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Silviculture Prescription
Heaphy Richardson Lot

Massachusetts Department of Conservation and Recreation
Bureau of Forestry

Central Berkshire District
October Mountain State Forest
Washington, MA

Prepared by:

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Approved by:
Management Forestry
Program Supervisor  Date: October 3, 2016
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Overview:

The Heaphy-Richardson Lot Forest Management project is located on the southern slope of the October Mountain State Forest (see Locus Map). The conditions that led to selecting this project for forest management are:

- Significant portions of the project area have been affected by abiotic (ice) and biotic (beech bark disease) agents and the overstory trees are in decline.
- The project area has a high percentage of white ash which is or will be infested with Emerald Ash Borer (EAB) soon.
- Due to the loss of the overstory trees there is a danger of heavy sprouting of American beech and subsequent loss of site diversity.
- This project area offers an excellent opportunity to demonstrate and fulfill objectives for DCR Woodlands including maintaining and establishing diverse and resilient native forests.

The Heaphy-Richardson Lot Forest Management Project endeavors to:

- Demonstrate thinning for stand improvement and group selections for regeneration in Northern Hardwood forests that have been damaged by ice storms and beech bark disease.
- Demonstrate multi-age silvicultural systems including irregular shelterwood and group selection and even age silvicultural systems to regenerate forests primarily composed and dominated by severely diseased American beech.
- Prevent proliferation of American beech with beech bark disease complex.
- Remove/salvage white ash prior mortality from infestation of EAB.
- Demonstrate harvesting techniques and best management practices that protect forest productivity, recreation values, soil and water resources.
- Fulfill management approaches for Woodlands as directed by the Forest Futures Visioning Process (2010) and subsequent Management Guidelines (2012)
    - Create a more diverse forest structure that is resilient to disturbance
    - Sequester carbon in retained overstory trees, permanent forest products produced from the harvest, and in the vigorous regenerating forest.
    - Provide locally grown forest products to the local economy

The Heaphy-Richardson Lot Forest Management Project will result in two timber sale entries.

Site Data:

Stand Information: The proposed project area consists of 230 acres of northern hardwood forest types. Throughout the project area the dominate tree species that were observed are white ash (Fraxinus Americana), sugar maple (Acer saccharum), red maple (Acer rubrum), American beech (Fagus grandifolia), black cherry (Prunus serotina), quaking aspen (Populus tremuloides), yellow birch (Betula alleghaniensis), red oak (Quercus rubra), white birch (Betula papyrifera), Eastern hemlock (Tsuga canadensis) and white pine (Pinus strobus). This project area has been shaped in recent years by beech bark disease, white ash die back and the ice storm of 2008. These events are pushing all these forest types into high risk / low quality beech dominated forest.

The northern hardwood and oak/hardwood forest types within this project area have variations of species density and size classes creating a mosaic effect. This general forest type will be broken down into individual stands for administration purposes based on topography and species composition to assist planning in proper management decisions. Size classes in this project area range from small to large diameter trees with high density levels. Portions of the project area are populated by Norway

spruce (Picea abies) and white pine (Pinus strobus) in the overstory as individuals that survived and flourished after a 1935 planting by the CCC's. Some portions have Norway spruce in the understory as well from the same planting.

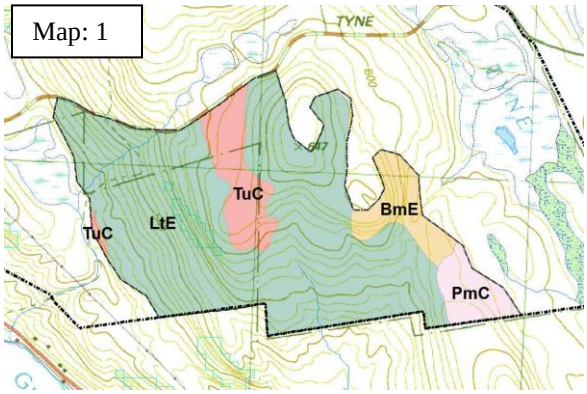
There are existing natural small gaps in the forest canopy mostly caused by white ash mortality and beech bark disease. Throughout the project area white ash has been in decline for several years. It is anticipated that the emerald ash borer (EAB) will kill the remaining stressed trees upon its arrival. The stand age is approximately 90-110 years old.

The DCR Management Guidelines of 2012 stated that forest stands will be "classed . . . and considered for silvicultural treatments that generally fit their productivity, structural complexity (or potential thereof) and diversity". An analysis of the Heaphy-Richardson Lot site history (land use; agriculture/logging) and conditions (soil types, productivity; vegetation cover) suggests a moderately high level of complexity indicating that uneven age methods of regeneration may be appropriate.

Geology and Landforms: This proposed project area is located in the southern portion of October Mountain State Forest in the town of Becket (see Appendix I: Locus Map). The project area is bound by Tyne Road to the North, planted and native softwood stands to the east, State Forest boundary to the south and softwood stands and wetland features to the west. The highest elevation is located within the northern portion of the project area and is at 2070 feet. Slopes drop to the west and south to an elevation of approximately 1470 feet along the western project boundary.

The project area has slopes facing generally west and south which range from less than five percent to as much as 40 percent. Where slopes may exceed the 40% management restriction guidelines set forth by the Landscape designations for DCR Parks and Forests: Selection Criteria and Management Guidelines (2012) or the Central Berkshire Forest Resource Management Plan (2007) (CBFRMP). The location will be evaluated while conducting on the ground project layout to determine if an internal "no cut" area will be established.

Soils: There are four soil types associated with this project area as shown on the soils map to left (Map: 1). The soils range from very poorly drained to flat bottom types to excessively drained upland soils. All of these soils formed as a result of glacial till. As with topography the forest composition changes with the soil types. The five types are described below (excerpts from "Soil Survey of Berkshire County Massachusetts", NRCS 1988).



- PmC - Peru-Marlow Association: This map unit consist of very deep, moderately well drained Peru soils and very deep, well drained Marlow soils. Peru soils are typically on the lower parts of slopes or in slightly concave areas and Marlow soils are on the upper parts of slopes on in convex areas. Permeability of Peru soils is moderate above the substratum and moderately slow to slow in the substratum. Permeability of Marlow soils is moderate above the substratum and moderately slow or slow in the substratum. Potential productivity is moderate for sugar maple on Peru soils and for northern red oak on Marlow soils. The main management concerns are the large stones and boulders on the surface and plant competition. (12 ac)

- BmE – Berkshire-Marlow Association: This map unit consists of very deep, well drained Berkshire and Marlow soils. The soils are on the sides of hill and mountains. Berkshire soils are typically on the steeper and higher slopes, and Marlow soils are on the less steep and lower slopes or in concave areas. Permeability in Berkshire soils is moderate to moderately rapid, and that in Marlow soils is moderate above the substratum and moderately slow to slow in the substratum. Potential productivity is very high for eastern white pine on Berkshire Soils and moderate for northern red oak on Marlow soils. The main management concerns are large stones and boulders, slope, and severe erosion hazard. Constructing access roads and trails on the contour and installing water bars help to control erosion. Plan competition is moderate. (16 ac)
- TuC – Tunbridge-Lyman Association: This map unit consists of moderately deep, well drained Tunbridge soils and shallow, somewhat excessively drained Lyman soils. These soils are on the sides and tops of hill and mountains. Tunbridge soils are typically on the flatter parts of slopes between rock outcrops, and Lyman soils are on the upper slopes or in convex areas. Permeability is moderate or moderately rapid in Tunbridge soils and moderately rapid in Lyman soils. Potential productivity for sugar maple on these soils is moderate. Wind throw is a moderate hazard because of depth to bedrock. Generally, the soils are droughty. (22 ac)
- LtE – Lyman-Trunbridge Association: This map unit consists of shallow, somewhat excessively drained Lyman soils and moderately deep, well drained Tunbridge soils. These soils are on the mountainous uplands. Lyman soils are typically on the upper steep slopes and Tunbridge soils are in the less sloping areas or in pockets between Lyman soils and rock outcrops. Permeably is moderately rapid in Lyman soils and moderate or moderately rapid in Tunbridge soils. Potential productivity for sugar maple on these soils is moderate. The main management concerns are shallow depth to bedrock, the low available water capacity of the soils and slope. (180 ac)

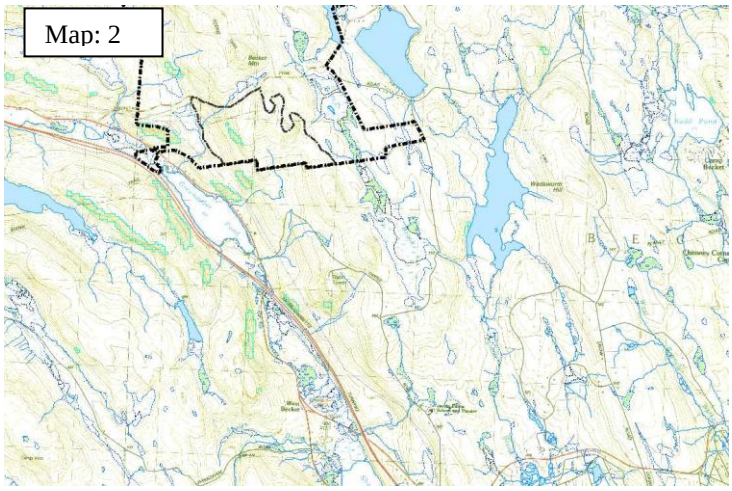
Climate: The project location lies in an area of mild summers and moderate winters with year round precipitation possible. Winds generally come from the west. Although major weather events can happen in any given year, the chances of hurricanes, tornadoes, ice storms or other forest changing events are seldom but do occur. The figures below (Table 1) are excerpt from the National Weather Service 2012 Climatological Report for Pittsfield, MA. The climate period used to determine normal value is 1981 through 2010.

Table 1:

	2015 Annual	2014 Annual	Normal Annual Value	Normal Winter	Normal Spring	Normal Summer	Normal Fall
Annual Maximum Temp	56.1	54.0	55.3	31.7	54.3	76.7	57.9
Annual Minimum Temp	35.3	35.0	35.4	15.4	32.9	55	38
Annual Mean Temp	45.7	44.5	45.3	23.6	43.6	65.8	48
Total Precipitation (in)	40.63	44.17	45.38	8.6	11.44	12.74	12.6
Days with >= .01 Precipitation	130	141					
Average Wind Speed	6.6	6.7					

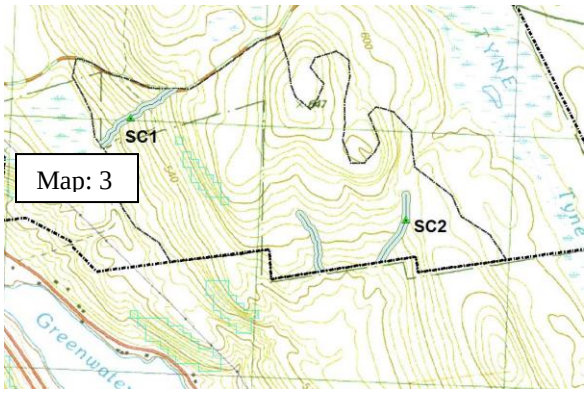
The most recent major event which damaged this project area was the ice storm of 2008. This event produced ice amounts of 0.5 – 1.5 inches thick on all surfaces causing extensive tree damage by breaking limbs and uprooting due to the ice's weight. This damage is still evident in the project area where many trees in the upper elevations with more than 50% crown loss have not recovered and broken branches and downed trees remain on the ground.

Hydrology and Watershed: Drainage from approximately 90 percent of the project area travels through several intermittent drainages that flow directly south or west through a large wetland then south out of the project area. After leaving the project area these streams cross under Route 20 and enter Green Water Pond, part of the Housatonic Watershed. The remaining 10 percent of the project area drains to the east through intermittent drainages outside of the project area to Tyne Swamp, part of the Westfield Watershed (Map: 2).



There are several water resources on this proposed project area. They will all be treated at or above the minimum standards set forth in "Massachusetts Forestry Best Management Practices Manual". There will be no timber management in regulated wetlands. Due to the potential skid road/trail layout there are only two anticipated regulated stream crossing in the project area and no anticipated wetland crossings. If it is necessary to cross additional unregulated drainages these stream crossing will be designed using standards of the "Massachusetts Forestry Best Management Practices Manual" and "Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines"

Stream Crossing 1 (SC1) will be located on the unnamed stream which flows from wetlands outside of the project area, across Tyne Road, through the project areas and into wetland west of the project area. This crossing will be approximately 200 feet south east of the existing wood road crossing used by the Appalachian Trail on the same stream. Stream Crossing 2 (SC2) is located in the south west portion of the project area long an unregulated intermittent stream; however this crossing will be treated as regulated. (Map 3)



Both of the above mentioned streams with their associated wetlands which make up the eastern and western boundaries of this project area will have a variable width filter strip where equipment will not be allowed within the first 50 feet and will follow filter strip standards of the "Massachusetts Forestry Best Management Practices Manual" (BMPs) as needed beyond 50 feet. As suggested in the BMPs a 15 foot no-cut buffer adjacent to wetlands and streams will be in place as well. (Map 3)

It is anticipated that an occasional unregulated intermittent stream crossing may be needed within the harvest area for skidding off of the main trails. Any stream crossing will be designed using standards of the "Massachusetts Forestry Best Management Practices Manual" and "Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines"

Disease and Insects: There are past, current and potential threats to this project area including beech bark disease, forest tent caterpillar, white ash decline and emerald ash borer whose damage has been can or can be amplified by the crown damage and weakening of the trees during the 2008 ice storm.

- Beech bark disease (BBD) was first found in Maine in the 1930s and has been spreading throughout the Northeast and beyond since then. It is believed to have come to the US from Europe through Nova Scotia. It has spread throughout the eastern United States and Canada.

BBD is a two stage insect/disease which starts when the beech scale insect attacks the bark leaving a path way for the Nectria fungus to invade and eventually lead to the death of the tree. BBD can attract other insects and diseases to hasten the declining tree into death. BBD reduces nut production negatively affecting wildlife which depends on it as a source of food. This disease will continue to re-infect the root sucker regeneration creating a continuous state of diseased beech in the stand.

There is evidence of resistance to the BBD in some individual beech. This is evident in dense beech stands were one or several stems appear vigorous and free of BBD when all others are damaged. Potential resistant beech are generally maintained and promoted throughout the stand.

- The native sugar maple borer is a long horned wood boring beetle that generally attacks the lower bole of the tree leaving behind a linear open scar. The damage caused by this borer acts as a girdle around the tree, reducing vigor and weakening the structure of the tree. This borer attacks previously stressed trees, generally due to overcrowding, suppression or drought. Tree vigor should be maintained by reducing completion for resources to control sugar maple borer.

- Ash Decline or ash dieback is still fully not yet understood. It is believed to be caused by a combination of biotic and environmental conditions. This list of potential stresses includes ash yellows, air pollution, fungi, viruses, drought and insects. Ash decline is evident in most stands in the region where stands are overcrowded and with a high density of ash.

- Emerald Ash Borer (EAB) was first found in Michigan and Ontario in 2002. It was introduced from Asia and has few natural predators here to control populations. EAB has spread from Michigan and is now located throughout the northeastern part of the United States and Canada. This insect feeds exclusively on ash trees and has destroyed millions trees across its range already. EAB is generally attracted to trees which were previously weakened or stressed.

The EAB has a one year life cycle in which each female lays 30-60 eggs on average with maximum of 200 in some cases. After the eggs are deposited in bark the larvae chew into the tree and begin feeding on the phloem of the tree. The following year the adult will exit the tree through a D-shaped hole and begin feeding on foliage to continue the cycle.

The first infestation found in Massachusetts is located approximately 6.5 miles from this project area. It is generally accepted that there is no way to stop or control EAB.

Roads, Trails and Recreation: Tyne Road is a paved secondary road owned and maintained year round for vehicle traffic by the Town of Becket. DCR owns both sides of this road for proximally 1.5 miles with this project lying in the middle of this owned section. There are private dwelling located beyond the DCR boundaries. As per the "Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines", there will be a 50 foot buffer along Tyne road where no more than 50% of live basal area will be harvested and no slash with in 25' of the road will remain. The Massachusetts Slash Law will be observed beyond the 25' no slash zone.

The Appalachian Trail traverses south to north in the western portion of this project area. This project will follow guidelines set forth in the "Memorandum of Understanding Guidance Document for the Appalachian National Scenic Trail in the Commonwealth of Massachusetts" established in 2003. Discussions between DCR, the Appalachian Mountain Club Berkshire Chapter (AMC) and the Appalachian Trail Conference (ATC) have occurred resulting in coordination in implementing the project within the both the primary and secondary zones of the "Appalachian Trail Corridor". It is anticipated that the AT will be crossed at one existing woods road location. Field staff from the ATC will assist in location of the primary buffer zone.

There are no other formal trails or recreational activities that require buffering within this project, however there is a long standing existing snowmobile trail (former woods road/skid trail) which connects Cordonier Road to the Snowmobile Association of Massachusetts (SAM) trail network to the south of October Mountain. Although this is not a formally accepted trail, every effort will be made to protect the trail from damage and keep it clear of debris during this project. There will be no formal buffer protection for this trail. It is anticipated that this trail will be crossed twice by skid trails.

The project area is also open to all legal passive recreation activities that are allowed on DCR properties.

Cultural and Archeological Feature: There are no known cultural resources except one 400 foot section of stone walls within the project area. These stone walls and any other resource found within the project area will be mapped and protected from disturbance during operations and will be treated according to guidelines set forth in the "Bureau of Forestry – Cultural Resource Management Protection Standards & Guidelines". Any additional features found will be mapped and protected.

To the east of the project area on Tyne road is the location of the former CCC camp. No parts of the camps foot print are within the proposed project area.

Wildlife / Rare and Endangered Species: According to the NHESP "Massachusetts Natural Heritage Atlas 13th Edition" there is no priority or estimated habitat sites located in this proposed project area or the immediate area. No rare plants have been identified in the field to date. Care will be taken to

address the needs of any rare/endangered plant if found. There are no certified or potential vernal pools mapped by NHESP.

No rare animals or critical habitat were noted upon the initial site visit. Large mammals noted were deer, moose, bear and coyote. Small mammals noted were squirrel, turkey and porcupine. It has been observed in previous forestry operations nearby that large herbivore pressure is not a concern. The proposed project area is a small portion of the total land in these forest types in the immediate vicinity.

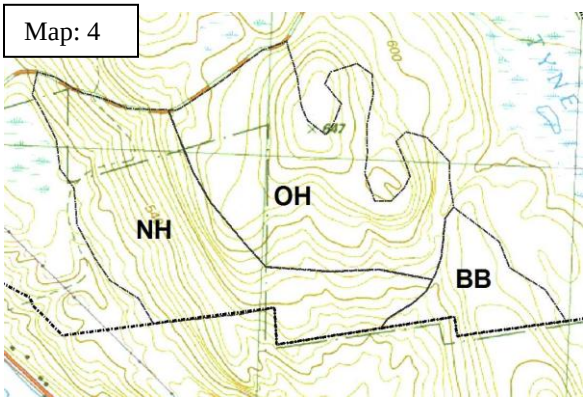
Due to the deteriorating nature of the forest types in this project area there is an abundance of large diameter coarse woody debris (CWD) and both live and dead wildlife trees (snags), see Tables 4, 5, 9 and 10 (Stand Structure Section). There were also a large amount of live wildlife trees observed in the field. These included large trees of various species with large cavities, rotten portions, large dead branches and broken tops.

Throughout the Project Area where possible current snags will be retained; however operators have the right to remove any snag that poses a safety hazard to themselves or equipment. Operators will not be required to utilize cull trees, if left behind they will add to the amount of large diameter CWD. Limbs and tops (slash) will also be left in place to augment existing CWD and add soil nutrients through decomposition.

Stand Data:

Forest Stand Attributes: This prescription will describe the conditions and treatments within the 230 acre project area. (Map: 4) This project area will be broken up into three stands for silvicultural treatment based on the forest type. The First stand is dominated by American beech, red maple and red oak (OH) while the second has a broader distribution of all species northern hardwood species including a larger proportion of red oak (NH). The third stand would be considered a beech, birch maple stand (BB). Portions of these stands are in a state of decline due to disease and weather events of the past decades. In these areas slow collapse of the overstory has given rise to a thick understory of diseased American beech seedling and saplings, hobblebush, ferns and rubus.

Map: 4

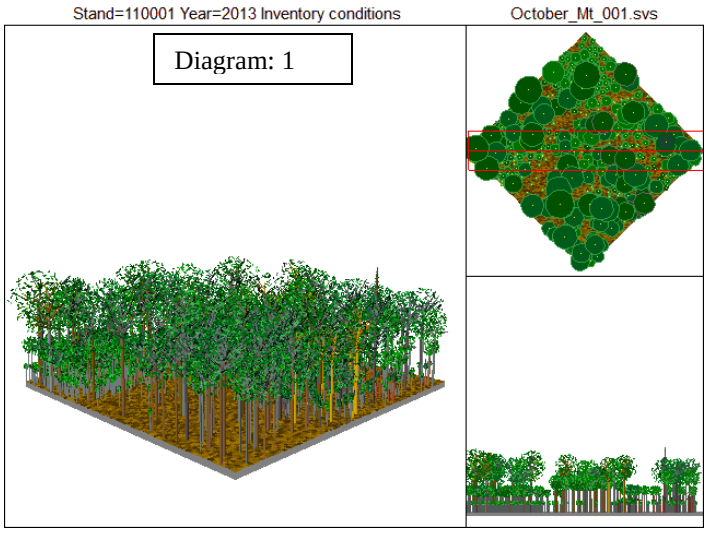


Silvicultural / Disturbance History: Forest management maps created in 1932 show the project area as a young forest of sparse small (2-4") pioneer species including grey birch (Betula populifolia), red maple, paper birch, yellow birch, beech and sugar maple. This indicates the area mostly likely was cleared or heavily harvested in the early 1920's.

The Commonwealth purchased the project are in two phases, 1924 and 1931. The northeast portion of the project area was planted by the CCC's in 1935 with follow a follow up release of individual trees in the mid 1940's. There is no known further silvicultural work in this area under state ownership.

This project area has been shaped in recent years by beech bark disease, white ash die back, and the ice storm of 2008. These events are pushing all these forest types into beech dominated forest due to the slow natural decline of forest canopy and American beech ability to aggressively compete in a shaded understory.

Stand Structure: All of these northern hardwood dominated stands are considered to be fully stocked. A representation of the current stands derived from the stand exam inventory is seen in the diagram to the right (Diagram: 1). These stands are approximately 110 years old and due to abiotic (ice) and biotic (insect and disease) agents portions of the overstory trees are in decline. These single age class stands are beginning to break up due to the above mentioned disturbances and regenerate slowly to American beech.



- Oak-Hardwoods (OH) - This stand is fully stocked with a combined overstory and understory stocking of 133 square feet of basal area per acre (BA/AC) and is considered to be at "A" level according to local stocking charts. Under the current condition the stand is overcrowded causing the already stressed trees to compete for the limited resources. Acceptable growing stock, trees free of mechanical and biological defects, account for 41% of the stand. Red oak, red maple, American beech and sugar maple dominate the overstory with black cherry, white ash, birches (paper, yellow and black), red spruce and white pine present in smaller amounts. The overstory quadric mean of the stand is 10.5"dbh with measured trees reaching 30"dbh. (Table 1)

  The understory of this stand is dominated by American beech seedling and saplings of all size classes (332 stems/acre over 4.5'). Other understory species include red oak and red maple and sugar maple as well as several other species to a lesser extent. (Table 2) The dominant ground cover species (all trees less than 4.5' in height, shrub and herbaceous species) that would affect regeneration of tree species are striped maple, ferns, hobblebush and rubus, grasses and American Beech. A list of other observed species is below. (Table 3)

  Throughout the stand there is an average of 44 snags per acre. The majority of these snags are black cherry, white ash and red spruce trees under 12"dbh. Occasional snags over 24"dbh were observed in the field. (Table 4) On average 188 cubic feet of coarse woody debris (CWD) per acre were recorded in inventory transects. This material is greater than three inches in diameter and three feet in length. Much of this CWD is a result of the 2008 ice storm and is still in the hard/sound category. The Landscape Designation Guidelines recommends that a minimum of 256 cubic feet of CWD be maintained during forest vegetation management activities therefore all limbs and tops of harvested trees will remain in the woods on site.

Table 1: OH Overstory (all measured trees greater than 5”dbh)

	All species	Red Oak	Red Maple	American Beech	Sugar Maple	Black Cherry	White Ash	Birches	red spruce	White Pine
Basal area (square feet)	134	39	24	20	17	12	7	9	4	1
Percentage of stand	100	29	19	15	13	9	5	6	3	1
Acceptable growing stock (percent)	41	72	32	10	35	25	43	67	25	0
Stems per unit area (stems per acre)	224	37.4	52.5	45.6	29.2	13.2	12.1	16.6	16.2	.9
Quadric Mean Diameter	10.5	13.8	9.3	9.0	10.3	12.9	10.3	10.9	6.7	14
Relative Density	77	20	15	17	14	3	1	5	1	1
Sawlog Net Total (bd/ac)	8144	4497	876	591	694	680	423	160	131	91
Cords Gross Total (cds/ac)	37.7	12.0	6.9	5.0	4.5	3.9	1.9	2.5	.8	.3

Table 2: OH Understory (measured trees less than 5”dbh)

	All species	Red Oak	Red Maple	American Beech	Sugar Maple	Black cherry	White Ash	Birches	Red Spruce	White Pine
Percentage of Plots Observed		56.8	22.7	88.6	9.1	2.3	0	9.1	4.5	6.8
<1 ft Per Acre	3781	700.3	183.8	989.1	35.0	8.8	0	33.1	17.5	17.5
1-4.5 ft Per Acre	997	35.0	0	875.4	0	0	0	87.5	0	0
4.5 ft – 1” Per Acre	665	0	0	385.2	0	0	0	8.8	8.8	0
>1” Per Acre	376	8.8	17.5	332.6	17.5	0	0	0	0	0
Total Stems Per Acre	5821	744	201.3	2582.3	52.5	8.8	0	131.3	26.3	17.5

Table 3: OH - Ground cover (all trees less than 4.5’ in height, shrub and herbaceous species)

Species	Percent of Plots	Average Percent cover
Lycopodium	6	< 10.0
Solomon seal	19	< 10.0
Fern	75	35.6
Striped Maple	54	17.9
Hobble	19	25.0
Sarsaparilla	21	12.7
Grasses	21	17.3
Star Flower	10	< 10.0
May Flower	17	11.1
Rubus	13	11.4
Bind Weed	12	40.0
Indian Pipe	2	< 10.0
Hop Hornbeam	2	< 10.0

Species	Percent of Plots	Average Percent cover
Partridge Berry	2	< 10.0

Table 4: OH - Snags

DBH	All species	Red Oak	Red Maple	American Beech	Sugar Maple	Black cherry	White Ash	Birches	Red Spruce	White Pine
Basal Area	20	2	2	2	2	5	3	1	3	0
Tress/acre	44.3	2.0	5.7	3.3	1.7	5.8	8.8	1.8	15.3	0

- Northern Hardwoods (NH): This stand is over stocked with a combined overstory and understory stocking of 161 BA/AC and is considered to be an "A" level according to local stocking charts. Under the current condition the stand is overcrowded causing the already stressed trees to compete for the limited resources. Acceptable growing stock, trees free of mechanical and biological defects, account for 61% of the stand. Sugar maple, red oak, white ash, red maple and American beech dominate the overstory with birches, hemlock, basswood and black cherry present in smaller amounts. The quadric mean of the overstory stand is 11.1"dbh with measured trees reaching 30"dbh. (Table 5)

  The understory of this stand is dominated by American beech seedling and saplings of all sizes (174 stems/acre over 4.5'). Other understory species include red oak, sugar maple, red maple, birches and black cherry. (Table 6) In this stand American beech, hobble bush and ferns are the dominant ground cover species (all trees less than 4.5' in height, shrub and herbaceous species) that would affect regeneration of tree species. A list of other observed species is below. (Table 7)

  Throughout the stand there is an average of 24 snags per acre. The majority of these snags are red maples between 6 and 12"dbh and white ash between 12 and 18"dbh. White ash and black cherry snags over 24"dbh were observed in the field. (Table 8) On average is 187 cubic feet of coarse woody debris per acre were recorded in inventory transects. Much of this total is a result of the 2008 ice storm and is still in the hard/sound category. All limbs and tops of harvested trees will remain in the woods on site so that the recommended minimum 256 cubic feet of coarse woody is maintained per the Management Guidelines.

Table 5: NH - Overstory (all measured trees greater than 5"dbh)

	All species	Sugar Maple	Red Oak	White Ash	Red Maple	American Beech	Birches	Hemlock	Basswood	Black Cherry
Basal area (square feet)	161.5	34.6	32.3	32.3	23.8	21.5	10.0	3.8	1.5	1.5
Percentage of stand	100	21	20	20	15	13	6	2	1	1
Acceptable growing stock (percent)	61	53	86	76	58	21	52	60	50	100
Stems per unit area (stems per acre)	242.0	80.0	28.2	28.0	40.5	38.7	15.1	6.3	3.6	1.3
Quadric Mean Diameter	11.1	8.9	14.5	14.5	10.4	10.1	11.5	10.6	8.8	14.9
Relative Density	101	32	17	12	12	19	3	2	1	1
Sawlog Net Total (bd/ac)	13266	1158	4439	4577	1498	785	310	191	0	207
Cords Gross Total (cds/ac)	47.4	8.6	10.1	11.2	7.0	5.8	2.9	.9	.4	.5

Table 6: NH - Understory (measured trees less than 5"dbh)

	All species	Sugar Maple	Red Oak	White Ash	Red Maple	American Beech	Birches	Hemlock	Basswood	Black Cherry
Percentage of Plots Observed		28.3	47.2	0	9.4	71.7	9.4	3.8	1.9	7.5
<1 ft Per Acre	1075	58	559	0	36	348	7	0	0	22
1-4.5 ft Per Acre	915	36	14	0	7	770	36	0	7	7
4.5 ft – 1" Per Acre	298	21	0	0	0	276	0	0	0	0
>1" Per Acre	247	50	0	0	7	174	14	0	0	0
Total Stems Per Acre	2536	167	574	0	50	1569	58	0	7	29

Table 7: NH - Ground cover (all trees less than 4.5' in height, shrub and herbaceous species)

Species	Percent of Plots	Average Percent cover
Lycopodium	3	< 10.0%
Solomon seal	18	< 10.0
Fern	80	20.0
Striped Maple	90	14.2
Hobblebush	28	16.4
Other	3	< 10.0
Sarsaparilla	20	< 10.0
Grasses	35	11.4
Star Flower	25	< 10.0
May Flower	5	< 10.0
Trillium	10	< 10.0
Maple Leaf Viburnum	25	11.0
Rubus	3	< 10.0
No Tally	18	0.0

Species	Percent of Plots	Average Percent cover
Blueberry	3	< 10.0
Bind Weed	10	17.5
Violet	3	< 10.0
Arrow Wood	3	< 10.0
Elderberry	3	< 10.0
Indian Pipe	3	< 10.0
Hop Hornbeam	3	< 10.0

Table 8: NH - Snags

	All species	Sugar Maple	Red Oak	White Ash	Red Maple	American Beech	Birches	Hemlock	Basswood	Black Cherry
Basal Area	10	1.5	0.8	0.8	3.1	2.3	1.6	0	0	0
Tress/acre	23.9	0.8	2.2	1.0	14.2	2.7	2.9	0	0	0

- Beech-Birch-Maple (BB) - This stand is fully stocked with a combined overstory and understory stocking of 180 BA/AC and is considered to be a high "A" level according to local stocking charts. Under the current condition the stand is overcrowded causing the already stressed trees to compete for the limited resources. Acceptable growing stock, trees free of mechanical and biological defects, account for 43% of the stand. Red maple, American beech, black cherry and red spruce dominate the overstory with yellow birch, hemlock, red oak, white pine and sugar maple present in smaller amounts. The overstory quadric mean of the stand is 11.5"dbh with measured trees reaching 36"dbh. (Table 9)

  The understory of this stand is dominated by American beech seedling and saplings of all size classes (288 stems/acre over 4.5'). Other understory species include red maple, yellow birch and red spruce as well as several other species to a lesser extent. (Table 10) The dominant ground cover species (all trees less than 4.5' in height, shrub and herbaceous species) that would affect regeneration of tree species are striped maple, ferns, hobblebush and rubus and American Beech. A list of other observed species is below. (Table 11)

  Throughout the stand there is an average of 38 snags per acre. The majority of these snags are red maple, red spruce and white pine trees less than 18"dbh. Occasional snags over 24"dbh were observed in the field. (Table 12) On average 585 cubic feet of coarse woody debris (CWD) per acre were recorded in inventory transects. This material is greater than three inches in diameter and three feet in length. Much of this CWD is a result of the 2008 ice storm and is still in the hard/sound category. This figure exceeds the recommended minimum of 256 cubic feet of CWD as required in the Landscape Designation Guidelines.

Table 9: BB - Overstory (all measured trees greater than 5”dbh)

	All species	Red Maple	American Beech	Black Cherry	Red Spruce	Yellow Birch	Hemlock	Red Oak	White Pine	Sugar Maple
Basal area (square feet)	180	48	40	28	20	13	10	10	10	3
Percentage of stand	100	26	22	15	11	7	6	6	6	2
Acceptable growing stock (percent)	43	36	18	75	50	100	33	67	0	0
Stems per unit area (stems per acre)	249	49.8	93.3	19.7	22.4	22.6	12.6	14.7	9.9	4.2
Quadric Mean Diameter	11.5	13.1	8.9	15.8	12.8	10.4	12.1	11.2	13.6	12.0
Relative Density	99	24	39	10	7	9	4	6	0	0
Sawlog Net Total (bd/ac)	11215	2887	705	2967	2346	95	748	656	686	121
Cords Gross Total (cds/ac)	53	14.6	9.6	9.2	6.9	3.5	2.4	2.8	3.0	0.9

Table 10: BB - Understory (measured trees less than 5”dbh)

	All species	Red Maple	American Beech	Black Cherry	Red Spruce	Yellow Birch	Hemlock	Red Oak	White Pine	Sugar Maple
Percentage of Plots Observed		50.0	91.7	8.3	50.0	33.3	0	25	8.3	0
<1 ft Per Acre	1925	609	674	64	160	160	0	64	32	0
1-4.5 ft Per Acre	1957	0	1187	0	96	641	0	32	0	0
4.5 ft – 1” Per Acre	321	0	256	0	32	0	0	32	0	0
>1” Per Acre	353	0	288	0	64	0	0	0	0	0
Total Stems Per Acre	4557	609	2407	64	353	802	0	128	32	0

Table 11: BB - Ground cover (all trees less than 4.5’ in height, shrub and herbaceous species)

Species	Percent of Plots	Average Percent cover
Lycopodium	42	< 10.0
Solomon seal	33	< 10.0
Fern	100	25.8
Striped Maple	83	17.0
Hobble	42	18.0
Sarsaparilla	25	< 10.0
Star Flower	8	< 10.0
May Flower	8	< 10.0
Maple Leaf	8	< 10.0
Rubus	17	< 10.0

Table 12: BB - Snags

	All species	Red Maple	American Beech	Black Cherry	Red Spruce	Yellow Birch	Hemlock	Red Oak	White Pine	Sugar Maple
Basal Area	26.7	3.3	0	0	6.7	0	3.3	0	10	3.3

	All species	Red Maple	American Beech	Black Cherry	Red Spruce	Yellow Birch	Hemlock	Red Oak	White Pine	Sugar Maple
Tress/acre	38	9.5	0	0	11.9	0	2.4	0	9.9	4.2

Evaluation of Data and Projected Results:

Objectives: Silvicultural practices in all of these stands will demonstrate the use of the group selection regeneration method in combination with the irregular shelterwood system in northern hardwoods and oak, This harvest will begin the process of moving these damaged even aged stands to a more uneven aged structure by aiding/creating a new age class through removal of diseased and damaged trees. The irregular shelterwood portion of this harvest will remove on average 30-80% of the existing basal area of each stand based on species composition, size and health.

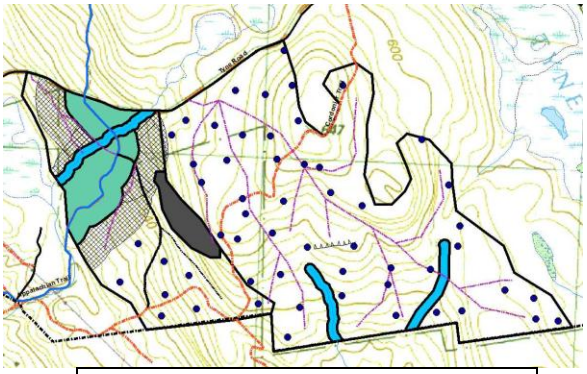
Primary/Secondary goals: The primary goal of treatment in these stands will be to ensure future diversity of age, size and species mixture of these stands to provide for protection from major storm events. These northern hardwood stands are currently in decline due to ice damage and insect damage, mortality due to disease, and a dense understory of beech. These stands also contain dense patches of ferns and hobblebush. If left unchecked, these stands will become dominated by diseased beech with steady decline in diversity and complexity.

Secondary goals of this project are to capture value of damaged and/or diseased trees, capture the value of mature white ash prior to infestation of the EAB, to provide raw materials to the lumber industry.

Silviculture Methods: Overstory treatments will create group openings up to 1/3 acre on approximately 10% of the project area. The groups will remove all trees over 5 inches in diameter and cut beech of all sizes leaving behind all acceptable advanced regeneration. The total number of acres to be harvested in groups will be 20 percent of the eligible project area. This area will be determined by subtracting wetlands, filter strips, buffer strips, possible steep areas and other non-harvestable areas from the total project area to determine the net acreage. These groups will not be within the primary or secondary buffer zone of the Appalachian Trail.

Type	Gross Acres	Exclusion Acres	Net Acres	10% to be Harvested	Size of Groups	MaxNumber of Groups
OH	101	2.4	98.6	9.9	1/3	29
NH	102	36.5	65.5	6.5	1/3	19
BB	27	2.1	24.9	2.5	1/3	8

The 1/3 acre size opening will comply with current guidelines established in Landscape designations for DCR Parks and Forests: Selection Criteria and Management Guidelines (2012). A 1/3 acre canopy opening is generally considered the smallest size for regeneration of shade intolerant and mid-tolerant species. Due to existing canopy conditions American beech dominates the understory. The existing American beech understory and small proposed opening size will inhibit fully shade intolerant species such as pin cherry (Prunus pensylvanica), black cherry, white birch and aspen (Populus).



Map 5: Blue dots indicate potential group opening locations

Initial center point location of these groups will be randomly selected by GIS program (map 5). When placing these groups on the ground these location may be moved to avoid rare/specimen/wildlife trees, unique features, buffers/filters or for any other reason. Each group will be connected or linked to a main or secondary skid road to ensure accessibility for the harvester.

The irregular shelterwood system marking within the remaining portion of the project area will remove 30-80% of the existing basal area. Removal of trees damaged by storm, insect and disease as well as those of poor vigor and/or form will be prioritized for harvest in these areas. In addition to removing poor trees, the intent of the harvest openings is to regenerate mid and shade tolerant species in the variably sized and shaped openings. This application of the irregular shelterwood system is best described as the "continuous cover variant" where the silviculturist works more with the material in place and adjusts the frequency and intensity of cuttings to the species and local site characteristics (Raymond et al, 2009)

Due to the current levels of American beech regeneration as well as dense shrubs and ground cover, a pre or post-harvest chemical treatment will be used where needed to assure beech does not proliferate. Groups with an acceptable amount of regeneration or where less than 25 or less percent of the area has interference will not be treated. Regeneration interference control may be conducted in the 1/3 acre patches and through areas where beech dominates in the Irregular shelterwood portions of the project area. If needed, this treatment will be conducted late in the growing season, likely in the month of September. A combination of Rodeo (glyphosate 53.8%) and Arsenal (imazapyr) will be used in a water solution, applied with a motorized backpack sprayer or by cut stump application. This method of application allows for targeting the desired beech trees and minimizes damage to non-target plants. Throughout the sale area all American beech that appears to be free of beech bark disease will be retained. Any chemical treatment used will avoid these clones in hope that the clean appearance of the trees is a sign of disease resistance. By leaving these trees a resistant population of American beech may be established.

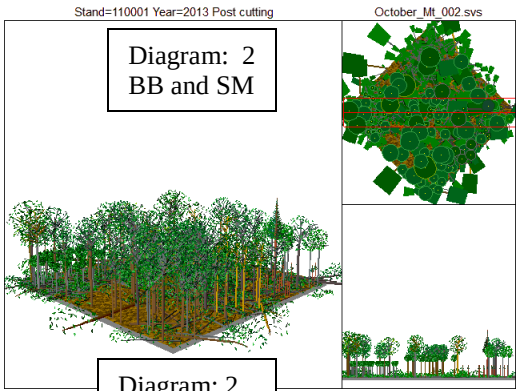


Diagram: 2 BB and SM

Diagram: 2 *Post* Harvest

Desired and Expected Results: The desired result is for a high level of diversity in tree and understory plant species as well as creating and maintaining vertical (tree heights) and horizontal (down woody material) stand complexity.

By removing approximately 20 percent of the mature trees through group selection along with the variable intensity of harvest in the irregular shelterwood portion of

the stand, the understory can successfully compete for light and nutrient resources establishing a new age classes. The Diagram generated from The US Forest Service SVS program below shows what these stands will generally look like upon completion of the prescribed harvest (Diagram: 3). These stands should be monitored in approximately 3- 5 years to determine the success of the chemical foliar treatment of American Beech and other shrub and ground cover species.

Below is a diagram stands may look like in 2036 prior to a next treatment if the stand is unaffected by natural disturbances such as ice, wind, insects or disease (Diagram: 3). The data used for this description was based on growth models derived from US Forest Service programs NED and FVS. The stocking of the stand will grow back to approximately 120-130 ba/sq in the next twenty years. The quadric mean tree diameter of the over story will be within one inch of the pre-harvest mean. The under story is expected to have regenerated with various native hardwoods and achieving rapid growth in the patch openings and throughout the stand. This stand should be monitored 5 – 10 years post harvest to determine if regeneration in the patch openings was successful. When regeneration is successfully established it is anticipated that the next silvicultural treatment will be used to expand and create new patch openings to further regenerate the stand.

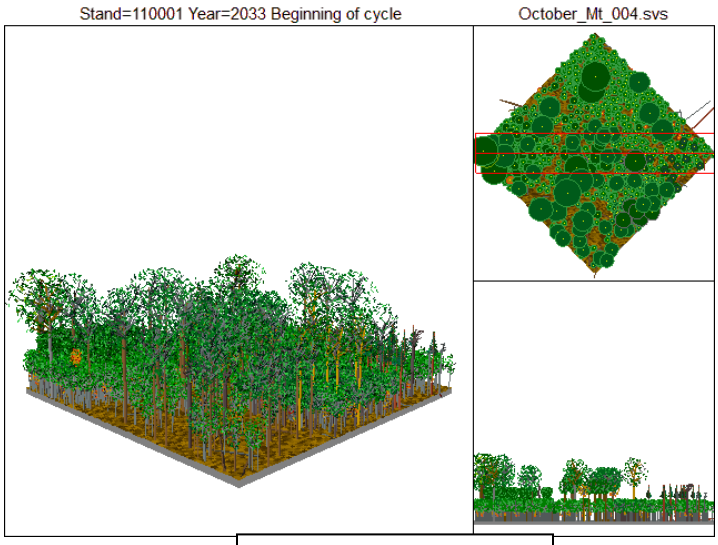
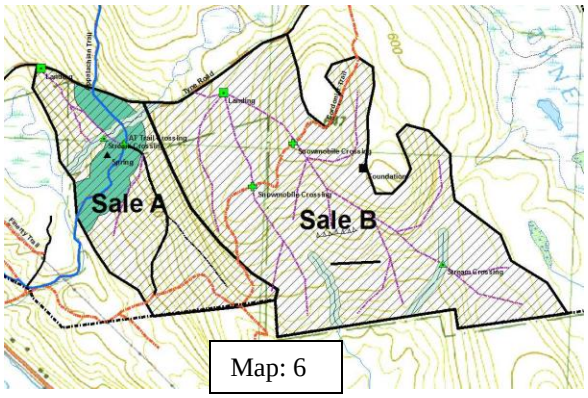


Diagram:3
Year 2036

Logging System Requirements: This project will be divided into two operation units at approximately the 1800 foot contour line. Each unit will be sold and contracted individually and will have independent landings and skid trail networks. Work will begin in the rear of each section and move towards the interior landing.

The harvesting of these stands can be accomplished with a variety of logging equipment safely, efficiently and effectively. Both mechanized and conventional felling systems will be allowed provided equipment has a ground pressure of 6psi or below. Whole tree harvesting will not be allowed in this prescription area, all trees felled will be limbed within the stand leaving slash dispersed in the felled location except where needed for skid trail use.

Either a forwarder or a skidder will be permitted to move product from the stump to the landing. Skidding length of stems and weight of forwarder loads can be restricted based on equipment size as well as operator ability to protect residual trees and roads/trails.



Map: 6

- **Project Access and landings:** Access to the proposed project area will be from State Route 8 in Becket then east on County Road which turns into Tyne Road or from State Route 20 in Lee then west on Becket Road which turns into Tyne Road. Two truck landings will be at located on Tyne Road.

Both landing sites are located on level terrain and easily accessed from Tyne Road. Each landing will have to cut out and graded for use. Approximately 30-50 yards of bank run gravel may be required for log truck access depending on the season of harvest. It may not be possible for tractor trailers to access these landings due to size and layout restrictions.

Upon completion of all harvesting activity both landings will be free of debris and graded to prevent erosion. Cleared portions that are not graveled will be seeded with "Berkshire Conservation Mix" grass seed and mulched with straw. Boulders will block access to the landings from illegal vehicles.

- **Forwarder Road and Skid Trails:** Throughout the project area there are existing skid trail segments still visible from the previous harvest. These existing segments will be evaluated and connected as needed to gain access to necessary areas of the project area. Primary skid trails will be laid out and marked prior to the project being advertized. Prior to harvesting all primary skid trails and stream crossing will be installed.

  Upon completion of all harvesting activity all skid road will be left in a stable state and water bars will be installed according the "Massachusetts Forestry Best Management Practices". The stream/wetland crossing will be stabilized.

- **In-kind Services:** Upon final tally of product the extent of in-kind services will be determined.
  - Chemical control of beech, to help these stands retain a diverse northern hardwood forest type.
  - Equipment and materials to maintain/restore roads and trails within October Mountain State Forest.
  - Installation of a gate and small parking area for recreational use at the eastern most proposed landing on Tyne Road.
  - Field mowing/restoration in the Shepardson Parcel of October Mountain State Forest.
  - Maintenance of Anderson Scenic Vista located on Schermerhorn Road within October Mountain State Forest.

Prescription Documentation:

Project Marking Guidelines: Follow the directions below for marking instructions of sale and stand level features.

Sale Level:

1. Locate, flag (pink wetlands) and paint with two red diagonal stripes the buffers and filter strips along all wetland and associated streams.
2. Locate and paint with two red diagonal stripes the sale boundary to the east, south and west wooded project boundary line of the southern line.
3. Flag temporary layout of primary and secondary skid trail network with orange flagging. Using orange paint mark small non commercial stems or stems already marked for removal located along adjusted skid trails upon completion of marking (Orange).
4. Flag Temporary layout of all wetland and stream crossing with labeled orange flagging. Using Red paint mark and label each crossing upon completion of marking and any final adjustment to location.
5. Locate and mark perimeter landings and with one red diagonal stripes.

6. General tree marking guide:

Type of Tree	Tally Method	Mark Type
Cut Saw Log	Individual tally DBH & height	Blue Horizontal Line
Cut Pulp/Cord Wood	Individual tally DBH - 1/10 height	Blue Dot
Cut Live Cull Tree	Count	Blue X
Dead Tree / Warning	No tally	Blue X

All Forest Types:
Group Selection Cutting: There will be up to 62 one third acre (1/3) opening within the project area, roughly 15 in Sale A and 47 in Sale B. Each group will be located with a GPS unit and will have an adjustment allowance of 100 feet. This adjustment will be used for moving the group to areas of established desired advance regeneration and/or areas of trees of poor health due to disease or mechanical damage. Adjustment will also be made to ensure the group is not located in any excluded area. The opening will be randomly distributed throughout the area. These opening will cover approximately ten percent of the total delineated eligible areas. Within these patches all live trees 5"dbh and above will be marked for harvest.

Irregular Shelterwood: Remove 30 to 80% of basal area within remaining project area based on existing ground conditions, including tree health, form and vigor using the following prioritized guide below. Residual density should remain higher in areas with acceptable growing stock.

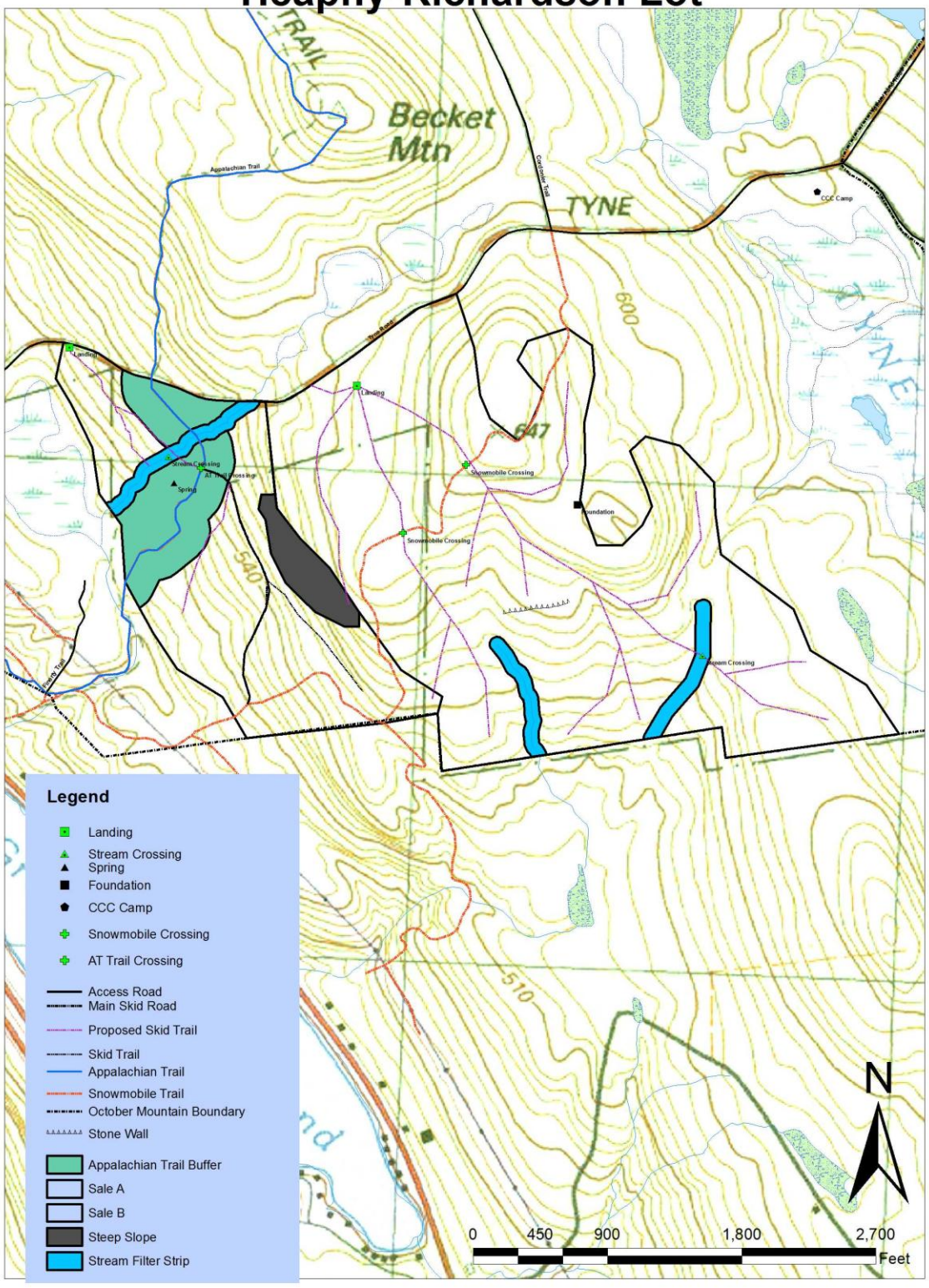
1. White Ash greater than 10" DBH
2. Any infected American Beech greater than 5" DBH
3. Any species with less than 25 percent live crown
4. Unacceptable Red Maple, Sugar Maple, Birch
5. Unacceptable Red Oak
6. Unacceptable Black Cherry
7. Unacceptable Soft Wood Species
8. Other Acceptable Hardwood

Residual Basal Area Ranges:

	Current Average	High	Low
BB	180	126	36
NH	161	112	32
OH	134	94	27

Attached: Stand Map and Locus Map showing location of Forest Products Sale Area

October Mountain State Forest
Heaphy-Richardson Lot



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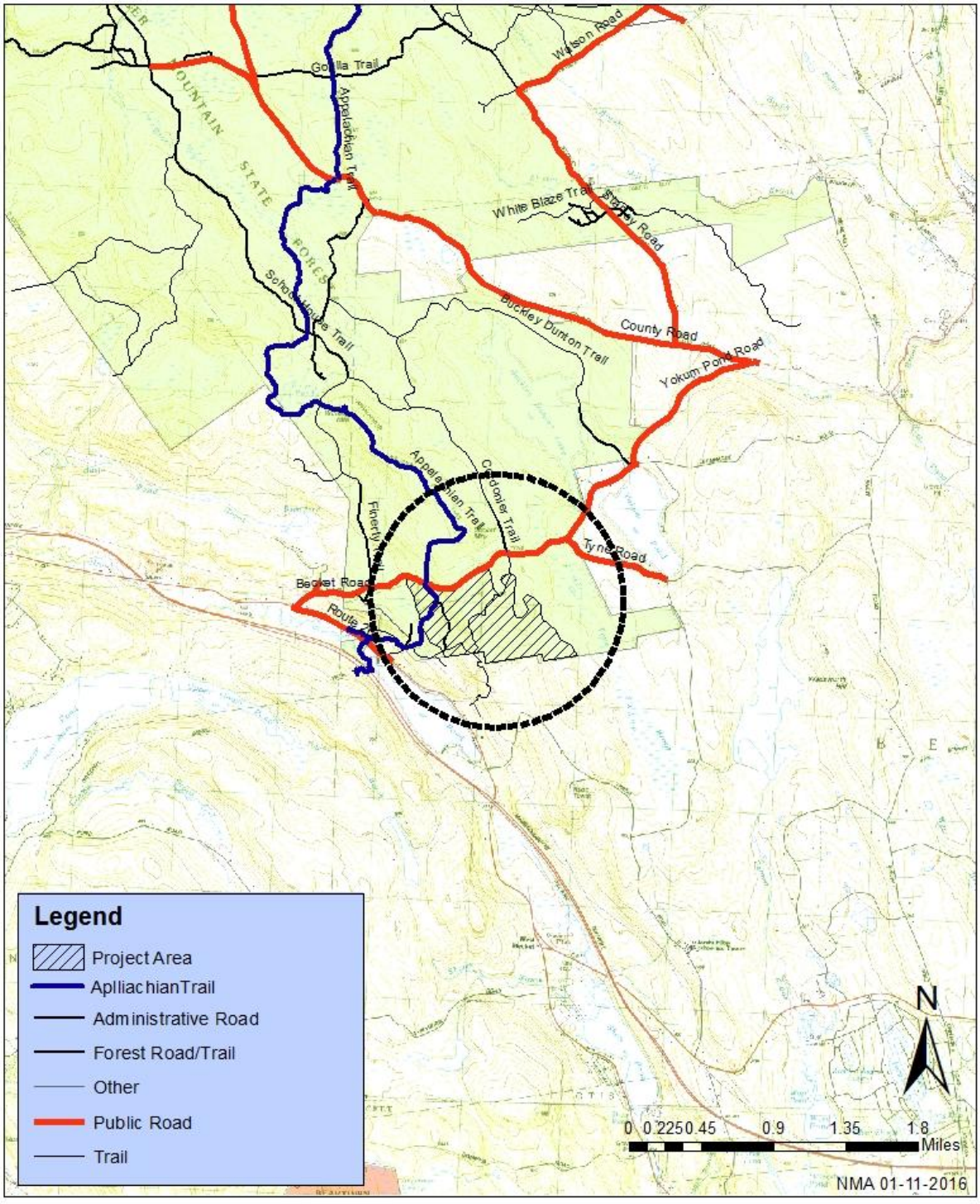
Heaphy-Richardson Lot - Locus Map
October Mountain State Forest



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