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Silviculture Prescription
Freetown Co-Peace

Massachusetts Department of Conservation and Recreation
Bureau of Forestry

Southeast District
Freetown/ Fall River State Forest
Freetown, MA

Prepared by:

Paul Gregory – Management Forester – Southeast District
Massachusetts Department of Conservation and Recreation
194 Cranberry Rd. – P.O. Box 66, South Carver, MA 02366
paul.gregory@state.ma.us – 508–866-2580 ext. 121

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Approved by:

Management Forestry
Program Supervisor _____ Date: March 21, 2013
William N. Hill, CF

Background

The Freetown / Fall River State Forest began in 1934 with the purchase of 923 acres. Most of the land in the Freetown / Fall River State Forest has been cleared of trees at some point during the past two centuries. The land was used for woodlots, pasture, and crops. Brush fires were common during the late 1800's and early 1900's. The forest that has regenerated during the past 100 years has been influences by storms (e.g. 1938 hurricane), forest fires, and forest management practices. A 227.5 acre portion of the forest was set aside in 1939 as an Indian Reservation. In 1976, by executive order, Governor Dukakis strengthened the Reservation by granting tribal rights to the Wampanoag Nation (GOALS 1990). The decline of oak species in recent years has been attributed to multiple insect infestations over several years. The sandy, stony, well drained soils support a forest of oaks and white pine. In 2002, the Southeastern Massachusetts Bioreserve was created. The approximately 14,000 acre Bioreserve combines the Freetown / Fall River State Forest, Copicut Wildlife Management Area, TTOR's Copicut Woods, and eastern parts of the City of Fall River's watershed lands, including the Copicut Reservoir.

Site Data

The forest management project is 48 acres in size and is divided into two stands. Stand 1 (S1) is located in the western part of the forest and is divided into two sections, a 10 acre section to the west of Haskal path and a 7 acre section to the east of Haskal path. Both sections of S1 received the same silvicultural treatment in 2001 and will be treated as one stand in this prescription. See the prescription documentation section for a locus map. Stand 2 (S2), is 31 acres in size and is located in the central part of the forest, bounded on the east by Makepeace Road and on the southwest by Hathaway Road. To the west of S1 is a steep sloped area that has had extensive illegal off-highway vehicle use. Erosion is occurring and has resulted in the formations of large gullies with sediment being transported down slope and being deposited into Rattlesnake Brook.

Climate

The Freetown / Fall River State Forest is located within the Narragansett-Bristol Lowland & Islands ecoregion. This region has flat to gently rolling plains. Forests are mostly central hardwoods and some elm-ash-red maple and red and white pine. There are numerous wetlands, some cropland/pasture, and many cranberry bogs. The Freetown / Fall River State Forest is dominated by mixed oak and white pine-oak communities with patches of swamps, plantations and pitch pine-scrub oak. S1 and S2 are within the white pine – oak natural community type, with white pine dominating. White pine –oak forests are often in a successional sequence from successional white pine forests (Swain and Kearsley 2011).

The yearly precipitation average from 1894 to 2010 of the DCR Lakeville rain gauge is 46.5 inches. Monthly precipitation averages range from 3.4 inches in June to 4.5 inches in March. The average January temperature is 27 degrees Fahrenheit, and the average July temperature is 72.5 degrees Fahrenheit (Hall et al. 2002). There were 67 hurricanes in New England that occurred from 1620 to 1997, averaging one storm every 6 years. The mean recurrence for southern coastal New England is 85 years for a storm capable of blowing down entire stands (Lorimer & White 2003).

Soils

The soils of S1 consist of Hinckley gravelly fine sandy loam, 8 to 15 percent slopes (map symbol 242C); Hinckley gravelly fine sandy loam, 15 to 25 percent slopes (map symbol 242D), Merrimac fine sandy loam, 3 to 8 percent slopes (map symbol 254B), and Agawam fine sandy loam, 3 to 8 percent slopes (map symbol 275B). The Hinckley soil units' parent material is friable sandy and gravelly glaciofluvial (meltwater streams of glaciers) deposits. The Hinckley soil unit is an excessively drained soil with a typical profile of gravelly sandy loam in the first 9 inches, very gravelly loam coarse sand from 9 to 20 inches, and stratified cobbly coarse sand to very gravelly loamy fine sand from 20 to 60 inches. The frequency of flooding and ponding is none. The Merrimac soil unit's parent material is friable coarse-loamy eolian (caused or carried by the wind) deposits. The Merrimac soil unit is a somewhat excessively drained soil with a typical profile of fine sandy loam in the first 11 inches, gravelly sandy loam from 11 top 23 inches, and stratified very gravelly coarse sand to sand from 23 to 60 inches. The frequency of flooding and ponding is none. The Agawam soil unit's parent material is friable coarse-loamy eolian deposits. The Agawam soil unit is a well drained soil with a typical profile of fine sandy loam in the first 18 inches, stratified gravelly sand to loamy fine sand from 18 top 28 inches, and stratified very gravelly coarse sand to fine sand from 28 to 60 inches. The frequency of flooding and ponding is none.

The Hinckley 242C soil unit and the Agawam soil unit are rated as being well suited for suitability for use by harvesting equipment. The Hinckley 242D soil unit and the Merrimac unit are rated as being moderately suited for suitability for use by harvesting equipment. All four soil units have eastern white pine (*Pinus strobus*) as the preferred tree to manage. The eastern white pine site index from the soil units are 60 for the Hinckley soil unit, 64 for the Merrimac soil unit, and 70 for the Agawam soil unit. The soil units are also rated with respect to any limitations affecting the construction of haul road and log landings, suitability for log landings, and soil rutting hazard. The Hinckley 242C soil unit and the Agawam soil unit are rated as having slight, whereas the Hinckley 242D soil unit and the Merrimac soil unit are rated as moderate in the limitations affecting the construction of haul road and log landings. The Hinckley 242C soil unit, Merrimac soil unit, and the Agawam soil unit are rated as moderately suited from suitability for log landings. The Hinckley 242D soil unit is rated as poorly suited for suitability for log landings due to slope.

The letter after the three digit number in a soil unit's name reflects the soil's slope class. The letter B is used for soils with slopes of 3 (or 0) to 8 percent, C for 8 to 15 percent, and D for 15 to 25 percent slope. The Hinckley 242D is rated as slight, the Hinckley 242C and the Agawam soil units are rated as moderate, and the Merrimac soil unit is rated as severe for soil rutting hazard due to low strength. The eroded slope area to the northwest of S1 is within the Hinckley 242D gravelly fine sandy loam for its steep section. The less steep and tow of slope is Walpole fine sandy loam, 0 to 3 percent slopes (map symbol 31A). The Walpole soil unit's parent material is friable coarse-loamy eolian deposits. The Walpole soil unit is a poorly drained soil with a typical profile of fine sandy loam in the first 5 inches, sandy loam from 5 to 19 inches, and stratified gravelly coarse sand to loamy fine sand from 19 to 60 inches. The frequency of flooding is none and the frequency of ponding is occasional for the Walpole soil unit.

The soils of S2 consist of Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony (map symbol 307B); and Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony (map symbol 312B). Both soil units have parent material of friable coarse-loamy eolian deposits. The Paxton soil unit is a well drained soil with a typical profile of fine sandy loam in the first 22 inches, and gravelly sandy loam from 22 to 60 inches. The frequency of flooding and ponding is none. The Woodbridge soil unit is a moderately well drained soil with a typical profile of fine sandy loam in the first 27 inches, and gravelly fine sandy loam from 27 to 60 inches. The frequency of flooding and ponding is none.

Both soil units in S2 are rated as being moderately suited for suitability for use by harvesting equipment. The Hinckley 242D soil unit and the Merrimac unit are rated as being moderately suited for suitability for use by harvesting equipment. Both soil units have eastern white pine as the preferred tree to manage. The eastern white pine site index from the soil units are 66 for the Paxton soil unit, 67 for the Woodbridge soil unit. Both soil units are rated as having moderate in limitations affecting the construction of haul road and log landings, moderately suited from suitability for log landings, and slight for soil rutting hazard (NRCS 2012).

Site Description

S1 is a 17 acre stand divided into two sections, a 10 acre section to the west of Haskal path and a 7 acre section to the east of Haskal path. Haskal path is an unpaved forest road in fair to poor condition. The stand is approximately 250 feet south of Copicut Road at its most northern point. To the east of the stand is the 227.5 acre Watuppa Reservation of the Wampanoag Nation. The western side of the stand faces west towards Rattlesnake Brook. The elevation is approximately 110 feet. A stone wall consisting of base stones is in the 10 acre section. Motorcycle trails and hiking/skiing trails wind their way through the stand. The stand is composed of gentle to rolling terrain. The overstory consists of mainly eastern white pine (90% of the basal area) with several oak species (*Quercus*), pitch pine (*Pinus rigida*) and black birch (*Betula lenta*).

S2 is bounded on the east by Makepeace Road and on the southwest by Hathaway Road. Wetlands are west and north of the stand. Both roads are unpaved forest roads in good condition. The stand is composed of level terrain. The elevation of the stand is approximately 215 feet. Two multi-use trails traverse through the stand. The overstory consists of eastern white pine (84 percent of the basal area) with small amounts of oaks, American beech (*Fagus grandifolia*), black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), black birch, and sassafras (*Sassafras albidum*).

The DCR Management Guidelines of 2012 states 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 site history (land use; agriculture/logging) and conditions (soil types, productivity; vegetation cover) for S1 indicates low to moderate soil and forest complexity and therefore points towards using silvicultural systems geared towards even age management. The analysis of site history and conditions of S2 indicates moderately high soil productivity and forest complexity and therefore suggests using silvicultural systems geared towards increasing diversity and complexity (Goodwin and Hill 2012).

Cultural and Archeological Features

Both stands had an archeological review and evaluation by DCR's archeologist. There are many pre-Contact sites within a mile of S1 and is a moderately sensitive area. There is one pre-Contact site within a mile of S2. S1 contains remnants of stonewalls with only the base stones remaining. Some of the skid roads in the 2001 timber harvest of S1 went over these base stones.

Stand Data

Stand description


S1 December 2012

S1 has an overstory composed mainly of large eastern white pine sawlogs with scattered individual stems of black oak (*Quercus velutina*), white oak (*Quercus alba*), scarlet oak (*Quercus coccinea*), black birch, and pitch pine. Eastern white pine has an average diameter at breast height (dbh) of 13.5 inches and a basal area of 89.2 ft^2/acre. The stand is approximately 80 years old. Eastern white pine is the most common species in the midstory comprising 61 percent of the sapling and pole-sized trees. Approximately 95% of the understory is eastern white pine with an average density of 9,500 stem per acre, most of this being less than or equal to 1" in dbh, and with an average height of 11 feet. Black birch and the oaks each make up another 2 percent of the understory with smaller

amounts of red maple, pitch pine, and American beech. Shrubs cover 31 percent of the stand with a ground layer covering 46 percent. S1 has a site index of 67 for the eastern white pine. Black birch saplings are mostly concentrated in the northeast corner of the stand. The regeneration followed a shelterwood establishment cut performed in 2001. The ground cover tree species consists of eastern white pine, oaks, red maple, black birch, pitch pine, sassafras, and American beech. Non-tree ground cover species consists mainly of black huckleberry (*Gaylussacia baccata*), bracken fern (*Pteridium aquilinum*), low bush blueberry (*Vaccinium angustifolium*), Indian pipe (*Monotropa uniflora*) and eastern teaberry (*Gaultheria procumbens*). S1 has standing dead oak trees as the result of multiple caterpillar infestations over the last few years.

Stand 1 is most likely the result of white pine establishing itself in an abandoned pasture becoming an "old-field" white pine stand. Abandoned pastures with white pine nearby would often produce even-aged white pine stands. This phenomenon was quite common in southern New England. Over time a few oaks were able to establish themselves. Some white pine regeneration was able to establish under the white pine overstory. To release and create more regeneration a shelterwood establishment cut was performed in 2001, resulting in the dense eastern white pine understory. Approximately 50% of the trees were cut from the canopy. A shelterwood establishment cut is an even-aged silvicultural method that prepares a seed bed to create a new age class by removing most trees, but leaving a subset to provide sufficient shade to produce a new age class in a moderated microenvironment (Helms 1998).


S2 December 2012

S2 is a 31 acre stand comprised of medium and large eastern white pine trees, medium and large black/scarlet oak trees, a scattering of American beech trees and some medium black birch trees. Eastern white pine has an average dbh of 12.1 inches and a basal area of 104 ft^2/acre. The average age of the eastern white pine is 80 years. Eastern white pine is the most common species in the midstory comprising 54 percent of the sapling and pole sized trees. Other midstory species are low vigor oaks, red maple, black gum, and sassafras. The understory regeneration is patchy and is made mostly of eastern white pine saplings with a small amount of red maple, black gum, American beech, sassafras, and oaks. Approximately 69% of the understory is white pine with an average density of 1,111 stem per acre, most of this being less than or equal to 1" in dbh, with an average height of 13.5 feet. Black gum, red maple, and American beech were other understory species that were above 5% in relative density. All three species were also mostly less than or equal to 1" in dbh. Shrubs cover 49 percent of the stand with a ground layer covering 67 percent. S2 has a site index of 61 for the eastern white pine. The ground cover tree species consists of eastern white pine, sassafras, oaks, American beech, red maple, black gum, and black birch. Non-tree ground

cover species consists mainly of black huckleberry, eastern teaberry, low bush blueberry, and bracken fern. Evidence of Beech Bark disease is apparent on some of the larger beech trees in S2. S2 has standing dead oak trees as the result of multiple caterpillar infestations over the last few years.

The lack of stone walls and the soil being very stony indicates the likelihood of S2 being a cut over stand prior to being purchased by the state. The State Forest Commission, established in 1914, bought burned or cut-over lands for reforestation and forest improvement. The land now occupied by the State Forest was utilized for crops, pasture and woodlots. Areas that had remained forested were often repeatedly harvested. This exploitative harvesting nearly always consisted of a diameter limit cut in which trees larger than a given diameter were harvested (Kenefic and Nyland, 2006). S2 had a commercial thinning to shelterwood cut in 1983 of 12 acres and a small 4 acre salvage cut following hurricane Bob in 1992.

Three hardwood defoliators that have played a major part in recent infestations: Winter moth (*Operophtera brumata*), Gypsy moth (*Lymantria dispar*), and Eastern Tent caterpillar (*Malacosoma americanum*). The worst of the infestations being attributed to Winter Moth. Winter moth and Gypsy moth are non-native species. Many different deciduous plants are susceptible to damage from Winter moth, these include oaks, maples, cherries, basswood, ash, and white elm. To combat the problem a Tachinid fly, *Cyzenis albicans,* has been released in Massachusetts, but it is going to take many years (10 or more) for this biological control to take hold. Oak regeneration will mostly likely remain at a reduced level in this time frame as Winter moth does go after oak saplings and seedling in heavy infestations (Ken Gooch, personal communication, January 27, 2012).

Wildlife

Freetown / Fall River State Forest is an Important Bird Area, as designated by Mass Audubon. An Important Bird Area is a site providing essential habitat to one or more species of breeding, wintering, and/or migrating birds. The Massachusetts Comprehensive Wildlife Conservation Strategy lists species in greatest need of conservation. Using the North American Breeding Bird Atlas (BBA) Explorer the following species were confirmed or probable in the blocks the Freetown / Fall River Forest occupies. Confirmed species were: Brown Thrasher (*Toxostoma rufum*), Field Sparrow (*Spizella pusilla*), Eastern Towhee (*Pipilo erythrophthalmus),* Wood Thrush (*Hylocichla mustelina*), Prairie Warbler (*Dendroica discolor*), and the Ruffed Grouse (*Bonasa umbellus*). Probable species were: Canada Warbler (*Wilsonia canadensis*), blue-winged Warbler (*Vermivora pinus*), American Woodcock (*Scolopax minor*), Whip-poor-will (*Caprimulgus vociferous*), Green Heron (*Butorides virenscens*), Broad-winged Hawk (*Buteo platypterus),* and the American Black Duck (*Anas rubripes*) (Massachusetts Division of Fisheries & Wildlife 2006). Other notable species from annual counts include Acadian Flycatcher (*Empidonax virescens*), Worm-eating Warbler (*Helmitheros vermivorus*), Hooded Warbler (*Wilsonia citrina*) and the Ovenbird (*Seiurus aurocapilla)* (J. Larson, personal communication, January 9, 2013). One state listed species, Northern Parula (*Parula americana),* is present in the

state forest. Many of these bird species use different habitats throughout the year. In particular the American woodcock habitat varies with activity, time of day, and season.

Of the species noted above that have a potential increase in habitat from the proposed timber harvest are: 1. Eastern Towhee-inhabits open areas including open shelterwood cuts; 2. Prairie Warbler-inhabits dry areas with low trees and shrubs; 3. Brown Thrasher-inhabits dry thickets in wooded areas, forest edges and clearings; 4. Ruffed grouse-inhabits early successional habitats; 5. American woodcock- inhabits young forests; 6. Broad-wing hawk-inhabits deciduous and mixed deciduous-coniferous forests with openings; and 7. Whip-poor-will-habits dry open deciduous or mixed woodlands of pine, oak, and beech, especially successional forests. Of these seven species, the majority are declining according to Mass Audubon's *State of the Birds* report.

The species that have a potential decrease in habitat from the proposed timber harvest are: 1. Wood Thrush-inhabits mature moist deciduous or mixed forests with closed canopies; 2. Acadian Flycatcher- inhabits mature extensive deciduous and mixed forest with tall trees, a closed canopy and open spaces in the understory; wooded swamps, and forested ravines near streams and 3. Oven bird-inhabits large areas of open contiguous mature deciduous or mixed forest interior with little or no understory and ample leaf litter and logs; and 4. Worm-eating Warbler-nests in dense understory in ravines, dry wooded hillsides, extensive stands of mature deciduous forests with thick understory, and edges of streams or swamps rimmed by shrubs or vines. The Worm-eating Warbler prefers deciduous or mixed mature forests that include ravines or hillsides with abundant shrub cover. Out of these four species, only the Wood Thrush is stable or likely decreasing, whereas the Acadian flycatcher, Ovenbird, and Worm-eating Warbler have seen an increase from BBA1 to BBA2. Both stands are mostly coniferous stands with a small percentage of hardwoods and may not be ideal conditions for these birds.

The species that have no change in habitat from the proposed timber harvest are: 1. Canada Warbler-favors deciduous forested swamps, dense undergrowth of shrubs in cool, moist, mature woodlands and along streams and swamps, and cedar bogs.; 2. Field Sparrow-inhabits grasslands, and abandoned agricultural areas; 3. Blue-winged warbler-prefers brushy old pastures and old fields; 4. Green Heron-inhabits primarily shrub or forested wetlands; 5. American Black Duck-inhabits variety of coastal and freshwater habitats; 6. Hooded Warbler- inhabits extensive deciduous or mixed forests of maple, beech, oak, with a dense understory. Limited logging may actually be beneficial to Hooded Warblers, as it creates small openings where understory plants can grow and provide cover; 7. Northern Parula-needs *Usnea* lichen which is found in Atlantic Cedar swamps (DeGraaf and Yamasaki 2001, Mass Audubon 2011).

The Freetown / Fall River State Forest is part of the Southeastern Massachusetts Bioreserve. The Southeastern Massachusetts Bioreserve provides the largest wildlife management area in southeastern Massachusetts. The Massachusetts Department of Fisheries and Wildlife (DFW) data indicate that forestland in the wildlife management zone 11 (Southeast Massachusetts) has approximately 15 white-tailed deer (*Odocoileus virginianus*) per square mile.

This density of deer is close to the threshold of having negative impacts on native plant communities. Deer may have an impact on regeneration of hardwoods.

The Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines propose maintaining a minimum of a least 256 cubic feet of down woody debris. There are approximately 300 cubic feet per acre of down woody debris in S1 and 175 cubic feet per acre of down woody debris in S2. The standing dead oaks will increase the amount of down woody debris in both stands as they fall. Down woody debris decomposes slowly, making it a long-term source of nutrients. Large pieces of down wood debris, dead logs, serve as a seed bed for tree and plant species (Evans & Kelty 2010). Dead down woody debris provides essential hiding and foraging habitat for at 50 vertebrate species in New England (DeGraaf et al. 2006). Examples include: Ruffed grouse, many salamanders, snakes, voles, shrews, and mice.

The conifer overstory prevalent in both stands provides structural and forage features required as nesting and feeding habitat by species such as warblers and squirrels. Hardwoods provide hard mast (acorns and beech nuts) and soft mast/fruits (cherries and berries), nesting structures, and snags required by wildlife species such as squirrels, blue jays (*Cyanocitta cristata*) and owls. Mast and fruits are high energy foods required by many wildlife species, including many species of migrating songbirds where high energy sources are of key importance during fall migration. All shrubs in both stands are deciduous. Shrub cover provides essential breeding and feeding cover for species that utilize this vertical layer of habitat, including many songbirds and small mammals, such as Eastern Towhees, Deer mice (*Peromyscus maniculatus*), and Ruffed grouse. Woods roads provide openings, usually seeded to grass, sedge, and other herbaceous species, that provide additional sources of food (vegetation and insects) for wildlife, such as voles and wild turkeys (*Meleagris gallopavo*).

S1 has an average of 15.4 snags per acre consisting of oak species. Additionally S1 has some dead Red pine trees in its most northern portion. S2 has an average of 32.5 snags per acre, consisting mainly of oak species, and some eastern white pine. Snags help maintain populations of wildlife that require cavities. Snags grow lichen, mosses, and fungi which many small mammals forage. All existing snags will be saved. Exceptions may occur due to removing snags near trails or landings for logger and public safety. Snags determined to be a threat to human safety will be cut and retained on site as coarse woody debris. The Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines propose retaining a minimum of five snags greater than 10 inches in diameter. S1 had an average of 9 snags/acre and S2 had an average of 11 snags/acre with a dbh >10 inches.

Rare species

All proposed timber harvest areas are not within priority habitats of rare species as those published in the 13th Edition of the Massachusetts Natural Heritage Atlas. Voluntary implementation of the Massachusetts Forestry Conservation Management Practices for Eastern

Box Turtles (*Terrapene carolina)* will occur on both stands as suggested by the Massachusetts Natural Heritage and Endangered Species program due to the proximity of recent observations. Timber harvest operations will only occur from December 1st through March 30th, per the Forestry Conservation Management Practices for Eastern Box Turtles.

Vernal pools and Wetlands

The proposed timber harvest areas are not within 100 feet of a certified or potential vernal pool according to the Natural Heritage & Endangered Species Program (NHESP) datalayers dated February 2011 and December 2000 respectively, available from MassGIS. Rattlesnake Brook is to the west of S1, approximately 100 feet at its nearest point. Wetlands exist to the west and north of S2 between Makepeace Road and Hathaway Road. They are approximately 20 feet to their nearest point of S2. Neither stand is in a surface water supply watershed, DEP surface water supply protection area, or a DEP wellhead protection area.

Recreational and Aesthetic Resources

Hunting, hiking, X-country skiing, snowmobiling, horseback riding, and seasonal motorcycle riding is allowed in Freetown / Fall River State Forest. S1 has motorcycle/multiple use trails, as well as hiking/skiing trails, unpaved road/snowmobile trials, and abuts the Long Trail. Many of the trails within or abutting S1 have erosion issues. The motorcycle trails especially have ruts that have significant height differences between the center of the trail and the corresponding edge/bank of trail. A slope facing Rattlesnake Brook just to the northwest of the proposed timber sale has been eroded due to illegal OHV use, see proposed timber harvest S1 map.

Stand S2 has motorcycle/multiple use trails within its boundaries. No geocaches currently exist within either stand. A geocache exists just to the west of Rattlesnake Brook about 170 feet west of S1 on the other side of the brook. A geocache exists approximately 200 feet to the west of the middle of S2.

Existing legal trails (trails shown on the Freetown / Fall River State Forest Trail Map) will have 50' wide corridors, where timber harvesting activities will occur, and will be designed to promote large-diameter trees, forest structures, forest health, a safe recreation experience, and quality scenery. Slash within 25 feet of forest roads and trails will be managed to result in a light and natural appearing forest ground cover. Trees will be felled away from trails to minimize any residual damage. Existing illegal trials (trails not shown on the Freetown / Fall River State Forest Trail Map) will be blocked off with woody debris to discourage future use. American holly (*Ilex opaca*) trees were found in S2 and will be protected as much as possible and any competing vegetation will be removed to allow this species to be free to grow and to be more visible.

In the final report of the Technical Steering Committee of the Forest Futures Visioning Process, scenic roads in Woodlands were recommended to have management guidelines to protect their integrity and scenic quality. The town of Freetown does not have a scenic road

designation in their by-laws, October 24, 2011 revision, and according to the town's administration office, May 23, 2012.

Management Objectives

The proposed management activities are consistent with management guidelines outlined in the Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines. Freetown / Fall River State Forest has been designated as a Woodland. Woodlands conserve a range of forest ecosystems, where recreation activities and sustainable forest management will continue.

The Freetown Co-peace forest management project objectives are:

1. Demonstrate a two age silvicultural system and an irregular shelterwood system in eastern white pine stands that have various stages of advanced regeneration.

2. To showcase the sustainable production of wood through commercial timber harvesting operations by demonstrating the range of "excellent forestry" through the application of best management practices. There will be demonstration forest opportunities to educate landowners and the general public.

3. To provide a source of renewable forest products to support local economies.

4. To provide "in-kind services" to improve access to Haskal Path and to assist in rehabilitating an eroded slope adjacent to Rattlesnake Brook due to off-road vehicle use.

The area was selected for forest management at this time because:

1. Recent forest management through timber sales has resulted in forest structure that is conducive to implementing multi aged silvicultural systems.

2. Timber sale revenues and contractual requirements can be used to prevent and aid in the repair of damages from illegal off road vehicles (ORV).

3. Due to its juxtaposition in Freetown this project offers an excellent opportunity to demonstrate and fulfill objectives for DCR Woodlands.

These objectives are congruent with the natural resources and cultural resources goals of the Southeastern Massachusetts Bioreserve Management plan. The Bioreserve's mission is to protect, restore, and enhance the biological diversity and ecological integrity of a large-scale ecosystem with diverse natural communities representative of the region; to promote sustainable natural resource management; to permanently protect public water supplies and cultural resources; to offer interpretive and educational programs communicating the value and significance of the Bioreserve; and to provide opportunities for appropriate public recreational use and enjoyment of this natural environment. The forest management project will broaden

forest structural diversity as forests of varied structures and succession stages provide habitat for different plant and animal species, retain snags and tree cavities that provide wildlife values, and enhance wildlife attributes provided by mast producing vegetation. Creating habitat diversity, both horizontal and vertical will allow for greater biodiversity. In addition, maintaining working landscapes (forestry, agriculture) in the Bioreserve is a cultural resources goal (Bioreserve management plan 2003).

Silvicultural Prescription

Stand 1 is an even-aged eastern white pine stand that will be managed in two-aged classes for purposes of adding structural diversity (Kelty et. al. 2003). The majority of the large eastern white pine trees will be harvested (approximately 75%). Large tree distribution will be for the most part a dispersed distribution where individual trees are scattered across the stand area. An aggregate distribution may occur in areas with unique features, i.e. areas with large diameter trees, rocky outcrops, or patch of snags. Openings will not exceed 1/3 acre per the Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines. A set of reserve mature eastern white pine trees will be held for the entire rotation of the younger sapling age class. The retention of a subset of mature trees will retain habitat elements of the mature forest, lessen the visual impact of the shift in complete removal of overstory trees, and will retain trees to produce large diameter older trees (Kelty, unpublished). The reserve trees will provide a seed source. The timber harvest will demonstrate a shelterwood removal cut with reserves. This silvicultural method is a modification of even-aged methods. A shelterwood establishment cut was done in 2001 and has resulted in large amounts of eastern white pine saplings which are ready to be released. The overstory removal will take the eastern white pine down to a total stand level of approximately 20 ft^2 /acre. Approximately 20 trees per acre with an average dbh of 12.4 inches with fill the overstory after the proposed timber sale. Existing overstory oak trees will be saved to retain species diversity and for a hard mast source. Existing dead red pines will be removed if their location is near trails, skid trails, landings or other areas where they could pose a safety risk.

S2 will be managed to increase tree/shrub/herbaceous species and structural diversity by applying the irregular shelterwood system. The irregular shelterwood system is a silvicultural system based on small scale natural disturbances that over time produce horizontal diversity, e.g. patches or gaps of different age classes, and vertical diversity, e.g. multiple canopy layers. The irregular shelterwood system is compatible with ecosystem-based management in forest types driven by partial stand mortality and gap dynamics and provides opportunities for maintaining old-growth forest attributes. In the Northeast, irregular stands used to be an important landscape component and typically developed from partial stand mortality occurring in the absence of whole stand-replacing disturbances (Raymond et al. 2009).

One third (1/3) acre gaps or openings will be scattered throughout the stand. Areas within and bordering desired advanced regeneration will be considered as potential gaps. Depending on the existing structure of the future gaps, a mixture of small, medium, and large

trees of various species could be harvested to release existing regeneration. Size and shape of gaps will be determined by topography, stand structure, and exiting regeneration. Gap openings will not exceed 1/3 acre per the Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines. The 1/3 acre gaps should allow species of low and intermediate shade tolerance to become established (Kelty et al. 2003). The timber harvest will demonstrate an irregular shelterwood using the expanding gap variant. Existing oaks with large healthy crowns will be released from competing vegetation to help increase vigor to combat future insect infestations. Thinning will occur between group openings, and will favor the development of the more vigorous trees through their release from competition.

Both stands are generally less productive and less structurally diverse stands and therefore fall into the broad category of rehabilitation and improvement as discussed in Appendix 2 in the Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines. As stated in the guidelines, a combination of silvicultural systems that include even and uneven age methods will be used. These silvicultural systems are examples of creating diversity in structure and species composition in stands that are even-aged.

Desired and Expected Results

The openings in the overstory of S1 as a result of the proposed timber harvest will facilitate the growth and vigor of the eastern white pine saplings along with creating the opportunity for natural regeneration to occur. By retaining some of the mature trees, having a more vigorous understory, and increasing the potential for regeneration to take place, the complexity and species diversity should increase. The long term desired condition of S1 is having the young trees approach the height of the reserve trees. Future silvicultural treatments should be a patch cut to further progress the stand towards a two-aged structure and/or a thinning to encourage the growth of pines and oaks in the canopy. The retention of the subset of mature eastern white pine trees should be left as legacy trees (permanently leave). These legacy trees would serve as future late-successional structure as they are left to grow, develop into snags, fall over and become large downed logs (D'Amato and Catanzaro 2009). There is less concern for the windfirmness or vigor of a least some of the reserve trees because they will continue as habitat structure when they blow down or become snags (Kelty unpublished).

The long term desired condition of S2 is the presence of stems with mixed species, a range of age classes with a multiple layered structure. Future silvicultural treatments could increase existing gaps to further provide diversity, stability, and resilience. Over time multiple canopy layers, differences in tree sizes, multiple age classes, and various other old-growth characteristics in irregular shaped gaps could be found in the stand. The irregular shelterwood system allows one to manage on an ecosystem-based method to bring back the vertical and horizontal structural diversity once seen in northeast forests (Raymond et al. 2009). See stand tables for simulation of growth, mortality, and regeneration.

Several high conservation valued bird species that are part of the associated Important Bird Area, such as Eastern towhees and Prairie warblers, prefer more open canopy conditions. Most New England wildlife species use such habitat conditions at some time in the annual cycle (DeGraaf et al. 2006). The expected partial overstory canopy conditions of S2 along with developing shrub and midstory layers will promote habitat for such species as ruffed grouse and wild turkeys. Slash from the timber harvest operations provides low canopy hiding and nesting cover for songbirds and small mammals, such as hermit thrushes (*Catharus guttatus*) and rabbits. Slash also protects seedlings from browsing damage by deer when deer density exceeds levels where damage occurs. Removing existing competition from large living oak trees that have healthy crowns will help increase production of acorns for a variety of animals and lessen stress to increase vigor to help combat any future insect infestations.

The DFW review of potential wildlife habitat implications for the associated Forest Management Proposal encourages DCR to look towards a restoration of native sandplain/shrubland communities. Due to the sandy loams present in the Freetown / Fall River State Forest and as a way to promote biodiversity, restoration of native sandplain/shrubland communities may warrant consideration in future management projects. Native sandplain/shrubland communities provide high stem densities and can potentially provide habitat for the New England Cottontail (*Sylvilagus transitionalis*). No recent records for the New England Cottontail exist from the state forest. The DFW review does mention that until a more ecological assessment can be done, the proposed harvesting operations for eastern white pine with retention of legacy trees should conserve all options for alternative future management and could serve as a first step towards other forest management activities, e.g. the sandplain/shrubland restoration. In addition, the DFW review states that both stands are large enough to incorporate multiple shelterwood openings of 2 hectares (5 acres) or more. These large openings could be centered on existing areas of advanced regeneration. DFW recommended that wildlife brush piles be constructed as part of the timber harvesting operation with the slash generated by the timber harvesting operation using a machine to rake and gather material. These piles could be beneficial to the New England Cottontail. This operation however would not be consistent with conservation management practices for the Eastern Box turtle where mechanical scarification is restricted.

Due to large openings being seen as publicly controversial before the Forest Futures Visioning Process, size restrictions of openings created by timber harvesting operations within the Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines, as well as this proposed timber harvest being the first in the Southeast since the 2008 timber harvest moratorium, the recommendations by the Massachusetts Department of Fisheries and Wildlife will be considered for future forest management activities.

As stated in the Landscape Designations for DCR Parks & Forests: Selection Criteria and Management Guidelines, both stands will be inventoried within five years of the completed treatment using the stand level inventory system used to assess the stands prior to treatment. Post

treatment stand examination/monitoring will measure the same attributes so as to track the results of the forest management objectives.

Slope Rehabilitation

To the northwest of S1 is a steep sloped area that has had extensive illegal off-highway vehicle use, and has resulted in large amounts of sediment being transported down slope and being deposited into Rattlesnake Brook. The department of Conservation and Recreation acknowledges the severity of the erosion, its damage to the forest, and looks to rehabilitate the slope.

The rehabilitation project's main objectives will be to: 1. stop illegal activity on the slope; and 2. stabilize and rehabilitate the slope. In order to prohibit access, the area will need physical barriers to deter people from accessing the area. Selective felling and interlocking of logs at entry points nearby will establish obstacles for people trying to access the area. In addition, boulders will be brought to further discourage use. Signs will be posted to bring awareness to this fragile site and that access is being denied in order for it to be rehabilitated. Patrols by DCR rangers, Environmental Police, and park staff will be required to ensure continued exclusion. Joint "sting" operations with the issuance of citations and fines will be pursued by the Department.

The stabilization of the slope will come from placing stumps, root wads, slash, and soil into the formed gullies. If deemed necessary, log terraces will be built to further hold back and stabilize the slope. The large material will anchor the slash and soil and provide a growing surface in which native plants could take root. Native plants in a variety of forms and patterns will be planted. As the existing organic layer is naturally thin on the slope it will take time for the slope to be fully vegetated (Nick Wildman, personal communication, January 7, 2013).

DCR has taken steps towards the rehabilitation of the slope by having this rehabilitation project selected by the Student Conservation Association of Massachusetts as one of their 2013 conservation projects. DCR will reach out to fellow Southeastern Massachusetts Bioreserve partners to fully implement and complete a rehabilitation project. DCR is also committed to use funds from fines of illegal OHV use in carrying out the project.

In-kind services from the proposed timber sale will assist in providing materials, supplies, or machinery, if deemed needed, as part of a rehabilitation project. The local motorcycle user group (e.g. Pilgrim Sands Trail Riders) will be asked to be part of the rehabilitation project. Other illegal trails, trails not shown on the 2012 Freetown/Fall River State Forest Trail Map, within or near the timber harvest operations will be blocked by felling trees along and across the trails. Access to the eroded slope area from skid trails will be discouraged by working from back to front of the stand and blocking off skid trails in several places as work is completed.

Harvest Methods and Sale Layout

S1 will require a cut-to-length harvesting system coupled with forwarders to reduce harm to the young eastern white pine sapling age class. Haskal Path will need to be widened, as it was in the 2001 timber harvest. Haskal Path will require some amount of road work to stabilize side banks and to level existing dips. This will provide future emergency and park access that is currently limited due to its poor condition. Haskal Path will be the main entrance and exit route for the eastern sub-unit. Two landings will be used as in the 2001 timber harvest and will use similar areas. The skid roads used in the 2001 timber harvest will be utilized whenever possible to lower the amount of residual stand damage. All stone features including stone walls will be avoided during harvest operations. These limitations conform to cultural resource protection limitations by DCR's archeologist. The cut-to-length harvesting system will keep limbs and tops in the state forest as whole tree harvesting will not be allowed. This will augment the existing coarse woody debris amounts mentioned in the Wildlife section above.

S2 will have two landings, one on each end of the stand to limit the length of internal skid trails. Use of Makepeace Road will be encouraged to lessen repeated use of internal skid trails. Signs will be displayed to close the sale area during timber harvesting operations and encourage travelers to use Hathaway Road to traverse through the forest. Makepeace Road will be graded if damage, e.g. ruts, has occurred from timber harvesting operations.

Existing legal trails, trails shown on the 2012 Freetown/Fall River State Forest Trail Map, will have 50' wide corridors where timber harvesting activities will be designed to promote native diverse vegetation, large-diameter trees, and forest structures, forest health, a safe recreation experience, and quality scenery. Timber harvesting operations will be conducted on frozen or otherwise stable ground from December 1st to March 30th to comply voluntarily with the conservation management practices for Eastern Box turtle. Frozen or otherwise stable ground will help stabilize the soils and limit rutting during operations. Landings and main skid roads will be stabilized, graded, and planted to appropriate native seed mixtures at the end of operations. Signs will be posted to notify the public that legal trails will be closed during harvesting operations. Seasonal motorcycle use is from May thru November.

Prescription Documentation

Timber Marking Guidelines

Tree marking is a management tool that allows foresters to achieve multiple benefits, such as maintaining an aesthetic appearance, providing habitat for wildlife, and maintaining and creating structural diversity. Trees will be designated for removal with the "Take Tree" marking method. Trees to be cut and/or removed will be marked/painted at breast height and stump. All other trees will be retained.

Sawtimber with be marked with a horizontal line around the bole in blue paint. Firewood and pulp will be marked with a vertical line on a least two sides in blue paint. Trees less than 5 inches in diameter at breast height to be cut will be marked with a blue dot. The boundary of the forest management project will be marked by three diagonal stripes in blue paint. Boundary

trees will be cut. All trees to be cut will have a stump mark in blue paint. The stump mark is to ensure only marked trees are being cut. Proposed skid trails will be marked with a vertical line in red paint, signifying the centerline of the skid trail. Bumper trees will be marked with a "B" in red paint. Trees that pose a hazard, e.g. a dead tree along a trail, will be marked with a blue "H" and will be removed. Trees to be saved for wildlife will be marked with a "W" with white paint to unsure their protection throughout harvesting operations.

For S1, approximately 20 trees per acre will be retained, spread uniformly across the stand. Trees with large crowns, good vigour, and low mortality risk will be chosen for retention. These trees will generally contribute to the future structure and quality of the stand by providing future mast and seed for regeneration. Existing snags, wildlife trees, and less common species, will be retained as well.

S2 will have 1/3 acre openings scattered throughout the stand. Light conditions, existing regeneration, bordering regeneration, size classes, species mix, topography, and stand structure will determine where opening will occur and which trees in the openings will be cut. Thinning will occur between openings, and will favor the development of the more vigorous trees through their release from competition.

Stand 1

2013 – Overstory Existing Conditions

Name	Value
Average DBH (in)	15.01
Basal Area (sq.ft/ac)	115.83
Basal Area of AGS (sq.ft/ac)	80.83
Basal Area of UGS (sq.ft/ac)	35.0
Canopy Closure (% closure)	49.6
Net Board-foot Volume (bd.ft/ac)	6,201.66
Net Cord Volume (cords/ac)	23.09
Net Tons (tons/ac)	46.17
Quadratic Mean DBH (in)	13.71
Merchantable Quadratic DBH (in)	13.89
Relative Density (%)	39.54
Stems Per Unit Area (stems/ac)	123.13

Stand 2

2013 – Overstory Existing Conditions

Name	Value
Average DBH (in)	10.85
Basal Area (sq.ft/ac)	140.53
Basal Area of AGS (sq.ft/ac)	70
Basal Area of UGS (sq.ft/ac)	70.53
Canopy Closure (% closure)	68.9
Net Board-foot Volume (bd.ft/ac)	6,124.55
Net Cord Volume (cords/ac)	28.42
Net Tons (tons/ac)	56.83
Quadratic Mean DBH (in)	11.59
Merchantable Quadratic DBH (in)	11.93
Relative Density (%)	54.29
Stems Per Unit Area (stems/ac)	202.07

2013 – Understory Existing Conditions

Name	Value
Average DBH (in)	1.29
Basal Area (sq.ft/ac)	36.51
Quadratic Mean DBH (in)	1.40
Relative Density (%)	99.43
Stems Per Unit Area (stems/ac)	10,183

2013 – Understory Existing Conditions

Name	Value
Average DBH (in)	2.15
Basal Area (sq.ft/ac)	15.48
Quadratic Mean DBH (in)	2.31
Relative Density (%)	28.14
Stems Per Unit Area (stems/ac)	1,605

Overstory Conditions Immediate Post Harvest

Name	Value
Average DBH (in)	12.43
Basal Area (sq.ft/ac)	20
Basal Area of AGS (sq.ft/ac)	16.26
Basal Area of UGS (sq.ft/ac)	3.73
Canopy Closure (% closure)	8.0
Net Board-foot Volume (bd.ft/ac)	1,260.46
Net Cord Volume (cords/ac)	4.71
Net Tons (tons/ac)	9.42
Quadratic Mean DBH (in)	12.86
Merchantable Quadratic DBH (in)	13.74
Relative Density (%)	8
Stems Per Unit Area (stems/ac)	20.45

Overstory Conditions Immediate Post Harvest

Name	Value
Average DBH (in)	10.83
Basal Area (sq.ft/ac)	101.73
Basal Area of AGS (sq.ft/ac)	57.23
Basal Area of UGS (sq.ft/ac)	44.50
Canopy Closure (% closure)	44.9
Net Board-foot Volume (bd.ft/ac)	4,916
Net Cord Volume (cords/ac)	23.12
Net Tons (tons/ac)	46.25
Quadratic Mean DBH (in)	11.61
Merchantable Quadratic DBH (in)	11.87
Relative Density (%)	44.92
Stems Per Unit Area (stems/ac)	145.87

Understory Conditions Immediate Post Harvest

Name	Value
Average DBH (in)	1.37
Basal Area (sq.ft/ac)	40.45
Quadratic Mean DBH (in)	1.48
Relative Density (%)	106.06
Stems Per Unit Area (stems/ac)	10,045

Understory Conditions Immediate Post Harvest

Name	Value
Average DBH (in)	2.15
Basal Area (sq.ft/ac)	14.88
Quadratic Mean DBH (in)	2.29
Relative Density (%)	27.41
Stems Per Unit Area (stems/ac)	1,566

2033 – Overstory Conditions after 20 years Growth, Mortality and Regeneration

Name	Value
Average DBH (in)	8.80
Basal Area (sq.ft/ac)	141.01
Basal Area of AGS (sq.ft/ac)	134.26
Basal Area of UGS (sq.ft/ac)	6.74
Canopy Closure (% closure)	57.1
Net Board-foot Volume (bd.ft/ac)	2,503.22
Net Cord Volume (cords/ac)	18.86
Net Tons (tons/ac)	37.71
Quadratic Mean DBH (in)	9.36
Merchantable Quadratic DBH (in)	14.11
Relative Density (%)	76.82
Stems Per Unit Area (stems/ac)	631.96

2033 – Overstory Conditions after 20 years Growth, Mortality and Regeneration

Name	Value
Average DBH (in)	12.32
Basal Area (sq.ft/ac)	135.60
Basal Area of AGS (sq.ft/ac)	79.01
Basal Area of UGS (sq.ft/ac)	56.59
Canopy Closure (% closure)	55.62
Net Board-foot Volume (bd.ft/ac)	7,373.41
Net Cord Volume (cords/ac)	32.61
Net Tons (tons/ac)	65.22
Quadratic Mean DBH (in)	13.32
Merchantable Quadratic DBH (in)	13.78
Relative Density (%)	55.61
Stems Per Unit Area (stems/ac)	147.15

2033 – Understory Conditions after 20 years Growth, Mortality and Regeneration

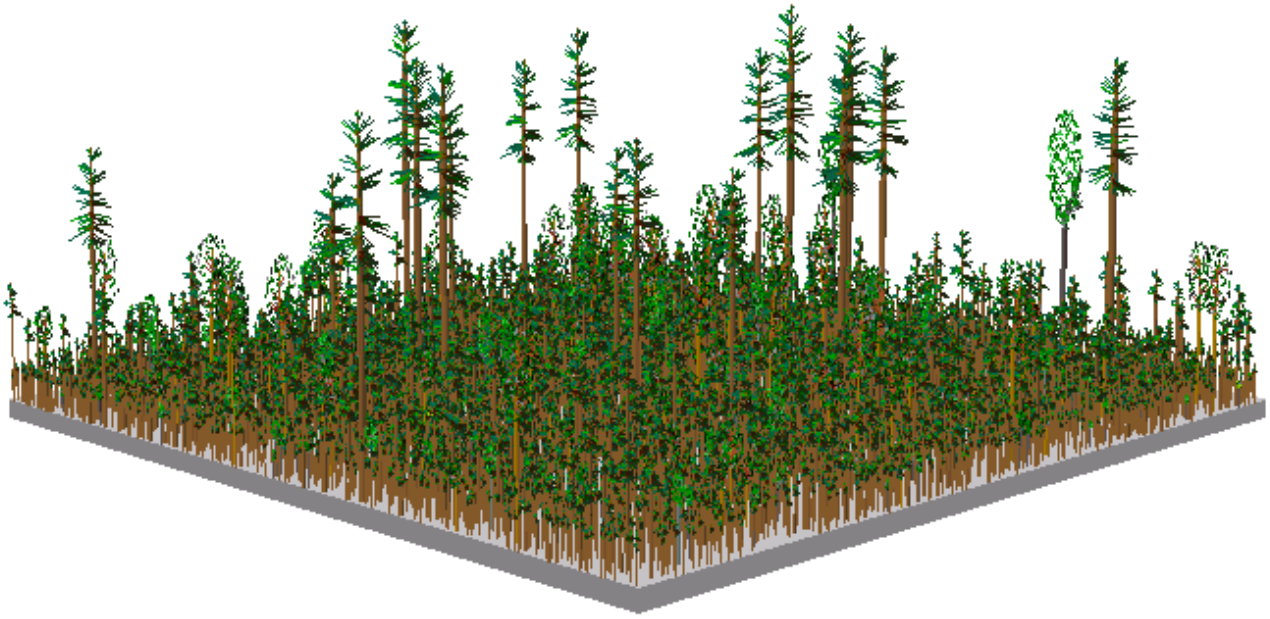
Name	Value
Average DBH (in)	2.11
Basal Area (sq.ft/ac)	166.91
Quadratic Mean DBH (in)	2.31
Relative Density (%)	254.98
Stems Per Unit Area (stems/ac)	8,034.12

2033 – Understory Conditions after 20 years Growth, Mortality and Regeneration

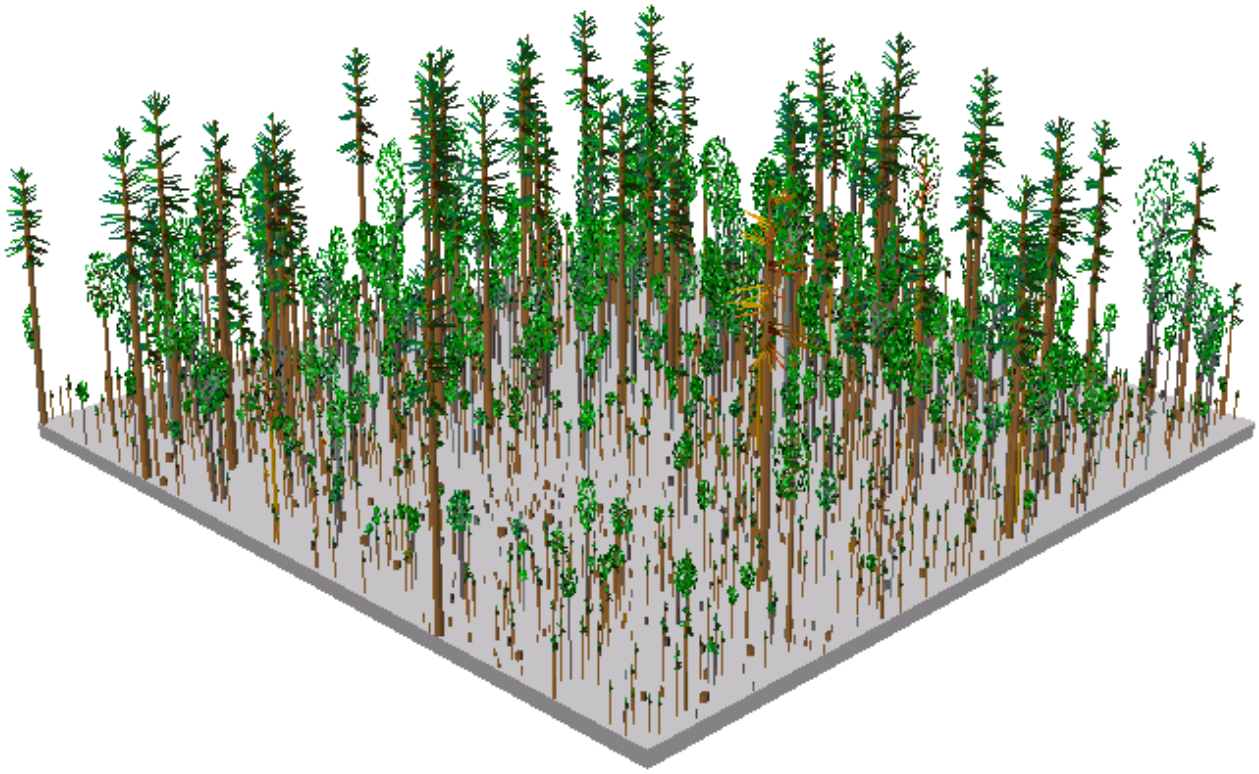
Name	Value
Average DBH (in)	2.44
Basal Area (sq.ft/ac)	22.76
Quadratic Mean DBH (in)	2.58
Relative Density (%)	40.55
Stems Per Unit Area (stems/ac)	1,111.93

Visualization of projected results

Stand Visualization System graphic depicting immediate (2013) post harvest stand S1 conditions. Simulation based on 2012 inventory data.

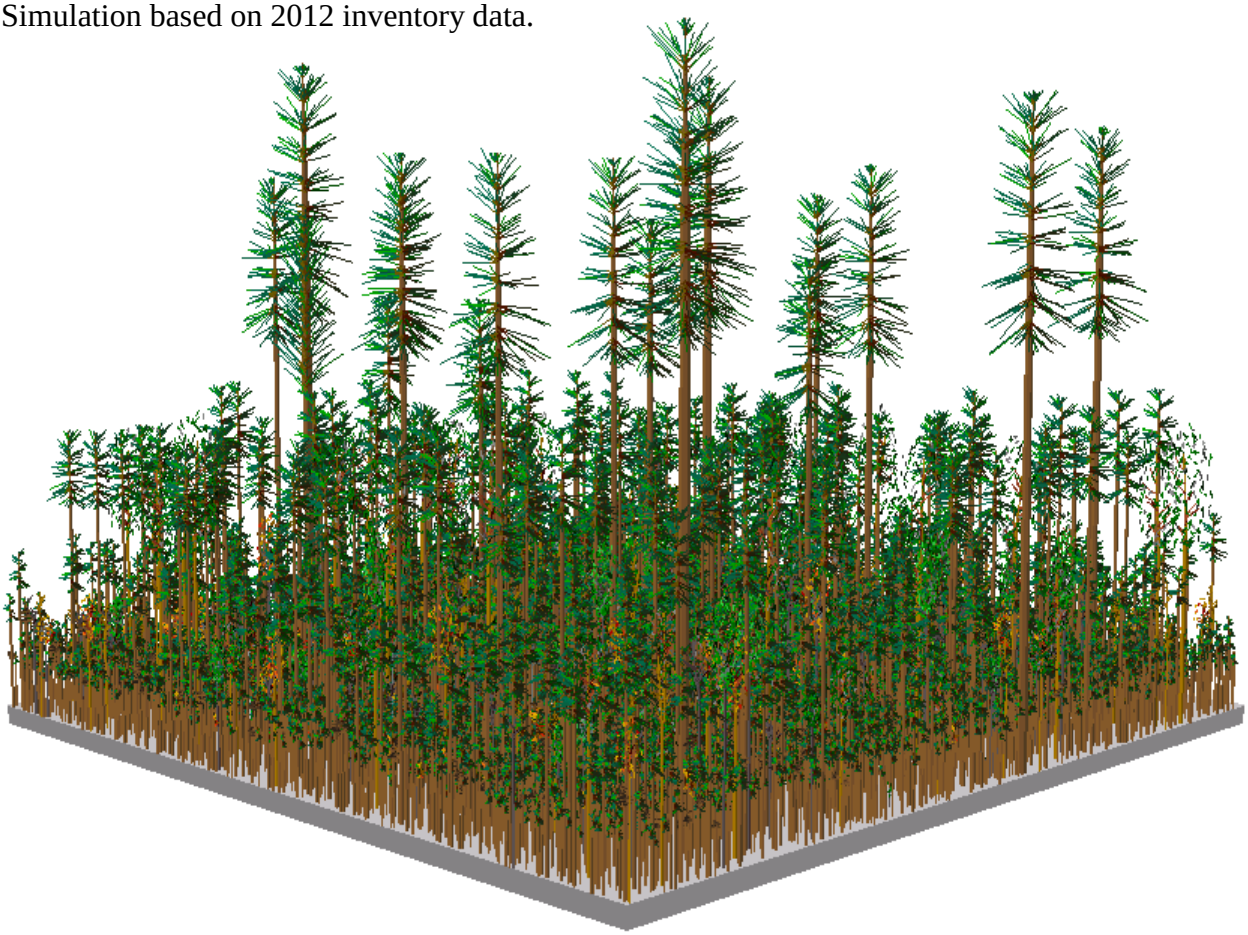


Stand Visualization System graphic depicting immediate (2013) post harvest stand S2 conditions. Simulation based on 2012 inventory data.

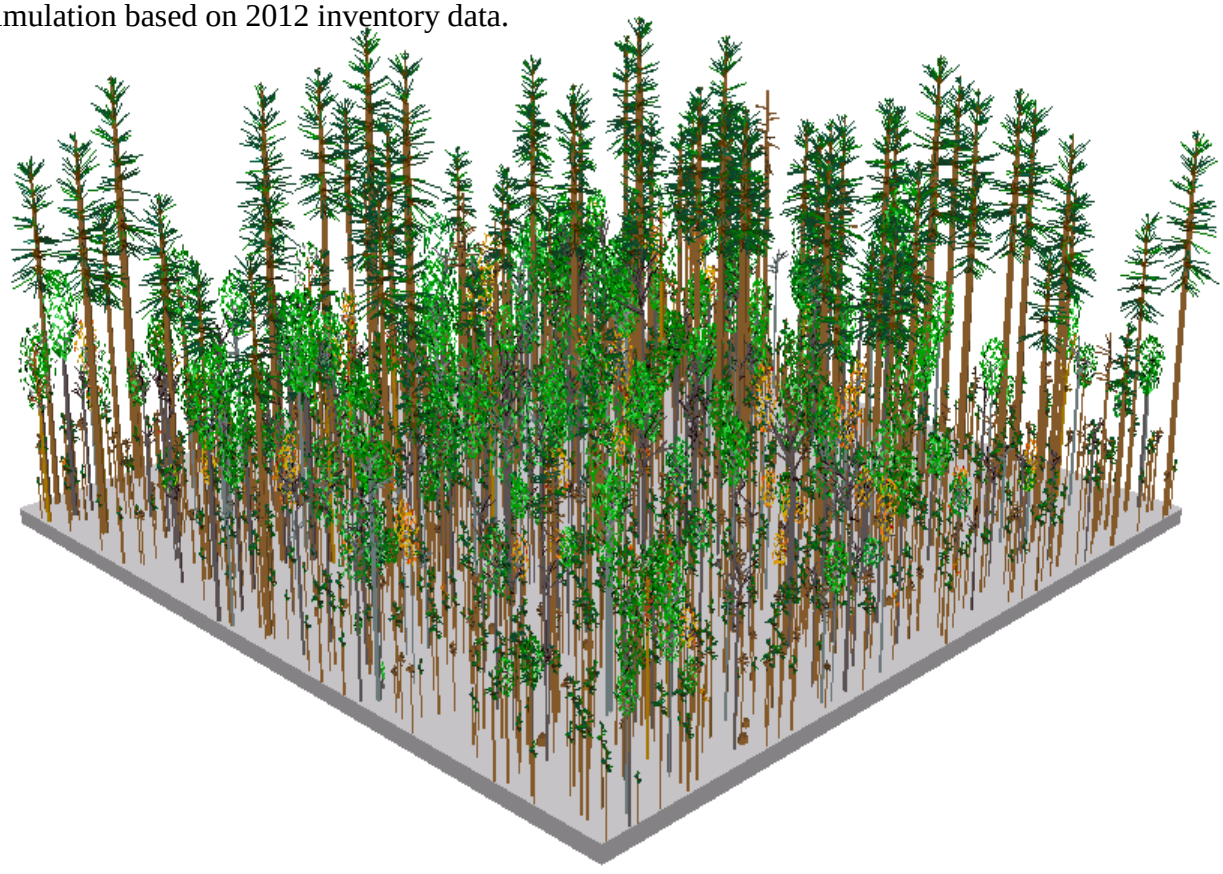


Visualization of projected results

Stand Visualization System graphic depicting 20 year (2033) post harvest stand S1 conditions. Simulation based on 2012 inventory data.

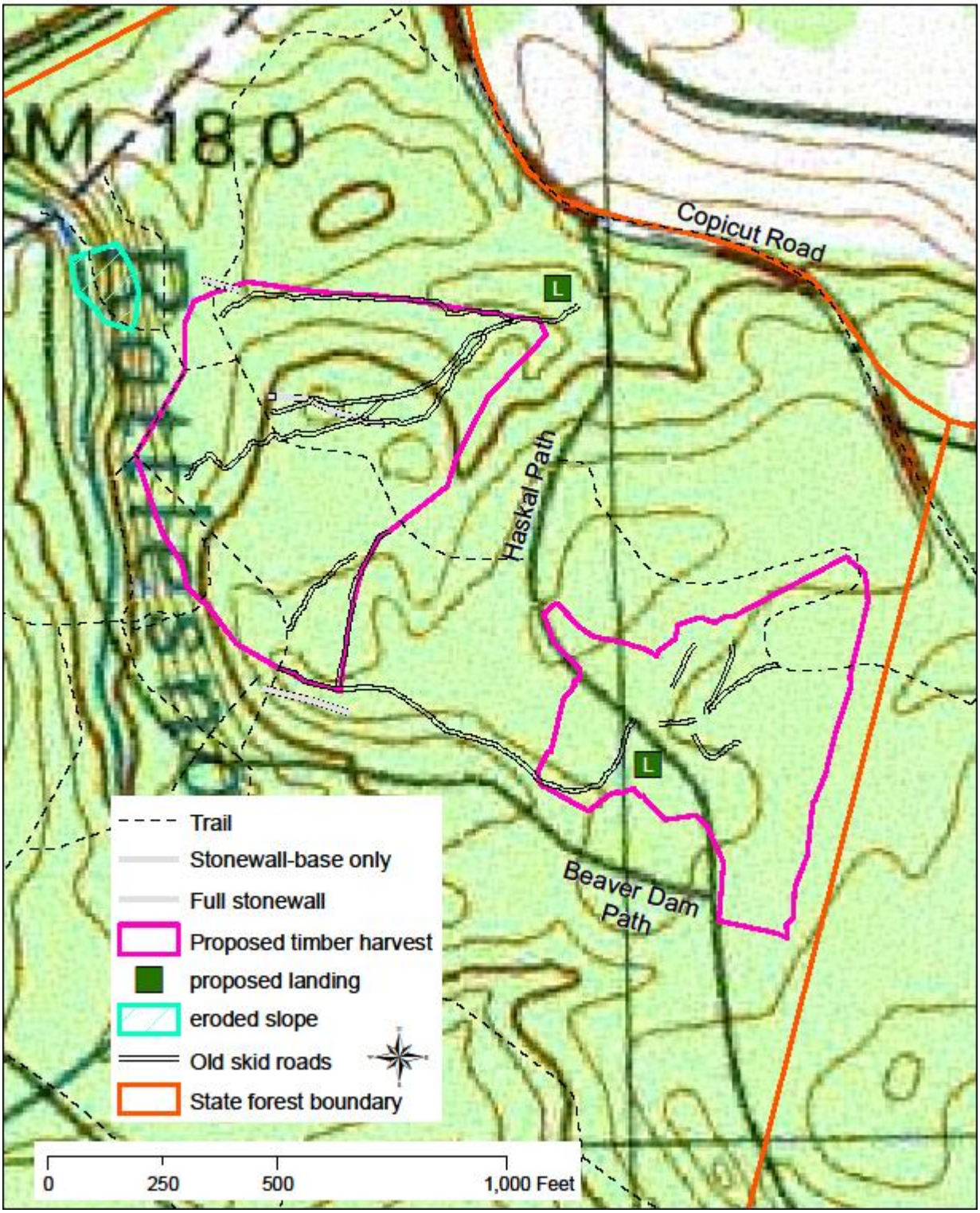


Stand Visualization System graphic depicting 20 year (2033) post harvest stand S2 conditions. Simulation based on 2012 inventory data.

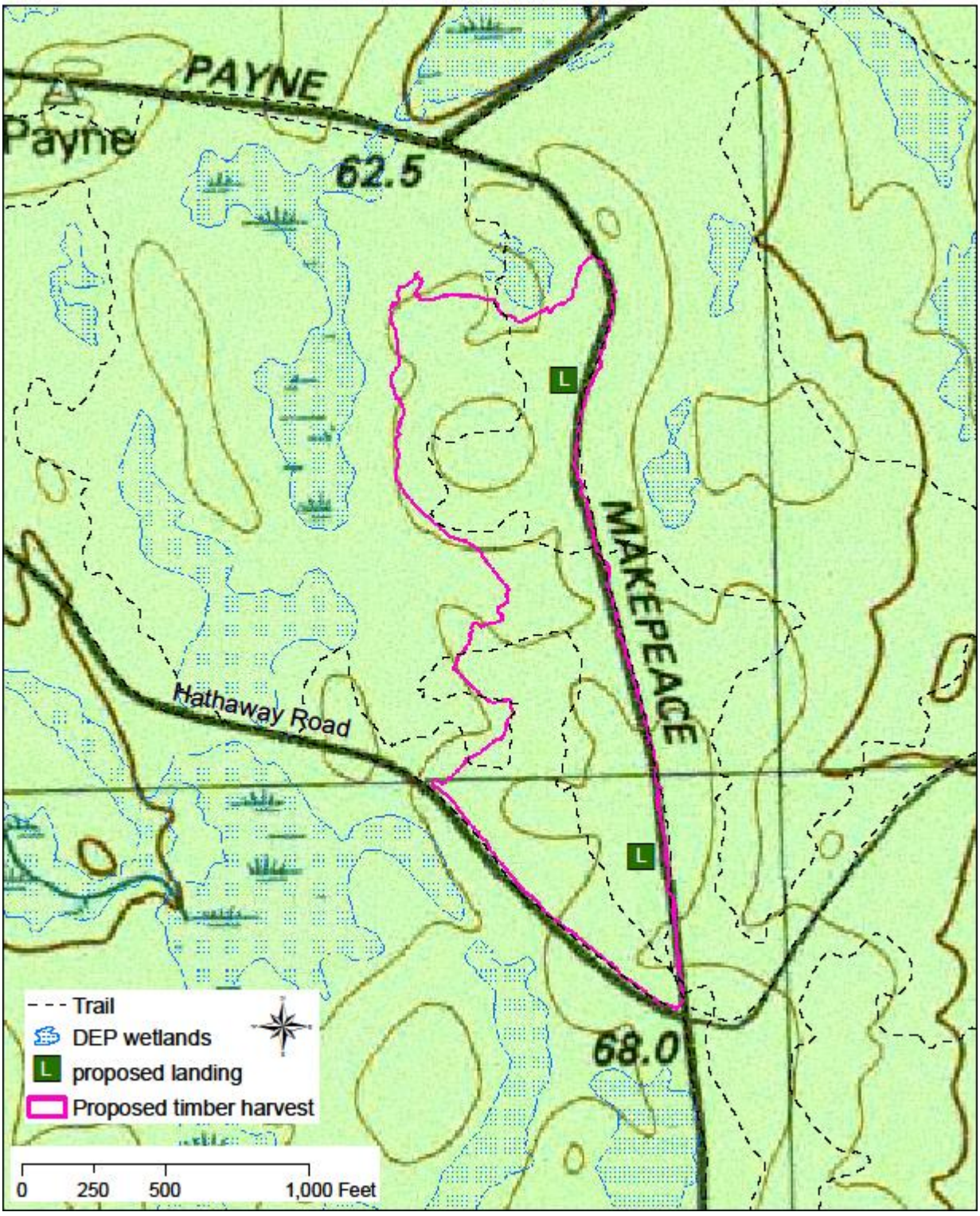


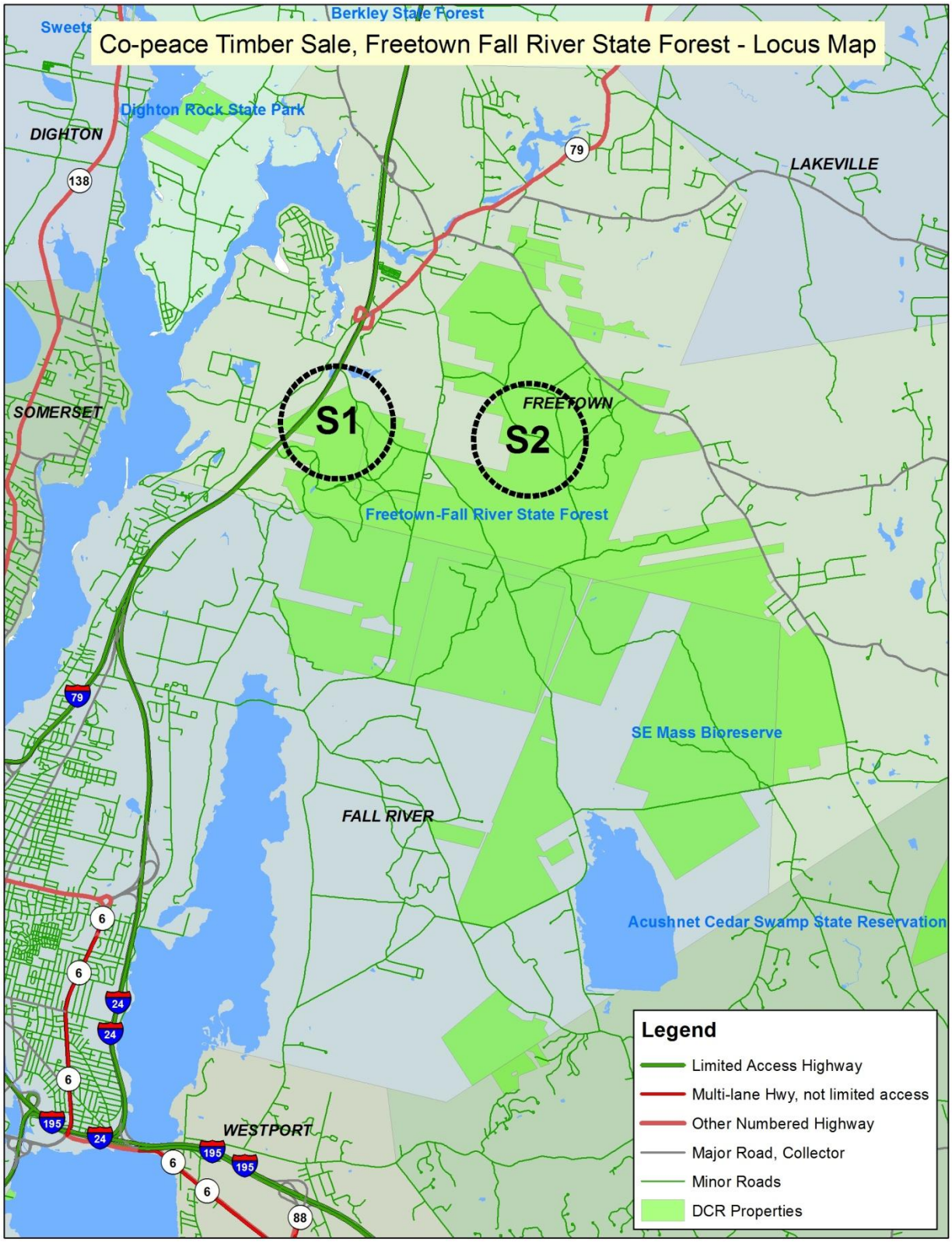
Proposed Timber Harvest

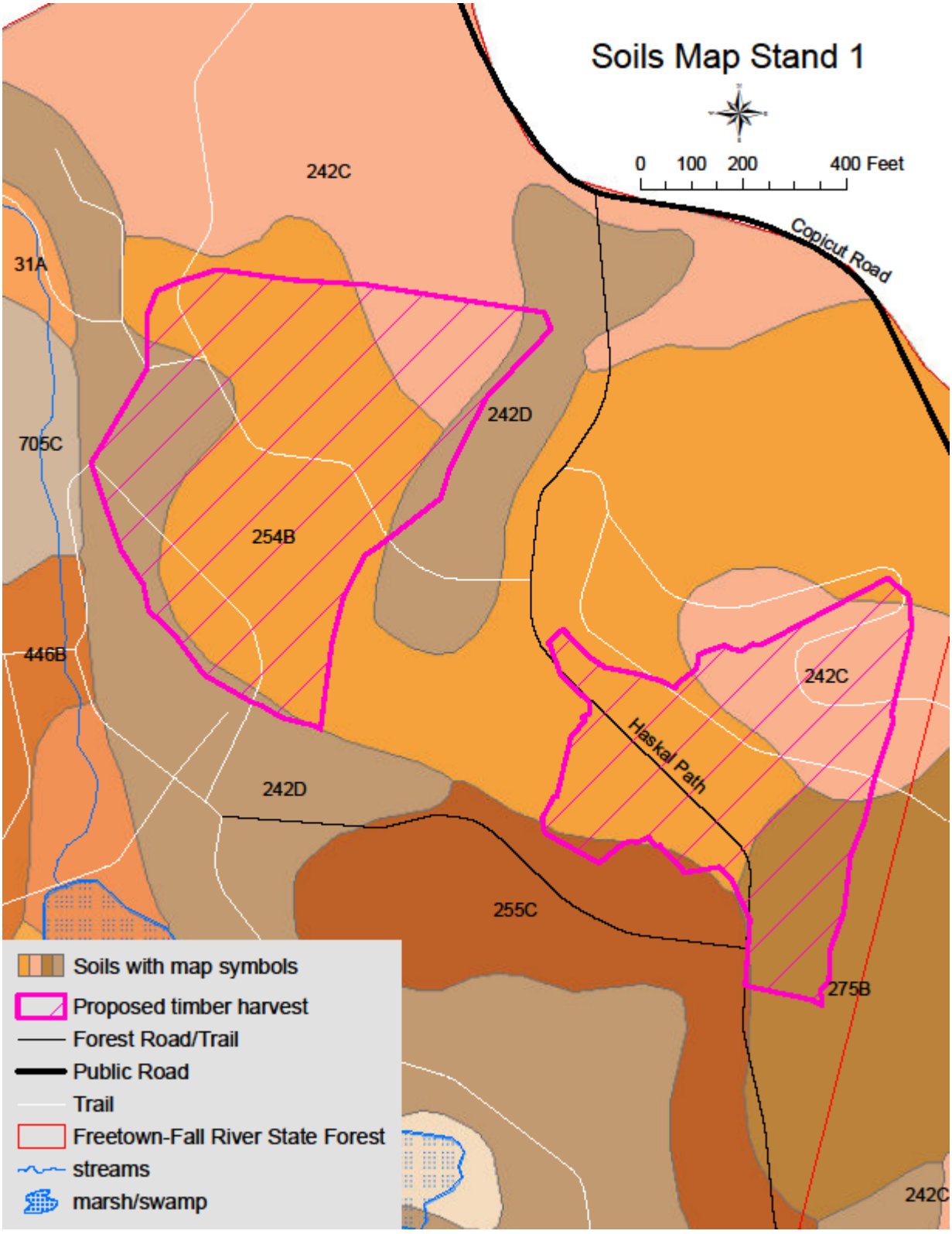
Proposed Timber Harvest S1

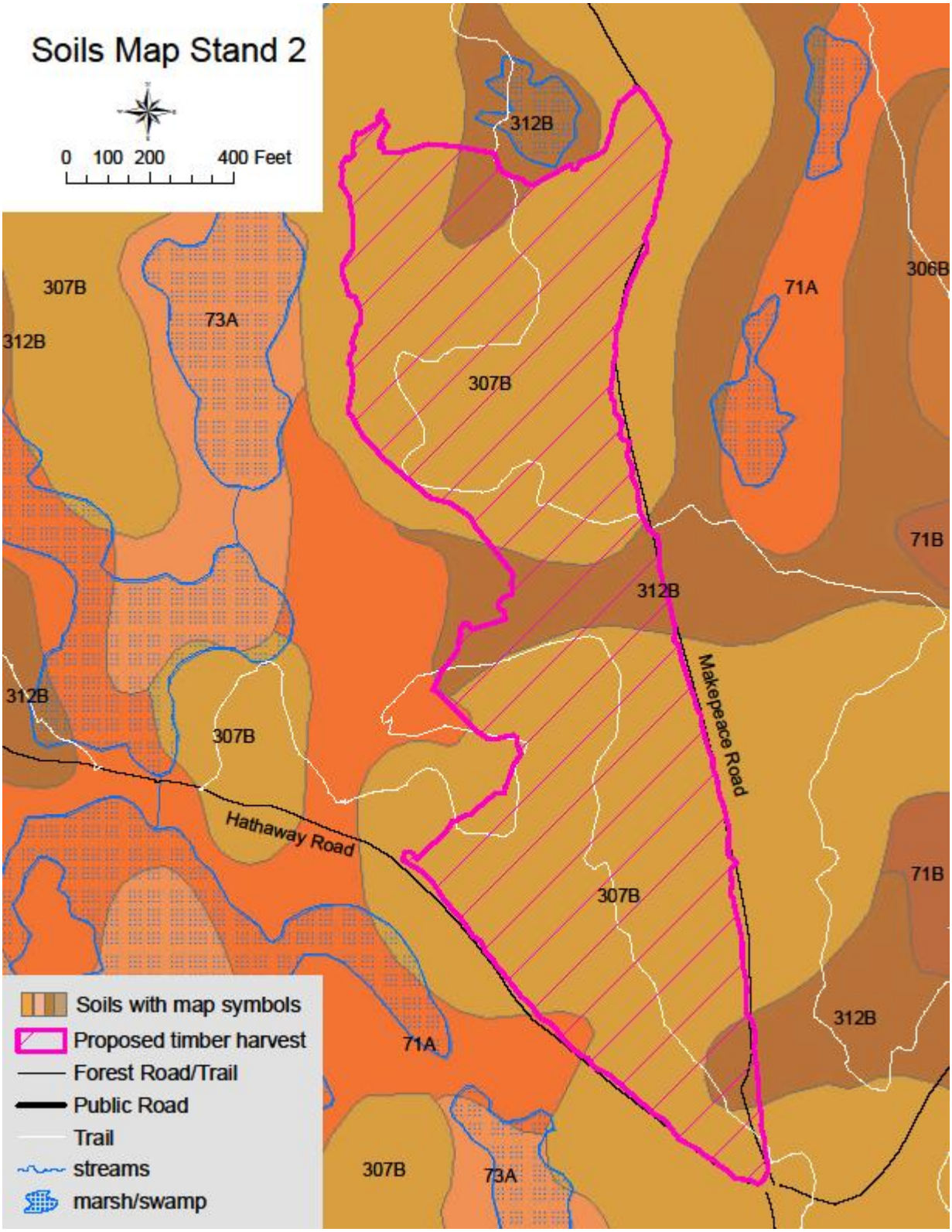


Proposed Timber Harvest S2




Co-peace Timber Sale, Freetown Fall River State Forest - Locus Map
Berkley State Forest
Dighton Rock State Park
DIGHTON
LAKEVILLE
SOMERSET
FREETOWN
S1
S2
Freetown-Fall River State Forest
SE Mass Bioreserve
FALL RIVER
Acushnet Cedar Swamp State Reservation
WESTPORT
138
79
6
24
195
88
Legend
Limited Access Highway
Multi-lane Hwy, not limited access
Other Numbered Highway
Major Road, Collector
Minor Roads
DCR Properties


Soils Map Stand 1
0 100 200 400 Feet
Copicut Road
Haskal Path
242C
31A
242D
705C
254B
446B
242C
242D
255C
275B
242C
Soils with map symbols
Proposed timber harvest
Forest Road/Trail
Public Road
Trail
Freetown-Fall River State Forest
streams
marsh/swamp


Soils Map Stand 2
0 100 200 400 Feet
312B
307B
73A
71A
306B
307B
71B
312B
312B
307B
Makepeace Road
Hathaway Road
307B
71B
71A
312B
307B
73A
Soils with map symbols
Proposed timber harvest
Forest Road/Trail
Public Road
Trail
streams
marsh/swamp

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