Massachusetts Department of Conservation and Recreation

Silviculture Prescription
East Hubbard River Forest Management Project

Massachusetts Department of Conservation and Recreation
Bureau of Forestry

Southern Berkshire District
Granville State Forest
Granville, MA

Prepared by:

Jeff Martin –Assistant Management Forester – Southern Berkshire District
Massachusetts Department of Conservation and Recreation
P.O. Box 1433, 740 South Street, Pittsfield - MA 01004
Jeff.Martin@state.ma.us – 413 442 8928 x124

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Approved by:

Management Forestry
Program Supervisor _____ Date: 6/9/2021

Overview:

The Hubbard River East forest management project is located on the eastern half of Granville State Forest and bordered by the Hubbard River to the south, a gas pipeline corridor to the west, and Tom Hayes Road on the eastern boundary. The project will fulfill management approaches for Woodlands as directed by the Forest Futures Visioning Process (2010) and subsequent Management Guidelines (2012) including the maintaining of structural and species diversity, providing positive benefits to wildlife, and adapting long term sustainable forest management practices.

This prescription is based on the Hubbard River East Forest Management Proposal that was vetted and approved in the spring of 2020. As outlined in the proposal this 322 acre project area will include at least two timber sales over the next two years.

The conditions that led to selecting this project for forest management are:

- Emerald ash borer (EAB) has infested the project area causing mortality in white ash trees.
- Past management practices have left a high percentage of trees classified as undesirable growing stock.
- The abutter, (Hartford, CT) Metropolitan District Commission (MDC), has a forestry project of their own and DCR can help with trail and road improvements that are needed for both landowners' management objectives.
- This project will use the value of sustainably harvested timber to offset costs of trail and road construction projects that augment and improve recreational opportunities.
- The project area has a high percentage of hemlock infested with hemlock wooly adelgid (HWA) and hemlock looper; and removal of infested individuals and giving healthy ones more growing resources (sunlight) will enhance ability to survive of residual hemlock trees.
- The project will provide an opportunity to demonstrate regeneration and retention of hemlock-hardwood stands by transitioning portions of the current even-aged stands to multiage / mosaic conditions.
- The existing road network suffers from deferred maintenance, poor location, and illegal off-road vehicle (ORV) use; all causing erosion and inhibiting access to the forest for recreation.
- This project area offers an excellent opportunity to demonstrate and fulfill objectives for DCR Woodlands including maintaining and establishing diverse and resilient native forests, building upon past management, and maintenance and repair of infrastructure.

The East Hubbard River forest management Project proposes to:

- Reduce ash phloem to slow the spread of EAB, and convert stands to an uneven-aged condition using an irregular shelterwood treatment.
- Reduce safety concerns and costs of mitigating hazards from dying white ash trees along access roads and trails.
- Use proceeds for road and trail improvement; including the relocation of the Ore Hill Trail to deter illegal ORV use on the abutting MDC watershed lands.
- Demonstrate harvesting techniques and best management practices that protect and enhance the aesthetic values associated within roadside and trail buffers.
- Fulfill management approaches for Woodlands as directed by the Forest Futures Visioning Process (2010) and subsequent Management Guidelines (2012) including:
    - Vegetation management necessary to protect public health and safety, public interests, public assets and/or restore or maintain recreation sites following significant natural disturbances or effects from destructive insects or diseases.

- Mitigation of hazardous trees or excessive fuel loads that pose significant risk to public safety may be removed.

The East Hubbard River Forest Management Project may result in two or more timber sale entries.

Site Data:

Property Information: The proposed project area consists of approximately 330 acres of densely forested woodlands containing both hardwood and softwood stands. Throughout the project area the dominant tree species that were observed are white ash (*Fraxinus americana*), sugar maple (*Acer saccharum*), red oak (*Quercus rubra*), red maple (*Acer rubrum*), white birch (*Betula papyrifera*), black cherry (*Prunus serotina*), black and yellow birch (*Betula lenta* and *Betula alleghaniensis*, hemlock (*Tsuga canadensis*) and American beech (*Fagus grandifolia*). Small amounts of white pine (*Pinus strobus*), hop hornbeam (*Ostrya virginiana*) and basswood (*Tilia americana*) also populate the stand. The white ash has been in decline for many years prior to the infestation of the emerald ash borer (EAB) and some mortality is evident especially in the northern section off Tom Hayes Road.

Landforms and Hydrology: This project area is in the southwestern portion of the Town of Granville. The project begins where Tom Hayes Road (Ore Hill Trail) becomes the eastern boundary of Granville State Forest, approximately one mile south of the road's intersection with State Route 57. The area is mostly hillside with long ridges; aspect is variable, and slopes range between 15-40% with some steeper gullies exceeding that. Elevation within the project area ranges from approximately 750 – 1300 feet above sea level, and the average elevation is 975 feet above sea level.

This proposed project area is in the eastern portion of Granville State Forest. The project area is bound by a utility corridor and Hubbard River to the west and south, to the north by a property boundary and to the east by Tom Hayes Road, Hartland Hollow Road, and the property boundary. Tom Hayes Road, unmaintained by the town, was a former county road that was abandoned in the late 1950's. It's now an important right of way for interior property owners to access State Route 57 to the north. Slopes are generally gentle slopes, but along the southwestern boundary of the project there may be isolated portions where slope exceeds 40% grade.

Drainage from this project area is entirely in the Farmington River watershed basin. All but a small portion flows southwestward in intermittent streams directly into Hubbard River which flows south across the state line and into the Barkhamsted Reservoir. The remaining portion of the project area flows eastward into Pond Brook, which joins the Hubbard River just south of DCR property. There are two known wetland features (0.2 & .06 acres) within the project area. There are no certified vernal pools or potential vernal pools mapped by NHESP.

Soils: There are four soil map units within this project area, mostly associated with deep, well drained, and stony upland soils. As with topography the forest composition changes slightly with the soil types. The four map units are listed below.

- 903C – (36 ac) Chatfield-Hollis Association
- 911C – (70 ac) Ashfield-Shelburne Association

- 912E – (72 ac) Hollis-Chatfield Association
- 921C / 921E - (152 ac) Westminster-Millsite Association

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 large scale disturbance events are seldom but do occur. The figures below (Table 1) are excerpted from the National Weather Service 2012 Climatological Report for Pittsfield, MA. The climate period used to determine normal values is 1981 through 2010.

Table 1:

	2012 Annual	2011 Annual	Normal Annual Value	Normal Winter	Normal Spring	Normal Summer	Normal Fall
Annual Maximum Temp	58.4	56.5	55.3	31.7	54.3	76.7	57.9
Annual Minimum Temp	39.2	37.4	35.4	15.4	32.9	55	38
Annual Mean Temp	50	50.2	48.3	23.6	43.6	65.8	48
Total Precipitation (in)	36.36	59.46	45.38	8.6	11.44	12.74	12.6
Days with >= .01 Precipitation	144						
Average Wind Speed	6.1						

Disease and Insects: The most eminent threat to trees in the project area is the emerald ash borer (EAB, *Agrilus planipennis*; Figure 1). EAB is a green buprestid or jewel beetle native to Northeast Asia that feeds on ash trees. Damage from these insects can be seen on ash trees throughout the project area and especially in the northern section where mortality has already occurred.

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 of trees across its range already. EAB is generally attracted to trees which were previously weakened or stressed.

Figure 1. Photograph of emerald ash borer.

The EAB has a one-year life cycle in which each female lays 30-60 eggs on average with a 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. It is generally accepted that there is no way at present to fully stop or effectively control EAB.

Hemlocks in the project area are threatened by both the wooly adelgid (HWA, *Adelges tsugae*) and hemlock looper (*Lambdina fiscellaria*) insects. HWA is a small insect that were introduced into America in the 1950's from the Southern Japanese island of Shansu. HWA feeds on nutrients stored in the tree, and can weaken hemlocks and cause mortality especially when coupled with other environmental stresses. Hemlock looper is a native insect that attacks a wide variety of coniferous trees and can cause widespread mortality when population levels are high. It has caused widespread destruction of hemlock, white spruce, and balsam fir stands in the Northeast and Canadian Maritime Provinces. Damage to hemlock stands from looper and HWA

can be minimized by keeping stand densities low and retaining well-spaced dominant healthy trees.

Wildlife Habitat Conditions: The NHESP "Massachusetts Natural Heritage Atlas 13th Edition" shows that there is no Priority Habitat within or adjacent to the project area. Consultation with NHESP has shown that no state listed threatened or endangered species are known to be in the project area. No other listed plants have been identified in the field to date. Care will be taken to properly report and address the needs of any listed plant or wildlife species if found on the site.

No listed animals or critical habitat were noted upon the initial site visits. Large mammals noted through observed signs were moose, deer, bear and coyote. Small mammals noted were squirrel, porcupine and chipmunks. Other wildlife including turkey and reptiles were observed as well. The proposed project area is a small portion of the surrounding landscape in these forest types in the immediate vicinity.

Due to the deteriorating nature of the white ash there are already an abundance of large diameter course woody debris (CWD) created by falling dead trees; this will be undisturbed to the extent possible during harvesting. In addition to white ash snags there are patches of Scotch pine (*Pinus rigida*) and red pine (*Pinus resinosa*) that were planted by the Civilian Conservation Corps and are mostly dead with severely declining crowns. Live wildlife trees were also observed in the field, and included large trees of various species with large cavities, rotten portions, large dead branches, and broken tops.

Infrastructure and Recreation: Tom Hayes Road begins approximately one-half mile east of Hartland Road off Route 57 in Tolland, MA. It is an unmaintained former county road that borders several private parcels and provides access to the eastern side of Granville State Forest and the MDC's lands in Massachusetts. It is designated as the Ore Hill Trail in Granville State Forest and is open to the public for hiking, cross-country skiing and snowmobiling. A portion of the trail needs to be relocated as the current path crisscrosses the old roadbed placing the Ore Hill Trail on MDC lands for short stretches. MDC forest land is not open to public recreation in this area, as it is a watershed protection forest for the drinking water supply of the greater Hartford area, and wants to limit public access to their property. Rerouting the Ore Hill trail can be easily accomplished with in-kind work from revenues generated through the timber harvest. The location of the proposed re-route will tie into the Hubbard River Trail creating a new loop that avoids the steep and eroded and former colonial road bed.

Cultural and Archeological Features: There are several known historic foundations and related wells of varying condition within the proposed project area that will be protected from disturbance during the operation. These will be treated according to guidelines set forth in the "Bureau of Forestry – Cultural Resource Management Protection Standards & Guidelines". Stone walls occur intermittently on both sides of the old roadbed and throughout the interior and will be protected. Where stone wall crossings are needed for logging operations existing openings, also called barways, will be utilized. Evidence of past surface mining for iron ore was also found in the project area and the occasional piece of ore can be found in local stone walls. If any additional historic/cultural features are found they will be left intact and protected during this project.

Previous Silvicultural History: The Commonwealth purchased the original 2,128 acre "Tiffany and Pickey Co. Lot" in 1920 followed by several more parcels in the 1920s, 1980s and 2000s.

Much of the property had been harvested shortly before Commonwealth ownership, while other portions consisted of abandoned fields.

Forest management maps created in 1924 with additional updates over time show the project area as a young forest regenerating after the extensive agriculture and cutting prior to state ownership. The open areas of the project area were planted to Scots and red pine in 1926. The portions that had reforested or remained wooded averaged 2-8 inches in diameter, were made up mainly of pioneer species including grey birch (*Betula populifolia*), red maple, paper birch, yellow birch, beech, and sugar maple, as well as previously established hemlock.

The most recent harvest within the project area occurred in the northern portion in 1988 covering much of the same area treated in the first timber harvest under the current prescription. There are records of 11 other forest management projects conducted by DCR, within Granville SF but outside the project area, from 1982-2000. These harvests have occurred in plantations, oak-hardwood, and hemlock-hardwood stands. Several forestry projects, abutting this proposed area on adjacent public and private lands, have occurred within the past 10 years.

Stand Descriptions and Inventory:

Oak Hardwood, Northern Hardwood, and Hemlock Hardwood: All three of these major types are present in the 330 acre project area. There will be at least two timber sales needed to complete the project, and smaller stands and operational units will be carved out of the major types using stonewalls, streams and steep terrain as natural boundaries. The forest types here tend to blend together with northern hardwood transitioning to oak hardwood, then to hemlock hardwoods, creating a mosaic of types that subsequently were treated as one stand.

An inventory of the stands was performed using 20 BAF horizontal point sampling for overstory trees (trees > 2 in. dbh) while understory trees and shrubs were inventoried with a fixed radius plot (6.8 ft., which is 1/300 acre). A total of 41 overstory plots were measured; collecting data on live and dead sample trees, where diameter, quality and product suitability were recorded. Twice as many understory plots (82) were measured with tree species, height class, and shrub presence noted within the sample plot.

These even-aged stands in general are well stocked and would be considered a high "A" level based on local stocking charts. Stand basal area averages 152 square feet/acre (ft^2/ac). Tree species in the stands (ranked by basal area from highest to lowest) were red maple, eastern hemlock, northern red oak, sweet birch, white ash, American beech, sugar maple, black cherry, yellow birch, white pine, hickory, paper birch, red pine, and serviceberry. Relative density within the project area was 84% indicating a mature canopy with trees competing for little available growing space. Trees of acceptable growing stock (AGS) had only a 31% relative density. Medial diameter over all species within the stand was 15.2 in. and the quadratic mean diameter was 11 in.; the with an effective stand age of 91 years old.

There are several small (under 2 acre) red pine and Scots pine plantations within the project area. Over the past 20 years these plantations have succumbed to red pine scale, sunlight competition and root rot resulting in the death of nearly 90% of the trees. The plantations are considered inclusions (small stands or groups of trees of different origins and characteristics) within the mosaic of forest types in the project area, and are neither managed nor mapped as separate stands.

The understory of these stands is a diverse mixture of mostly shade tolerant species due to the high overstory tree relative density. Shrubs and herbaceous ground cover are relatively sparse

throughout the stand with ferns, grasses, mountain laurel, blueberry, sedges, *Lycopodium* spp., and *Rubus* spp. occurring sporadically across the project area.

Silviculture and Projected Results:

Primary/Secondary goals: The primary goal of treatment is to recover the value in dead and dying trees of ash and other species using an irregular shelterwood treatment, which at the same time will create stands with a higher percentage of AGS and more diverse age classes. Maintaining healthy, dominant hemlock and white pine, and creating more growing room for desirable hardwoods, are important goals for the project. This practice will help ensure a diverse and resilient forest as directed in the goals of the "Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines".

Secondary goals of this project are to reroute the location of the Ore Hill Trail to the west, away from the sensitive watershed lands of the MDC where illegal ORV use emanating from DCR lands is a problem. Another important goal of the project is the improvement of Tom Hayes Road which has not been maintained regularly in the past.

Silvicultural Methods: The irregular shelterwood treatment, with openings not to exceed 1/3 acre, will create an uneven-aged forest of varying residual density; this will remove approximately 50-70% of stand volume. This system is effective for increasing and enhancing variability. Areas where a high percentage of trees are unhealthy or composed of unacceptable growing stock (UGS) will be cut heavier, and may resemble more of a seed tree cut. Healthy white ash trees 8 in. dbh and under will be retained at low densities where they do not pose a future safety issue. The results of this treatment will provide the remaining trees with increased light and nutrients, as well as provide light to the forest floor promoting herbaceous species and seedling growth.

Desired Future Conditions: This treatment should lead to residual stands that are healthier and more diverse then current stand conditions. Trees of all size classes will remain creating a more diverse and resilient forest. The harvest will also reduce hazards to public safety and infrastructure damage by removing both live and dead hazard trees. The stand, in aggregate, will be just below B-level stocking; residual overstory trees will have ample opportunity to grow and regeneration will be developing in the understory. As the stand matures wildlife trees will become larger and provide more habitat opportunities. An example of post-harvest tree spacing is pictured in Figure 2.

Current mean basal area for all types was 152 ft^2/ac, with a low of 80 and a high of 220 ft^2/ac. Residual basal areas in the harvested stands will range from a low of 30 (ft^2/ac) to a high of 100 ft^2/ac. Trees marked for removal will be evaluated based on their acceptability related to defect, crown condition, spacing and overall health. Roughly a third (32%) of the trees across all stands were determined to be AGS and two-thirds were UGS. Acceptability varied greatly by tree species; oaks had the highest percentage of trees in AGS at 69%, while white ash and beech had the lowest at 5% and 10% respectively in AGS. Trees harvested with the irregular shelterwood system will be concentrated heavily on the UGS population leaving a stand of higher quality growing stock across all size classes. Due to the mosaic patchwork of species

Figure 2. Picture of representative post-harvest tree spacing.

distribution, geologic features, and slope variability, portions of the project area will not be subject to harvesting operations. The stands should be evaluated in 5-10 years to determine if regeneration is successful and further overstory harvesting could occur.

Overstory Summary- Quality, Diameters, Age, Structure, Density, Volumes, Values: (2020 inventory data)

Composition - Basal area (BA), % BA, trees per acre

Species	Total BA (ft^2/ac)	Percent BA	Trees per acre
All species	152.2	100	232.0
All oaks	15.6	10	8.9
red maple	33.7	22	46.7
eastern hemlock	29.8	20	46.7
northern red oak	15.6	10	8.9
sweet birch	14.6	10	20.8
white ash	10.7	7	11.3
American beech	10.2	7	35.4
sugar maple	10.2	7	21.5
black cherry	7.8	5	7.8
yellow birch	6.8	4	15.0
eastern white pine	5.4	4	1.9
hickories	2.9	2	9.0
paper birch	2.0	1	4.8
red pine	2.0	1	2.1
balsam fir	0.5	0	0.3

Quality - percent in AGS (all trees > 2.0 inches DBH

Species	Saplings	Poles	Small sawtimber	Medium sawtimber	Large sawtimber	All sizes
All species	38.0	43.0	23.0	28.0	47.0	32.0
All oaks	0.0	100.0	50.0	42.0	93.0	69.0
red maple	0.0	71.0	21.0	25.0	0.0	36.0
eastern hemlock	33.0	22.0	9.0	14.0	33.0	16.0
northern red oak	0.0	100.0	50.0	42.0	93.0	69.0
sweet birch	0.0	36.0	25.0	29.0	0.0	30.0
white ash	0.0	0.0	8.0	0.0	0.0	5.0
American beech	33.0	10.0	0.0	0.0	0.0	10.0
sugar maple	100.0	50.0	56.0	67.0	0.0	52.0
black cherry	0.0	0.0	33.0	20.0	0.0	25.0
yellow birch	0.0	50.0	60.0	100.0	0.0	57.0
eastern white pine	0.0	0.0	100.0	67.0	14.0	36.0
hickories	0.0	67.0	0.0	0.0	0.0	67.0
paper birch	0.0	0.0	0.0	0.0	0.0	0.0
red pine	0.0	0.0	0.0	0.0	0.0	0.0
balsam fir	0.0	0.0	0.0	0.0	0.0	0.0

Diameters and Ages - inches, years

Species	Medial diameter	Merchantable medial diameter	Quadratic mean diameter	Years to maturity	Effective age
all species	15.2	15.5	11.0	15.0	91.0
all oaks	21.1	21.1	18.0	0.0	106.0
RM	14.4	14.4	11.5	18.0	72.0
EH	15.7	16.3	10.8	11.0	109.0
NRO	21.1	21.1	18.0	0.0	106.0
SB	13.5	13.5	11.4	30.0	90.0
WA	15.2	15.2	13.2	14.0	76.0
AB	10.2	11.2	7.3	45.0	75.0
SM	13.8	14.3	9.4	25.0	95.0
BC	15.1	15.1	13.6	14.0	76.0
YB	13.4	14.2	9.1	26.0	94.0
WP	24.7	24.7	22.5	0.0	165.0
H	8.3	8.3	7.7	64.0	56.0
PB	11.0	11.0	8.7	47.0	73.0
RP	14.0	14.0	12.9	27.0	93.0
BF	16.0	16.0	16.0	13.0	107.0

Structure

Species	Q factor
all species	1.57
all oaks	1.21
RM	1.56
EH	1.40
NRO	1.21
SB	1.29
WA	1.46
AB	1.61
SM	1.41
BC	1.29
YB	1.36
WP	1.21
H	1.36
PB	1.43
RP	1.34
BF	0.00

Relative density - percent

Species	Relative density	AGS only
all species	84.0	31.0
all oaks	8.0	5.0
RM	18.0	8.0
EH	16.0	3.0
NRO	8.0	5.0
SB	8.0	3.0
WA	3.0	0.0
AB	9.0	1.0
SM	9.0	5.0
BC	3.0	1.0
YB	4.0	2.0
WP	2.0	1.0
H	2.0	2.0
PB	1.0	0.0
RP	1.0	0.0
BF	0.0	0.0

Volumes and Values (per acre) - International 1/4 inch Log Rule

Species	Gross total cords	Net total cords	Net pulpwood cords	Gross board-foot	Net board-foot	Dollars
all species	44.4	35.5	21.0	11841.2	9620.0	1595.4
all oaks	5.5	4.4	1.6	2047.6	1930.9	759.8
RM	10.4	8.4	6.1	1974.9	1447.0	132.1
EH	7.6	6.1	2.3	2677.0	2380.3	85.4
NRO	5.5	4.4	1.6	2047.6	1930.9	759.8
SB	4.1	3.3	2.6	825.2	417.4	10.3
WA	3.5	2.8	1.5	973.4	853.2	234.6
AB	2.1	1.7	1.5	368.3	168.9	6.7
SM	2.8	2.2	1.5	659.5	487.5	51.6
BC	2.7	2.1	1.3	696.5	585.1	263.6
YB	1.8	1.4	1.1	374.9	196.5	11.8
WP	2.0	1.6	0.3	943.6	915.6	33.7
H	0.7	0.5	0.5	0.0	0.0	1.1
PB	0.5	0.4	0.3	97.6	68.6	1.3
RP	0.6	0.5	0.3	177.7	147.4	2.7
BF	0.2	0.1	0.1	25.3	21.6	0.8

Understory: The understory in the stands is relatively open due to a lack of sunlight. It contains sparse occurrences of shrubs such as mountain laurel, witch hazel, arrowwood, blueberry, and choke cherry. Small individuals of evergreen shrub species and ferns and grasses were also noted during the inventory process. Tree species in the understory, recorded by their prevalence were: beech, oak, hemlock, sugar maple, yellow and sweet birch, striped maple, white pine, red maple, black cherry and balsam fir. Beech regeneration, at 552 trees per acre, is by far the most common and undesirable species present. A chemical treatment for beech control will be evaluated at a later stage in the project.

Regeneration, trees per acre under 2.0 inches dbh

SPECIES	**3 in. ≤ HT < 1.0 ft.**	**1.0 ft. ≤ HT < 4.5 ft.**	**0.0 in. < DBH < 1.0 in.**	**1.0 in. ≤ DBH < 5.0 ft.**	**TOTAL**
yellow birch	29.41	11.76	0.00	5.88	47.06
white pine	23.53	0.00	0.00	0.00	23.53
red maple	23.53	0.00	0.00	0.00	23.53
hemlock	23.53	23.53	5.88	29.41	82.35
sugar maple	29.41	0.00	0.00	41.18	70.59
red spruce	11.76	29.41	0.00	0.00	41.18
red oak	152.94	11.76	0.00	17.65	182.35
beech	100.00	200.00	94.12	158.82	552.94
cherry	0.00	11.76	0.00	0.00	11.76
balsam fir	5.88	0.00	0.00	0.00	5.88

Anticipated Future Treatments: There are no current plans to harvest this area again in the next 10 years, however this stand should be examined in 5 years to verify if the goals of the treatment were met, and follow-up treatments planned accordingly. Normal re-entry times for shelterwood cuts are anywhere from 10-25 years after initial harvest.

Access/Logging System: This operation will utilize at least two log landings. The northern landing accessed from MA State Highway 57 is located on Tom Hayes Road where MDC lands and DCR lands meet. The landing has already been constructed by MDC using geotextile fabric and processed stone and is capable of handling tractor trailers. The MDC barely utilized the landing as their contractor chose to forward wood down to Hartland Hollow Road rather than improve Tom Hayes road. The other landing will be located off Hartland Hollow Road, accessed through MDC lands from CT Route 20. The first of the two separate timber sales planned under this prescription will utilize the northern landing, partially on MDC property, while the southern half of the project area will use the other location.

The forester will consider all conventional and mechanical logging equipment as suitable for the operation. Whole tree harvesting and skidding will not be permitted in this project area. All trees felled will be processed or limbed within the stand leaving slash treated in the felled location except where removal is needed in buffer areas. Slash will be removed for the first 50 ft. from the road edge and lopped to under 4 ft. in height in the remaining sale area.

Throughout the project area skid trails will be laid out to avoid steep slopes, to avoid any water features found, and to reduce any negative aesthetics. Any unavoidable stream or wetland crossing will be designed at or above the standards of the "Massachusetts Forestry Best Management Practices Manual".

Upon completion of all harvesting activity, all landings will be free of debris, graded, and seeded with "Berkshire Conservation Mix" grass seed and mulched with straw. Skid roads will be left in a stable state, graded with water bars installed according the "Massachusetts Forestry Best Management Practices", and seeded with "Berkshire Conservation Mix" grass seed and mulched with straw as needed. Any utilized stream/wetland crossing will be stabilized.

Wildlife Resources: Current snags will be retained where they do not pose a safety issue; 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.

In-kind Services: Upon final tally of product the extent of in-kind services will be determined.

- Road and trail improvements within Granville State Forest.

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

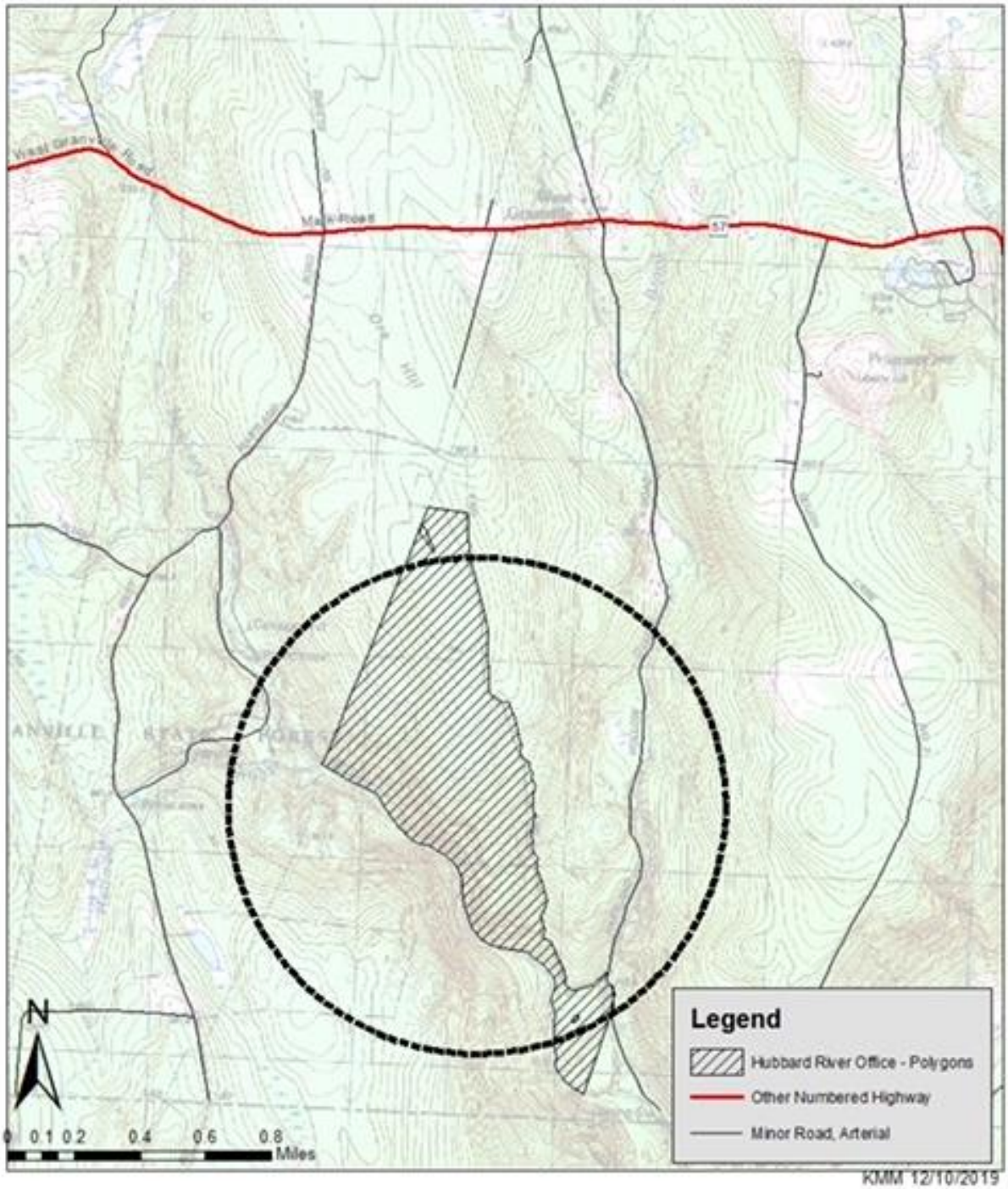
Sale Level:

1. Locate and paint with two orange diagonal stripes the buffers and filter strips along all wetlands and associated streams found on site.
2. Locate and paint with two orange diagonal stripes the remaining wooded project boundary line. This will not be done where the project boundary is a road.
3. Flag temporary layout of the section access points and primary skid trails with orange flagging.
4. Flag temporary layout of any unavoidable wetland and stream crossing found with labeled flagging. Using red paint mark and label each crossing upon completion of marking and any final adjustment to location.

5. General tree marking guide:

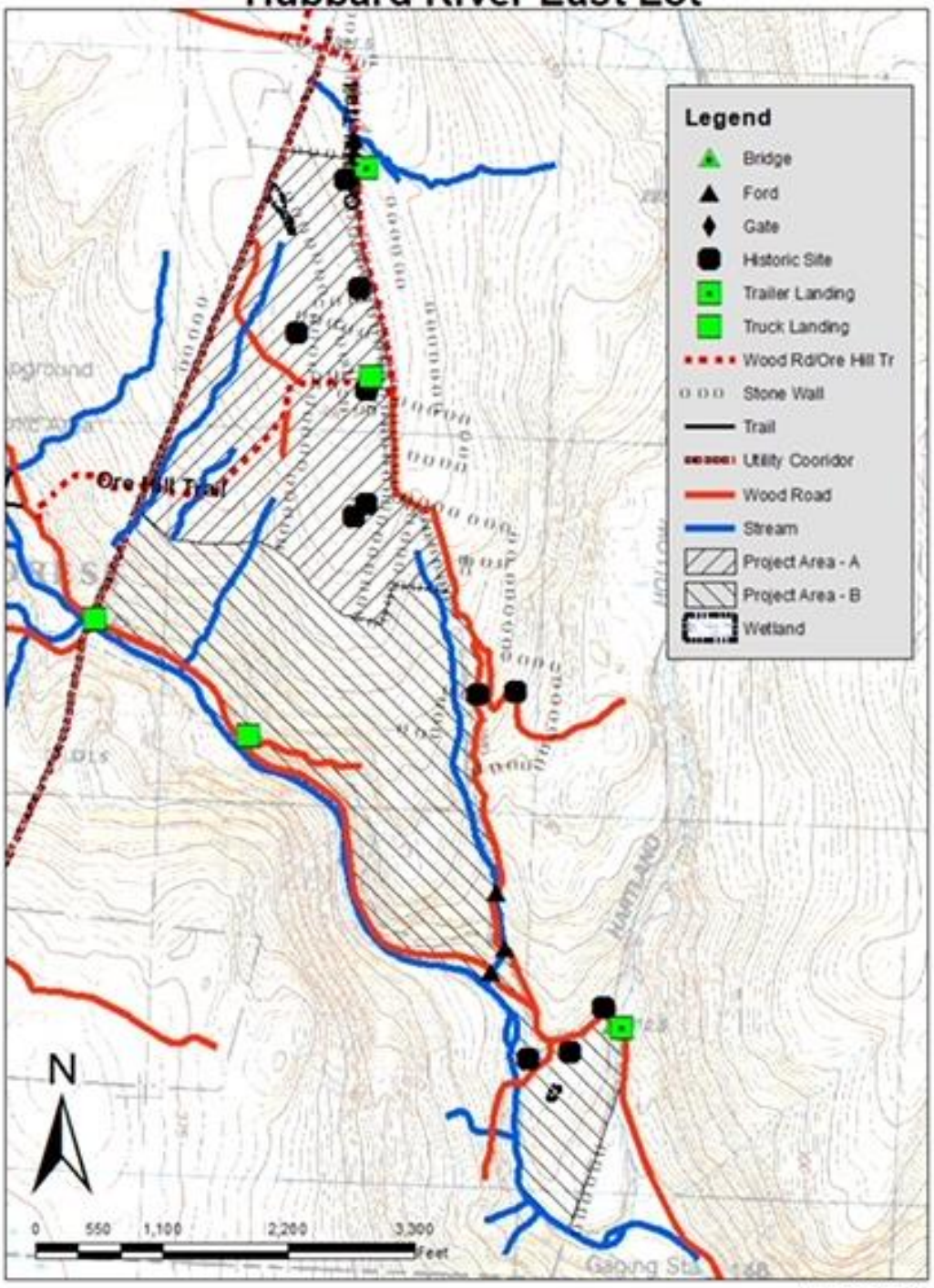
Marking type	**Type of Tree**	**Tally Method**	**Mark Type**
Leave Tree	Leave Tree	As needed	Red Horizontal Ring
Cut Tree	Cut Saw Log	Individual tally DBH & height	Blue Horizontal Line
Cut Tree	Cut Pulp/Cord Wood	Individual tally DBH - 1/10 height	Blue slash
Cut Tree	Cut Live Cull Tree	No tally	Blue X
Cut Tree	Dead Tree Warning	No tally	Blue X

Granville State Forest
Hubbard River East Lot - Locus Map



KMM 12/10/2019

Granville State Forest
Hubbard River East Lot



KMM 02/26/2021