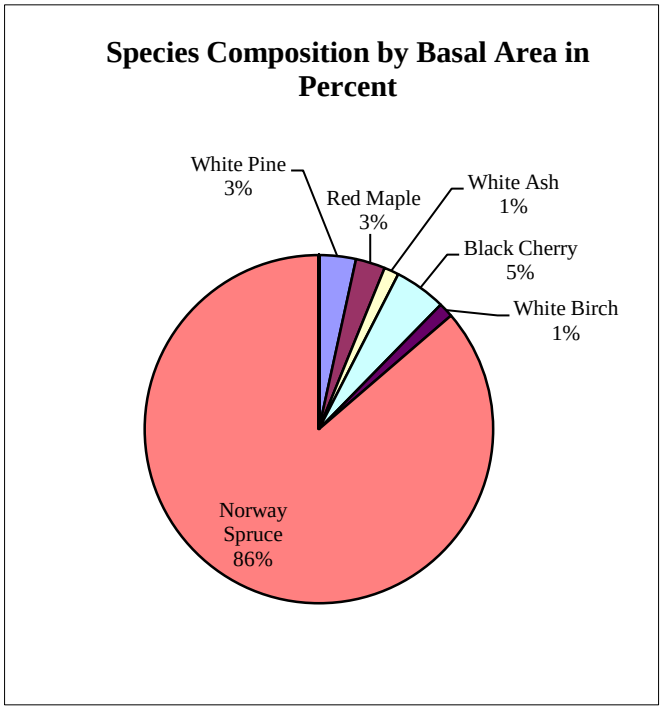


Table 5 – Norway Spruce Plantations Advanced Regeneration:

Species	Avg Stems/Ac	Species	Avg Stems/AC
Red Maple	4680	Red Oak	120
Beech	240	Sugar Maple	120
Yellow Birch	360	Red Spruce	60
White Ash	600	White Pine	60
Norway Spruce	840		

Table 6 – Norway Spruce Plantations Ground Cover:

Species	Percent Cover
Striped Maple	19
Ferns	16
Canada Mayflower	15
Sarsaparilla	36

Within the Tannery Road sale area it is estimated that there is 759 cubic feet/acre of course woody debris (CWD) already on the ground, which is above the 256 cubic foot minimum retention guideline listed in the DCR Management Guidelines (2012). During operations prior downed material will not be removed.

Data was gathered during the stand exam in regards to advanced regeneration of commercial timber species, as well as, herbaceous and woody ground cover. Though red maple is the dominant commercial tree species, American Beech is proliferating because of the impact of the Beech Bark Disease Complex (BBD). In those areas that dominate in American beech, a beech

brush condition has occurred limiting the diversity of both ground cover and overstory tree recruitment. Future timber stand improvement activities will include the identification of areas for herbicide applications to control beech, reduce competition with other trees (sugar maple, hickory, and oak will be heavily favored), and diversify herbaceous ground cover.

Aesthetic Resources

The harvest is not anticipated to have a negative aesthetic impact along the edge of Tannery Road. Additionally, many of the scenic views in this area are located along the Mohawk Trail, which is not visible from the sale area. Tannery Road is currently open to vehicular traffic from the general public and is a seasonally maintained road of the Town of Savoy.

Recreation Resources

- Hunting – This area has a long history of hunting and is a popular spot. Deer, bird, and small game hunters frequent the area during open seasons.

- Wildlife Viewing – Due to the presence of moose and alpine vegetation, much of Savoy Mountain State Forest is a popular destination for this user group. Moose sign has been observed in the project area.

- Trails – Balanced Rock Trial is located just outside the southeastern boundary of the sale and is designated for hiking. This trail is in poor condition, and the culvert that is used for crossing Ross Brook is located about 50' downstream of the crossing. This damage was most likely done during tropical Storm Irene and has not been repaired. Lewis Hill snowmobile trail is located along the western and southwestern portions of the project area. The trail appears to be in fair condition and is used for snowmobiles in the winter and hiking in the summer.

Threatened and Endangered Species (TNE)

There are no TNE, critical habitats, or estimated habitats of TNE species listed in the 13th edition of the Mass Natural heritage Atlas

Wildlife

<u>Species</u>

The wildlife occurring in this area is typical of a northern hardwood forest. Observed species include black-capped chickadee, white-tail deer, blue jay, and common crow. Other species expected to occur are black bear, moose, various songbirds, ruffed grouse, snowshoe hare,

raccoon, various fur bearers, grey squirrel, red squirrel, various raptors, and other small mammals such as bats and rodents.
Also, this site is entirely in BioMap Core habitat for the spring salamander, a species of conservation concern. Small spring fed streams and wetlands in the project area will be buffered in accordance with the most recent edition (currently 2013 2nd edition) Massachusetts Forestry Best Practices Manual in order to avoid negative impacts. This project also borders a forest reserve.

Snags and Retained Live Trees

All snags will be retained on-site provided that they do not pose a hazard to humans during or after operations. Live trees that appear to be a den or nest site either currently or in the recent past will also be retained.

Evaluation of the Data and Projected Results

The Massachusetts Department of Conservation and Recreation has developed a list of ecological services and benefits derived from active forest management of Woodland Zones (Exhibit 1). The following are lists of goals and objectives for the Tannery Road Project and the associated ecological services and benefits that are satisfied.

Goals and Objectives of the Tannery Road Project

Goal 1: Successful Implementation of Silvicultural Prescription (MA DCR Goal – **Production of Wood Products, Diversified Habitats, Carbon Stock Management, Water, Recreational Opportunities**).

Objectives

- Residual relative basal areas at 66% within the hardwood stand with between 83 ft^2 and 55 ft^2 BA/ac. Residual relative densities within the Norway spruce at 43% with between 155 ft^2 and 105 ft^2 BA/ac.
- Residual basal area within selected groups in the hardwood stand between 20 ft^2 and 0 ft^2 per acre. Residual basal area of Norway spruce within thinned rows of 0 ft^2 BA/ac.
- No cutting or harvesting within filter strips.
- No cutting or harvesting within 75' of identified cultural resources other than stone walls.
- No loss of undesignated wood.
- Ensure harvesting contractor compliance with all BMP's.
- Frequently monitor operations to minimize and/or mitigate damage to the site.
- Ensure full understanding of contractual requirements by the harvesting contractor.
- Residual CWD of no less than 256 ft^3 per acre.

Residual basal area ranges provided within the objectives and the Silvicultural Prescription section were determined using the Fox DS Cruiser version 2007.2 Workhorse (New Hampshire Forests & Lands Staff, 2009) which analyzes inventory data gathered in the field, and comparing those results with stocking tables located in the Silvicultural Guide for Northern Hardwoods in the Northeast (Leak et al., 2014)

Goal 2: Adequate Stocking in Single Tree and Group Selection Areas (**MA DCR Goal – Diverse Habitats & Carbon Stock Management**).

Objectives

- Have 500+ stems per acre of healthy native hardwood or softwood regeneration within gaps and thinned rows, with the exception of those species which can dominate a site; i.e.: striped maple, pin cherry, etc.; within 5 years of the harvest.
- Reduced beech regeneration competition with native tree regeneration and ground cover.

Goal 3: Increase biological diversity and introduce more complexity into existing stands (**MA DCR Goal – Diverse Habitats & Water**).

Objectives

- Install gaps within the existing hardwood stand in order to create early successional habitat and begin a new age class of trees.
- Row thin within the existing Norway spruce plantations to promote native species recruitment and diversity.

Goal 4: Improve wildlife habitat, specifically browse and cover (MA DCR Goal – **Diverse Habitats).**

Objective

- When establishing gaps ensure that they are large enough to have full sunlight on the forest floor. Gaps in the hardwood stand or thinned rows in the Norway spruce plantations will not exceed 1/3 acre in size, and will be located a minimum of 100' apart. Beech brush or exotic vegetation that is disturbance driven will be mitigated through treatments that will most likely occur prior to harvest.

Goal 5: Improve recreational experiences primarily associated with hunting and wildlife viewing (MA DCR Goal – **Recreational Opportunities**).

Objective

- When marking in the hardwood stand, maximize the number of gaps to be installed based on site conditions and current and/or anticipated vegetation.

Goal 6: Improve the distribution of early successional habitat and younger age classes (MA DCR Goal – **Diverse Habitats**).

Objective

- Distribute group selection openings in the hardwood stand, where appropriate, throughout the stand.

Goal 7: Increase the distribution and density of sugar maple to combat sugar maple decline.

Objective

- Sugar Maple will be favored for retention over other tree species. Regenerating areas of sugar maple will have competing overstory trees removed provided that the removal(s) does not violate the Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines (2012).

Goal 8: Remove beech infected with Beech Bark Disease Complex (BBD) (MA DCR Goal – **Diverse Habitats).**

Objective

- Beech that show clear signs of BBD will be biased for removal, while adhering to the guidelines established in the Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines (2012). Particularly those guidelines relating to legacy trees and opening sizes.

Goal 9: Commence the process of removing the off-site Norway spruce plantations.

Objective

- Approximately ½ of the volume within the existing Norway spruce plantation will be removed through third row thinning.

Silvicultural Prescription

Hardwood Stand

All white ash trees over 10"dbh will be removed from the Tannery Road corridor, as well as any other dead or dying tree within 1 tree length of the road. In the remainder of the stand an expanding-gap irregular shelterwood system (Raymond *et al.,* 2009) will be used. This type of system works by creating gaps in the forest canopy through harvesting, and expanding those gaps through each successive entry. In order to facilitate future entries, and perpetuate the system, gaps will be installed systematically throughout the sale area (MAP 1). Installed gaps will be no less than 1/10 of an acre and will not exceed 1/3 of an acre; however, the final size of each gap will be determined according to the conditions present on the ground. The stand will also be thinned in between the installed gaps using variable density thinning within the range identified.

The purpose of this system will be to maintain diversity; i.e.: biological, density, age, size, and successional; manage for superior crop trees; presalvage white ash; create horizontal and vertical structural complexity; and control understory beech. This will be accomplished by:

- The introduction of a new cohort of regeneration by expanding initial gaps with each successive entry
- Retaining legacy trees in the overstory;
- Varying thinning densities which will create a range of tree densities and light conditions in the understory
- Removing trees that are not expected survive until the next silvicultural entry, freeing up resources and growing space
- Promoting crop trees that are financially and ecologically desirable

The target residual basal areas for those areas that are selected as groups will be between 20 ft^2 and 0 ft^2 per acre, with everything but advanced regeneration and healthy sugar maple being removed. Those areas that have thinning and single tree selection cutting regimens will have a target between 83 ft^2 BA/ac and 55 ft^2 BA/ac.

Marking Guide

White ash over 10" dbh will be favored for cutting to reach target basal areas, those trees 10" dbh and below will be retained as a future seed source. All beech with no visible signs of beech bark disease complex, and greater than 14" in diameter, will be retained as hard mast producers and potential stock that is resistant to beech bark disease complex. Sugar maple will be retained unless diseased, not expected survive until the next silvicultural entry, or part of a group selection opening; due to the regional issue of sugar maple decline. Larger, healthy eastern hemlock (20"+ DBH) will be retained if it is not showing signs of the hemlock wooly

adelgid that is decimating hemlock in other areas of the Berkshires. Due to its low occurrence, low vulnerability to climate change, and high ecological value, healthy hickory will be retained. It is also possible the hickory will become more prevalent in the landscape due to climate change. Red oak legacy trees (35"+ DBH) will not be cut due to their ecological values, potential for seed, aesthetics; and as with hickory, low vulnerability to climate change. The following cut guides will be followed:

Table 7 – Tannery Road – Harwood Group Selection

Group Selection Cutting

Fox DS Cruiser version 2013 – New Hampshire Division of Forests and Lands

Rotation Age	150
Cutting Cycle	30
Stand Acres	80
Tending starts @	30

Suggested Acres in Clearings		
	14	Lower
	16	Target
	18	Upper

Harvest Level = .435

Spp	Est BdFt	Est Cords
White Pine	0	4.79
Hemlock	9,490	18.49
Spruce	5,653	0.00
Sugar Maple	18,242	29.28
Red Maple	49,664	94.57
White Ash	21,904	3.36
Black Cherry	15,499	17.46
White Birch	7,532	0.00
Yellow Birch	5,281	0.00
Beech	3,013	17.95
Red Oak	7,191	0.00
Norway Spruce	11,691	27.28
Total	**155,160**	**213**

Table 8 – Tannery Road Hardwood Thinning

		Harvested			Residual			
Species	**% to cut**	**Sawtimber**	**Cords**	**Rel Den**	**Sawtimber**	**Cords**	**Rel Den**	**Basal Area**
White Pine	30	**0**	**6**	**0**	**0**	**13.4**	**0.2**	**0.6**
Hemlock	10	**3,796**	**7**	**0**	**34,165**	**66.6**	**3.8**	**8.3**
Red Spruce	30	**6,784**	**0**	**0**	**15,829**	**0.0**	**0.3**	**1.2**
Sugar Maple	10	**7,297**	**12**	**1**	**65,671**	**105.4**	**12.6**	**15.8**
Red Maple	60	**119,194**	**227**	**22**	**79,463**	**151.3**	**14.4**	**18.3**
White Ash	80	**70,092**	**11**	**6**	**17,523**	**2.7**	**1.6**	**2.0**
Black Cherry	30	**18,599**	**21**	**3**	**43,398**	**48.9**	**6.7**	**8.8**
White Birch	40	**12,051**		**0**	**18,077**		**0.0**	**3.0**
Yellow Birch	30	**6,337**		**1**	**14,786**		**2.8**	**3.5**
Beech	90	**10,846**	**65**	**6**	**1,205**	**7.2**	**0.6**	**0.8**
Red Oak	30	**8,629**		**1**	**20,134**		**2.5**	**2.9**
Norway	30	**14,029**	**33**	**1**	**32,733**	**76.4**	**2.3**	**7.0**
Total		**277,654**	**381**	**42**	**342,985**	**471.9**		**72.0**
						>>>	**48**	<<<

Harvest level = **0.358**

Norway Spruce Plantations

Third row thinnings (alternating leaving 3 rows and cutting 3 rows) will be conducted in order to accelerate the plantation conversion process. Thinnings will not exceed 1/3 of an acre in size, and not less than 100' apart so it may become necessary to leave unthinned gaps within the rows. Any existing inclusions within the plantations, due to naturally occurring canopy gaps, will be left intact and not targeted for thinning. The only exceptions to this are areas that are dominated by American beech with BBD, striped maple, or pin cherry. These species will be removed from preexisting openings.

The purposes behind using this system are driven mainly by ecological and operational considerations. The large spaces between rows are intended to encourage recruitment and diversity by increasing the amount of light reaching the forest floor. Norway spruce regeneration is anticipated, however, other native hardwood and softwood species regenerate as well. The row thinnings will facilitate future operations within the plantations; and should help expedite removal, as it will be evidently clear where the next thinnings are to be conducted. Additionally, windthrow is expected within the plantations and pathways through the standing residual trees will help provide improved and safer access for future inventory and marking operations. Target basal areas of Norway spruce within the thinned rows will be 0 ft^2 BA/ac, while gap colonizing native hardwood and softwood densities will be variable.

Marking Guide

All spruce 6" and above will be marked within rows targeted for thinning. Gaps within rows, and alternate rows, will not have any improvement thinning conducted. Native hardwood and softwood that is healthy and vigorous; other than striped maple, beech with BBD, and pin cherry; will be avoided but not exempt from removal. Rows will be marked systematically, and where possible, in an east – west orientation in attempt to get the most damaging winds from the north up and over the plantation.

For both the hardwood stand and Norway spruce plantations paint colors, paint patterns (X's, stripes, etc.), flagging, etc. will follow current Mass DCR Standard Operating Procedures, Mass DCR Policy and Procedure, and past practices.

Table 9 – Tannery Road Norway Spruce Thinning

		Harvested			Residual				
Species	% to cut	Sawtimber	Cords	Rel Den	Sawtimber	Cords	Rel Den	Basal Area	
White Pine	20	2,543	0	0	10,172	1.0	1.7	4.4	
Red Maple	30	954	1	1	2,225	2.4	2.6	3.1	
White Ash	90	4,469		2	497		0.2	0.2	
Black Cherry	30	1,570	2	2	3,664	4.2	4.3	5.4	Harvest level = 0.306
White Birch	40	1,362		1	2,043		1.3	1.3	
Norway Spruce	30	97,955	72	14	228,561	167.2	33.0	98.0	
						>>>	43	<<<	

Short Term and Long Term Conditions

Short Term (Present – 100 years)

Hardwood Stand

Ground cover density, diversity, and distribution are expected to increase. Installed gaps will begin to regenerate with desirable growing stock, most likely: birches, maples, some oak, beech, and white ash. Herbicide applications, probably glyphosate formulations will be used to control significant American beech expansion. Sun exposure and herbicide treatments should limit the growth of beech and provide the opportunity for those more tree and ground cover species to escape beech brush shading prior to crown closure. Use of the area by wildlife adapted or obligated to early successional habitat should increase.

Norway Spruce Plantations

Norway spruce plantations will be removed over the next 2 cutting cycles. Third row thinning will continue; improvement thinning within the previously removed rows will occur. Within areas for improvement thinning; healthy native hardwoods (other than striped maple and pin cherry) and conifers will be preferred stock while striped maple, pin cherry, and diseased or otherwise unhealthy hardwoods and conifers will be targeted for removal.

Long Term (100 years +)

Ground cover densities, distribution, and diversity will be maintained through subsequent silvicultural entries. Gap-expansion will be used in those areas that had gaps established in the previous entries. Sugar maple should become more plentiful as competition is reduced through beech brush control and cutting that biases against sugar maple removal. Norway spruce plantations will be completely removed and replaced with a mix of native hardwood and

conifers. An uneven-aged condition, representing the entire spectrum of natural community development from early successional to old growth, will be found throughout the area.

Logging System Requirements

Conventional and mechanical harvesting will be permitted, provided that equipment does not exceed 6 psi ground pressure. Tannery Road will be used for hauling designated timber off of state owned lands, and the Lewis Hill snowmobile trail for forwarding and/or skidding. This area may be a winter/dry ground only operation do to the sensitivity of the site. Generally, all trees will be felled into the stand and slash will remain in that location unless required for the skid trail. Deviations from this will be reviewed on a case-by-case basis by the forester-in-charge or their designee.

Haul Roads

The haul road for the sale is Tannery Road. This road will require improvements such as resurfacing and grading, ditch repair, and turnout repairs at the completion of harvesting activities. The current road profile is anticipated to be sufficient for the activities being conducted and the need for large-scale widening or extensive pre-work will most likely not be required.

Skid Trails

Primary skid trail have been identified in MAP 1. Since no record of harvesting exists, and no previous skid trails were located during the stand exam, the installation of all interior skid trails will be required. Skid trails will be marked prior to the start of harvesting activities, and it is understood that minor changes to the routes may be required during the course of logging operations. All proposed changes will be reviewed on a case-by-case basis by the forester-in-charge and/or Program Supervisor as required. Prior to the leaving the harvest areas all skid trails will have water bars installed, and excess disturbance will be mitigated. If pole fords were used to cross unregulated streams, the poles will be removed and placed outside of the filter strip. Bridge panels used for the identified stream crossing will also be removed at the cessation of logging activities.

Landings

Preliminary landings have been located, and are shown on MAP 1. Additional landings may be required, but are not anticipated. Any additional landings that may be required will use existing openings or gaps, and will not be intended for loading log trucks. Prior to leaving the sale, all landings will be smoothed, logging residue will be moved into the woods, and the landings will be seeded.

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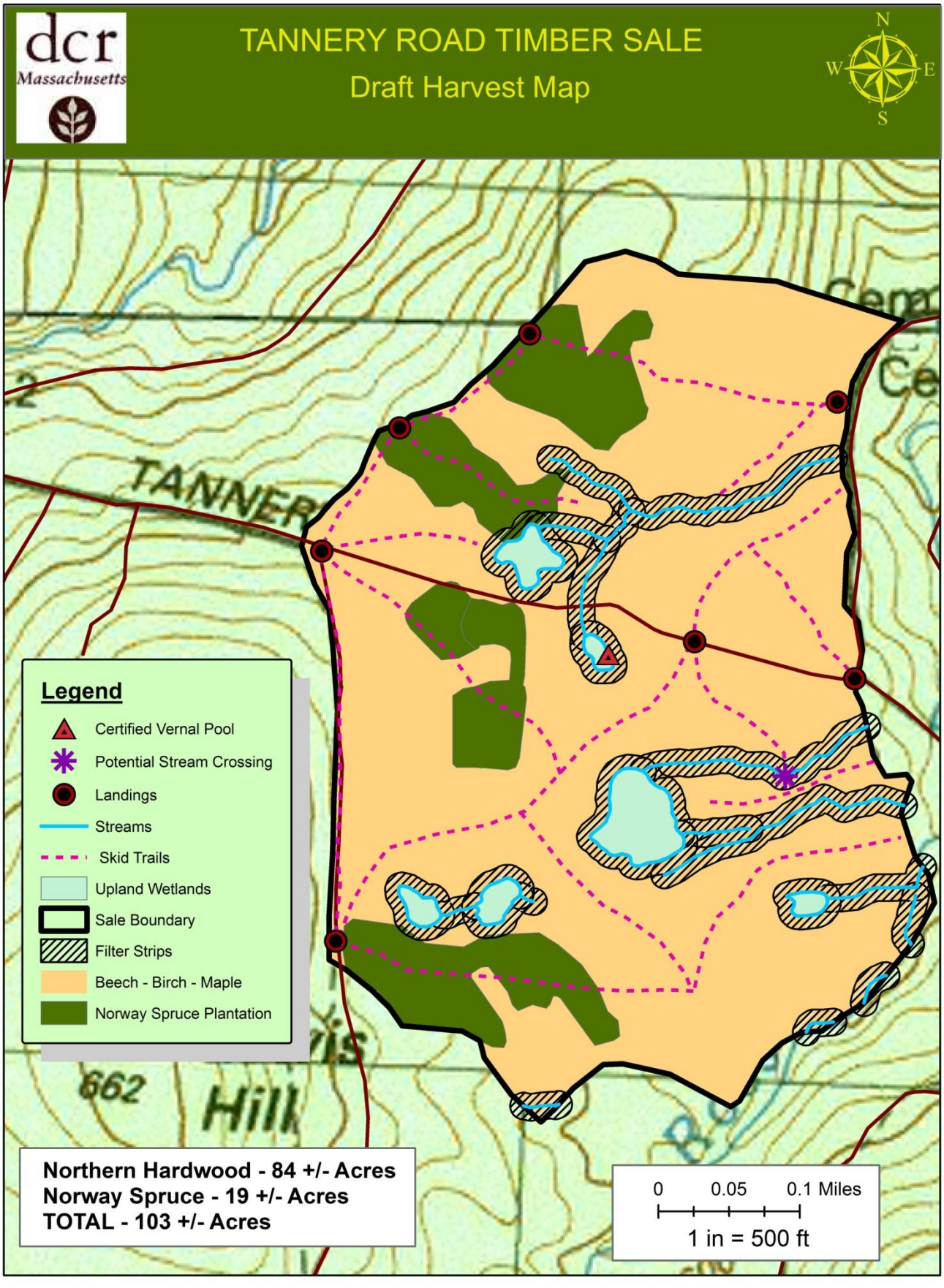
MAP 1


dcr
Massachusetts
TANNERY ROAD TIMBER SALE
Draft Harvest Map
N
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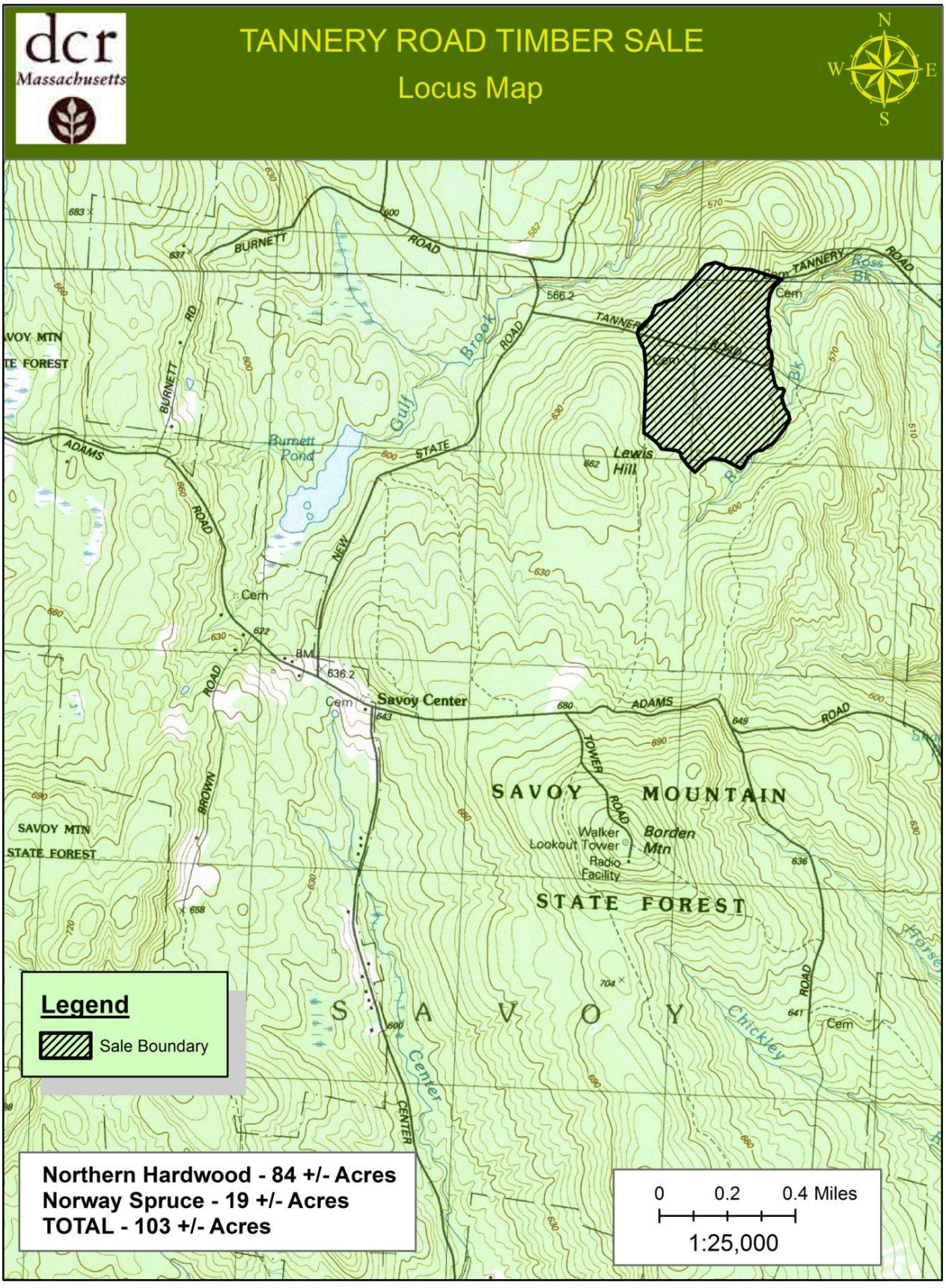
TANNER
662
Hill
Legend
Certified Vernal Pool
Potential Stream Crossing
Landings
Streams
Skid Trails
Upland Wetlands
Sale Boundary
Filter Strips
Beech - Birch - Maple
Norway Spruce Plantation
Northern Hardwood - 84 +/- Acres
Norway Spruce - 19 +/- Acres
TOTAL - 103 +/- Acres
0
0.05
0.1 Miles
1 in = 500 ft

MAP 2


dcr
Massachusetts
TANNERY ROAD TIMBER SALE
Locus Map
N
W
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S
BURNETT ROAD
TANNERY ROAD
ADAMS ROAD
STATE ROAD
NEW ROAD
BROWN ROAD
TOWER ROAD
CENTER ROAD
Gulf Brook
Burnett Pond
Ross Bk
Lewis Hill
Savoy Center
SAVOY MOUNTAIN STATE FOREST
SAVOY MTN STATE FOREST
Walker Lookout Tower
Radio Facility
Borden Mtn
Chickley
Center
Cem
BM
636.2
566.2
Legend
Sale Boundary
Northern Hardwood - 84 +/- Acres
Norway Spruce - 19 +/- Acres
TOTAL - 103 +/- Acres
0 0.2 0.4 Miles
1:25,000

MAP 3

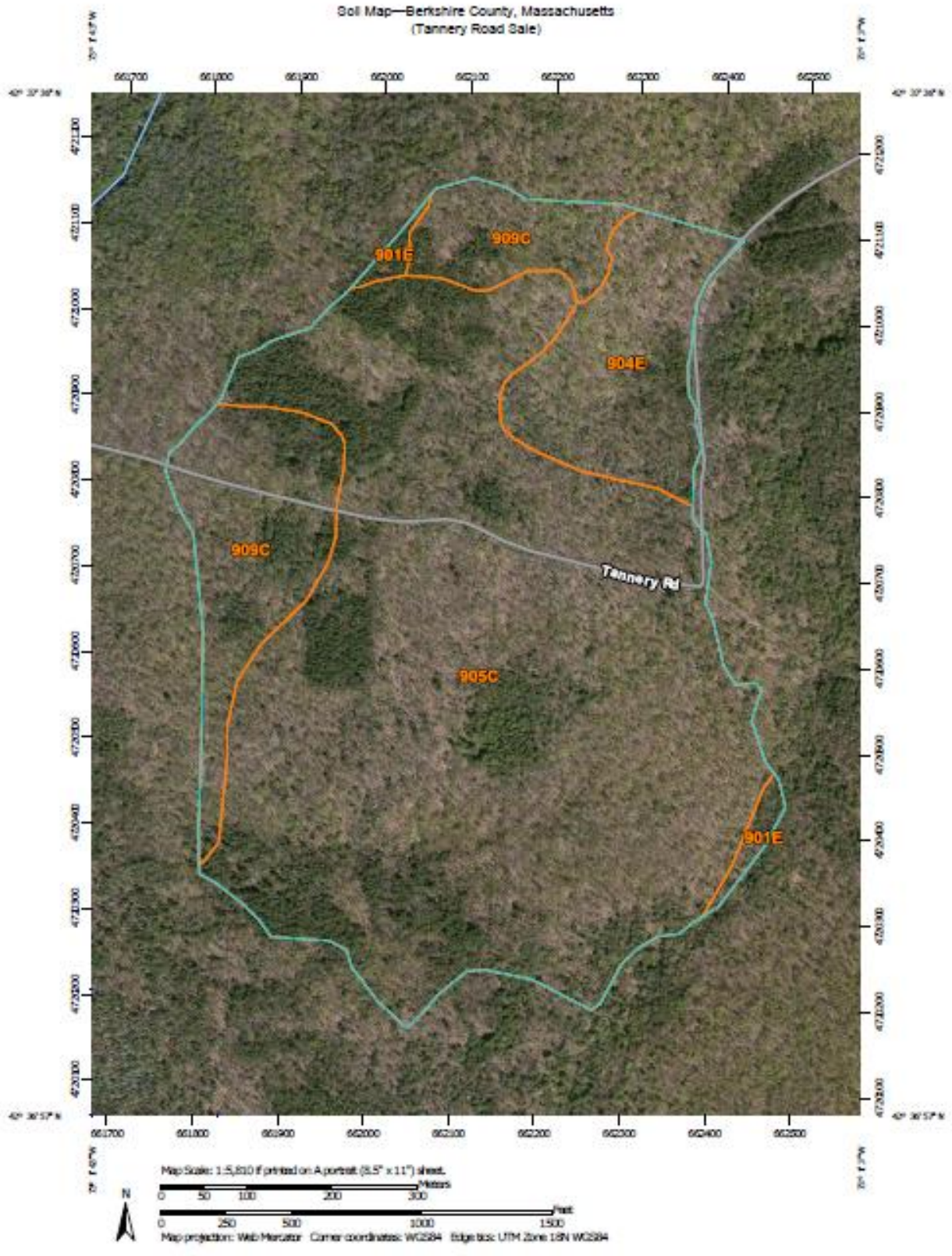
Soil Map—Berkshire County, Massachusetts
(Tannery Road Sale)
901E
909C
904E
909C
Tannery Rd
905C
901E
Map Scale: 1:5,810 if printed on A portrait (8.5" x 11") sheet.
Meters
0 50 100 200 300
N
Feet
0 250 500 1000 1500
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84
USDA
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
9/7/2016
Page 1 of 3

Exhibit 1

MA Department of Conservation and Recreation
Division of State Parks and Recreation
Woodland Zone

The Mission of the Bureau of Forestry Management Forestry Program in lands designated as Woodland on State Forests, Parks and Reservations is to provide ecosystem services and benefits associated with active forest management.

Ecosystem services that are provided through active forest management on the Woodland landscape are:

- ***Production of wood products*** *that is ecologically and economically sustainable benefiting local economies.*

- ***Water*** *quality protection and enhancement of water supply.*

- ***Diverse habitats*** *that range from early seral vegetation to late successional forest encompassing many structural components and provide protection from extreme disturbance events.*

- ***Recreational opportunities*** *that are safe and fitting for their location determined in conjunction with the Operations staff of the Division of Parks and Recreation*

- ***Carbon stock management*** *using innovative and scientific forest management methods for increasing sequestration.*

❖ Forest management on DCR forests, parks, and reservations endeavors to demonstrate excellent forestry practices to private landowners and the public.

❖ The ecosystem services that state lands provide will be balanced across the landscape and the scale of time where they are deemed appropriate.