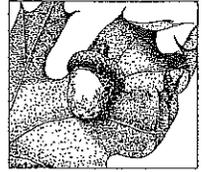


dcrc



# FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation  
For enrollment in CH61/61A/61B and/or Forest Stewardship Program



CHECK-OFFS						Administrative Box			
CH61 cert. <input type="checkbox"/>	CH61A cert. <input type="checkbox"/>	CH61B cert. <input type="checkbox"/>	STWSHP new <input checked="" type="checkbox"/>	C-S EEA <input checked="" type="checkbox"/>	Case No. <u>214,9731</u>	Orig. Case No. <u>- New</u>	Owner ID <u>503169</u>	Add. Case No. _____	
recert. <input type="checkbox"/>	recert. <input type="checkbox"/>	recert. <input type="checkbox"/>	renew <input type="checkbox"/>	Other <input type="checkbox"/>	Date Rec'd <u>5.2.13</u>	Ecoregion <u>221ae</u>	Plan Period <u>2014-2023</u>	Topo Name <u>Ehamp</u>	
amend <input type="checkbox"/>	amend <input type="checkbox"/>	amend <input type="checkbox"/>	Green Cert <input checked="" type="checkbox"/>	Conservation Rest. <input type="checkbox"/>	Rare Sp. Hab. <u>Yes</u>	River Basin <u>Mill</u>	Plan Change: _____ to _____		
			CR Holder _____						

## OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) The City of Northampton, Department of Public Works,\* "ROBERTS MEADOW"  
 Mailing Address 125 Locust Street, Northampton, MA, 01060 Phone (413) 587-1376

Property Location: Town(s) NORTHAMPTON Road(s) \*\*

Plan Preparer Michael Mauri, Forester Mass. Forester License # 161  
 Mailing Address 20 West Street, South Deerfield, MA 01373 Phone (413) 665-6829

## RECORDS

Assessor's Map No.	Lot/Parcel No.	Deed Book	Deed Page	Total Acres	Ch61/61A 61B Excluded Acres	Ch61/61A 61B Certified Acres	Stewshp Excluded Acres	Stewshp Acres
<u>SEE</u>	<u>NEXT</u>	<u>PAGE</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
TOTALS				<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>

Excluded Area Description(s) (if additional space needed, continue on separate paper)  
 None

**HISTORY** Year acquired ca. 1900 Year management began ca. 1930

Are boundaries blazed/painted? Yes  No  Partially

What treatments have been prescribed, but not carried out (last 10 years if plan is a recert.)?

stand no. N/A treatment \_\_\_\_\_ reason \_\_\_\_\_  
 (if additional space needed, continue on separate page)

Previous Management Practices (last 10 years)

Stand #	Cutting Plan #	Treatment	Yield	Value	Acres	Date
<u>N/A</u>	<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>_____</u>

Remarks: (if additional space needed, continue on separate page)

\*Attention Nicole Sanford, Senior Environmental Scientist; \*\*Chesterfield, Sylvester, Kennedy and Reservoir Roads

### Landowner Goals

Please **check** the column that best reflects the importance of the following goals:

Goal	Importance to Me			
	High	Medium	Low	Don't Know
Enhance the Quality/Quantity of Timber Products*	X			
Generate Immediate Income		X		
Generate Long Term Income	X			
Produce Firewood			X	
Defer or Defray Taxes			X	
Promote Biological Diversity	X			
Enhance Habitat for Birds		X		
Enhance Habitat for Small Animals		X		
Enhance Habitat for Large Animals		X		
Improve Access for Walking/Skiing/Recreation			X	
Maintain or Enhance Privacy			X	
Improve Hunting or Fishing			X	
Preserve or Improve Scenic Beauty			X	
Protect Water Quality	X			
Protect Unique/Special/ Cultural Areas	X			
Attain Green Certification	X			
Other:				

\*This goal must be checked "HIGH" if you are interested in classifying your land under Chapter 61/61A.

In your own words, describe your goals for the property:

Promote and sustain a diverse, healthy and vigorous forest, and maintain associated infrastructure in good operating condition, so that the primary goal of water quality protection, and secondary goals of long-term timber revenue and habitat diversity are served.

### Stewardship Purpose

By enrolling in the Forest Stewardship Program and following a Stewardship Plan, I understand that I will be joining with many other landowners across the state in a program that promotes ecologically responsible resource management through the following actions and values:

1. Managing sustainably for long-term forest health, productivity, diversity, and quality.
2. Conserving or enhancing water quality, wetlands, soil productivity, carbon sequestration, biodiversity, cultural, historical and aesthetic resources.
3. Following a strategy guided by well-founded silvicultural principles to improve timber quality and quantity when wood products are a goal.
4. Setting high standards for foresters, loggers and other operators as practices are implemented; and minimizing negative impacts.
5. Learning how woodlands benefit and affect surrounding communities, and cooperation with neighboring owners to accomplish mutual goals when practical.

Signature(s): Edward S. Huntley

Date: 4/30/13

Owner(s) (print) Edward S. Huntley

(This page will be included with the completed plan.)

Page \_\_\_\_\_ of \_\_\_\_\_

Property Overview:  
Roberts Meadow Tracts  
Land of City of Northampton DPW  
Reservoir, Chesterfield, Sylvester and Kennedy Roads,  
Northampton, MA

Landscape/Regional Context

**The local pattern of land use** is mainly forested or agricultural, with nearby sand and gravel quarrying, grassland and row-crop farming, maple sugaring, with residential development occurring over recent decades. These parcels fall mostly within the watershed of the Roberts Meadow Reservoirs, which served until 1960 as the back-up drinking water system for the City of Northampton. Other local uses are forestry/logging, hunting, snowmobiling, hiking and cross-country skiing, as well as off-road vehicle use. This parcel is near other Department of Public Works (DPW) watershed land (the Kingsley farm parcel, which is located in Westhampton and is covered under a separate Forest Stewardship Plan), other land protected by the City of Northampton (Mineral Hills, Sawmill Hills, and Roberts Hill Conservation Areas) and protected private land (e.g. Marble Brook Conservation Restriction).

**Distinguishing or special features include:** These parcels include three surface water reservoirs that historically served as the back-up water supply for the City of Northampton. This system captures in-flow from Roberts Meadow and Marble Brooks. Most of the acreage is occupied by a mix of tall forest types (see discussion of forest types below) interspersed by shallow marsh and other wetland habitats adjoining the former channel of Roberts Meadow Brook. There are a number of vernal pools. With one minor exception, there are no public trails on the property (the exception is the trail across from Musante Beach that leads to the Roberts Hill Conservation Area). The main, authorized recreational use is Musante Beach (at the Lower Reservoir), a popular destination for local residents.

Property Overview

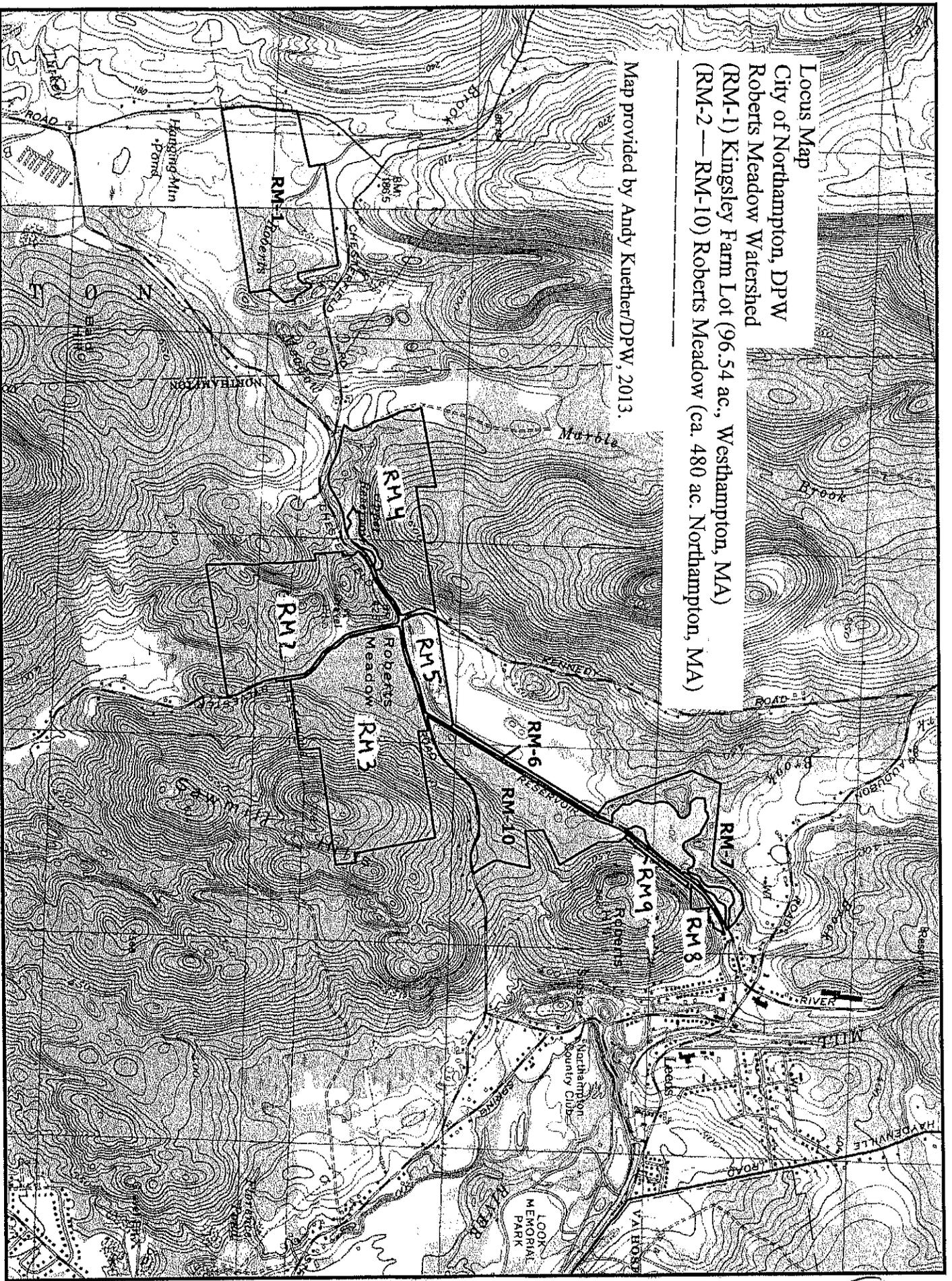
The property is comprised of six tax parcels. There is significant road frontage (ca. 5.75 miles) on Sylvester, Chesterfield, Kennedy and Reservoir Roads. The property location is shown on the Locus Map and on the Stand Locator Map.

A geographic information system (GIS) calculation of the acreage prepared by DPW GIS staff arrived at a total of 480.02 acres for the parcels covered by this plan. Of that total, 28.51 acres are the surface of the three reservoirs. The City of Northampton Assessors list the total acreage as 462.23 acres. This discrepancy is not a concern.

This plan uses the GIS acreage total (ca. 480 acres) and covers a total of 441 acres of upland forest and affiliated wetland and work/access areas to be enrolled in DCR's Forest Stewardship Program and Green Certification Programs. The remaining 39 acres were excluded from this plan. Of these 39 acres, approximately 28.5 are water, with another 10.5 acres of beach, grass,

Locus Map  
City of Northampton, DPW  
Roberts Meadow Watershed  
(RM-1) Kingsley Farm Lot (96.54 ac., Westhampton, MA)  
(RM-2 — RM-10) Roberts Meadow (ca. 480 ac. Northampton, MA)

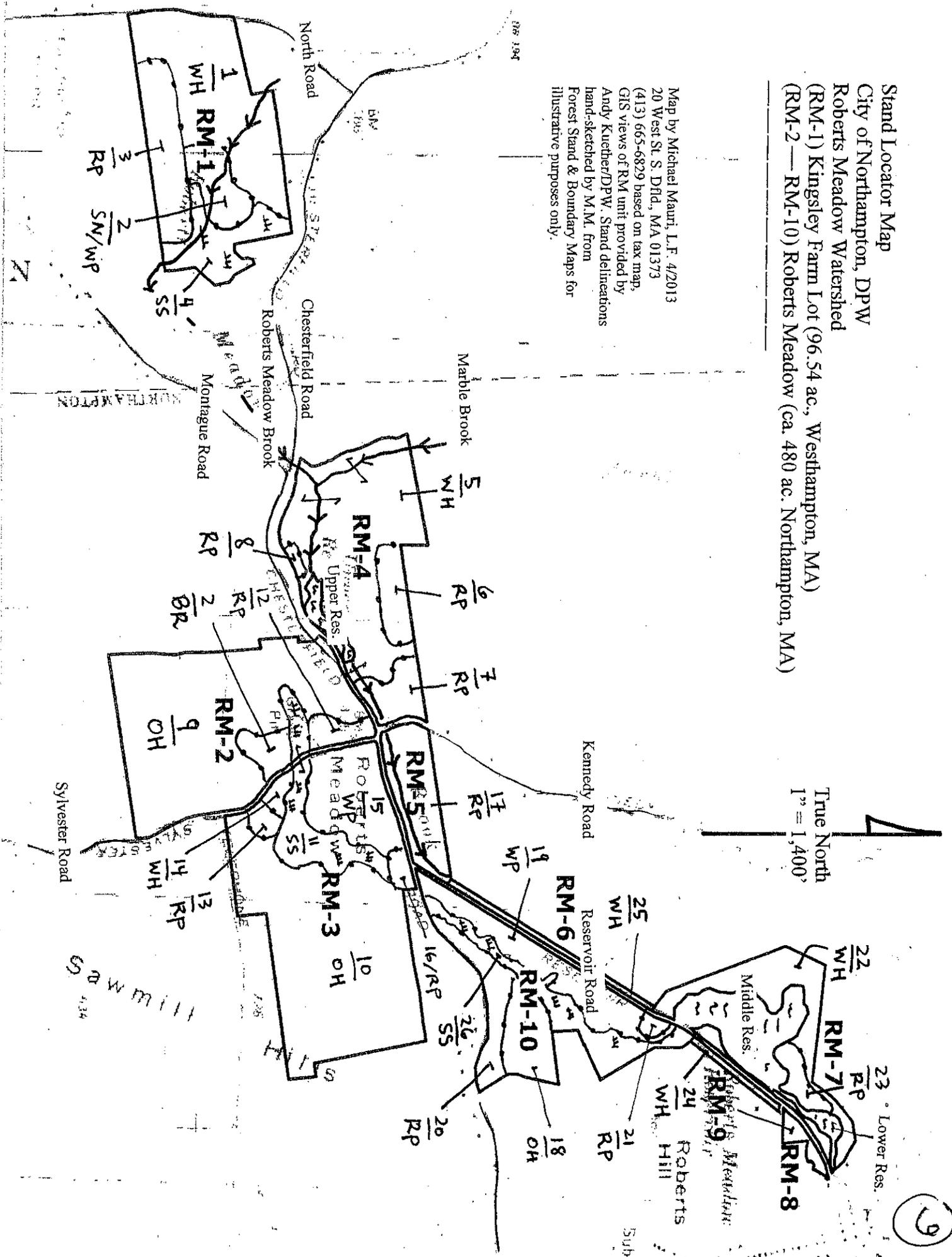
Map provided by Andy Kuether/DPW, 2013.



Stand Locator Map

City of Northampton, DPW  
 Roberts Meadow Watershed  
 (RM-1) Kingsley Farm Lot (96.54 ac., Westhampton, MA)  
 (RM-2 — RM-10) Roberts Meadow (ca. 480 ac. Northampton, MA)

Map by Michael Mauri, L.F. 4/2013  
 20 West St. S. DfId, MA 01373  
 (413) 665-6829 based on tax map,  
 GIS views of RM unit provided by  
 Andy Kuehler/DPW. Stand delineations  
 hand-sketched by M.M. From  
 Forest Stand & Boundary Maps for  
 illustrative purposes only.



water tank, parking, and marginal forest areas, etc. (see Stand Descriptions and Forest Stand & Boundary Map for RM 7, 8 & 9).

**Possibility of temporary sedimentation basins in RM-5:** The City of Northampton Department of Public works has begun permitting associated with dam removal at the Upper Roberts Meadow Reservoir. While final design plans have not yet been completed, conceptual plans and consultations with the Massachusetts Department of Environmental Protection detail that hydraulic dredging prior to dam removal and dewatering in a sedimentation and flocculation basin are the preferred methods of sediment management for this project.

The temporary sedimentation and flocculation basins will be located in RM-5. The basins will be constructed by excavating earthen material and using it to create berms around the perimeter of the basins. Preliminary sizing of the basin was based on volume of in-place dredged material, residence time for primary settling, and capacity for bulking/expansion of the material during dredging. The sedimentation basin is designed with approximately 25,000 cy of capacity and the smaller flocculation basin has an approximate capacity of 9,500 cy.

The construction of these basins could alter up to 5 acres of forest in RM-5. However, these basins are temporary and any excess material will be removed after the dam removal is completed. The area will be graded to pre-construction grades and replanted with native vegetation. Construction of this project will likely begin in 2014 and will take a year to complete. If construction does go forward, the relevant portions of this Forest Stewardship Plan pertaining to Stand 17 will be amended to reflect the changes.

**Topography:** most of the acreage is on hilly terrain, sometimes with surface boulders and ledge outcrops. The steepest area is on RM-3 (see Locus Map), which is situated at the northern end of the Sawmill Hills. Soils in these hilly areas were formed in glacial till. The remaining acreage is on flat land occupying lower areas in the landscape. Much of this acreage has surface water (streams and shallow marsh) or has a seasonally high water table, though there are excessively drained areas with deep gravel as well. Soils in these areas were formed in glacial outwash or by alluvial processes (flood deposits).

**Dominant forest types are:** (see below)

**Pure Red Pine (Plantations):**

The ten separate red pine stands comprise about 57 acres. It is assumed that these stands were planted in the late 1930's on land – we assume – that did not have forest cover at that time. This contrasts with the red oak & hardwood areas and white pine and hemlock areas (see below), which have been in a forested condition for much longer. The red pines tend to consist mostly of tall (80' or more), well-formed, slender timber co-mingled with tall red pine pulp. The timber trees averaged 13" in diameter and 2.7 16-foot log heights. As at the City of Northampton's Ryan & West-Whately and Mountain Street watersheds, which are located in Conway, Whately, Williamsburg and Hatfield, the red pines show a lack of vigor and are in poor health. There is not expected to be any appreciable growth in height or diameter over time. Instead, it is more likely that the red pines will continue to decline and eventually die. Based on an examination of growth rings, the red pines have barely been growing over the past 25 years. Now it appears that some

7

areas have begun to enter a phase of final and rapid decline driven by the action of Ips beetles (notably in the red pines east of Kennedy Road, in Stand 17). The beetles could spread to other red pine areas.

As at the Ryan & West Whately watershed, the red pine plantations have been thinned at least once, and the lack of vigor does not seem attributable to overcrowding. Despite early height growth, it is possible that the red pine is not well-suited to the soil conditions over the long term (unlike the planted white pine (and, at Kingley Farm, Norway spruce), which have remained vigorous on similar soils). However, even at the Ryan & West Whately and Mountain Street watersheds, where soils are different from these, the crowns of the red pine are also thin, short and weak, indicating that red pine may simply not be suited to long-term growth in this general area.

The red pine in Stand 17 that has either already died or that is likely to die within one or two growing seasons, is infested with a number of pests and pathogens. There are at least two kinds of bark beetles. One in particular, *Ips calligraphus*, has heavily infested many trees. Further, the red pines are also infested with Diplodia tip blight/canker, a fungus that causes girdling cankers in the twigs. The red pines are also infested by a needle-cast fungus which causes needles to break in half or fall off altogether. Furthermore, armillaria root-rot fungus (aka. shoestring root rot) is present in this stand. Recent droughts have further taxed these trees. All of these factors combine to place the red pines under tremendous stress. There is no treatment that can be applied to reverse the decline and mortality. The only good news is that no red pine scale was detected. If red pine scale (which is spread by birds) makes it into these stands, sweeping mortality can be expected within one or two years. Red pine scale has been having a devastating effect on red pine in other parts of Massachusetts. It is assumed that, sooner or later, if left long enough, red pine scale will appear in these stands.

Some, but not all, areas of the red pine plantations are infested with non-native invasive plants and/or wild grapes. Most areas of the red pine plantations have well-established understories of mixed hardwoods – notably sugar maple – and sometimes understories of witch hazel. Some areas contain large, seed-bearing black cherries or white pines. Other areas are near large, seed-bearing oaks.

The most prudent approach to managing the red pine plantations seems to be to implement a timely but challenging “exit strategy” that will capture some of the monetary value of the red pine and avoid the risk and mess of standing by passively as large areas of tall, dead trees develop. A successful, proactive approach would be to convert these areas to a native forest mix without triggering a release of aggressive vines (e.g. bittersweet and grapes). A forest of mixed native hardwoods and native shrubs would provide good water quality protection. The well-established understories of hardwoods and witch hazel provide a glimpse of the positive direction these stands could go in. However, if the exit strategy is to succeed, active suppression of vines will need to be a part of this approach. Because red pine logging debris can attract and further promote Ips bark beetles, a whole-tree harvesting system (which leaves almost no slash) should be used wherever possible.



### **Pure White Pine (Plantations):**

The two white pine plantations comprise about 47 acres. These were planted around 1950, a little later than the red pine stands, also, we assume, on land that did not have forest cover at that time. The white pines in pure stands tend to consist mostly of very tall (95' – 100'), poorly-formed, slender timber with abundant, tall white pine pulp. The quality of many of the timber and pulp trees is poor due to twisty, branchy trunks. This is especially true of Stand 19. Typical diameters in Stand 15 were 16"-18" with heights of 2 – 3 16-foot logs; typical diameters in Stand 19 were 13"-15" with heights of 1 - 2 16-foot logs. These stands had at least one thinning in the distant past, and were even pruned, but, unlike the red pine stand, were not thinned in recent decades. This lack of follow up thinning was already mentioned in the 1987 plan by Karl Davies, the previous consulting forester for Northampton DPW. As a result, the white pines are overcrowded, which reduces tree vigor and, therefore, these white pines have not been able to grow much clear (knot-free), valuable wood volume over the pruned length of their trunks. Assuming Stands 15 & 19 were planted at about the same time and original spacing, a possible explanation for the difference in size and quality would seem that Stand 15 had one more thinning than Stand 19. Another possible explanation is the higher water table in Stand 19 is a further limit on growth.

Unfortunately, a large number of trees might effectively be too crooked for timber or pulp, and might be most suitable as whole-tree chip material. Their tall, spindly form leaves them less stable in storms, especially in the first few years following a thinning, which is a further risk and challenge.

Unlike the red pine, there is no obvious indication of pest- or drought-driven decline in the planted white pine. Further, the planted white pine seems to be free of any serious pests or threat of pests. One possible exception is the nearby population of Ips beetles in the red pine. Ips beetles can attack a number of pine species, including white pine. It is unknown whether the Ips beetles present in the red pine will jump over to the white pines. In general, trees in poor health are more likely to be successfully attacked by bark beetles. The main health issues facing these white pine stands are the inter-related problems of diminished vigor due to overcrowding, the risk of wind-throw following any logging or severe storm (also due to prolonged overcrowding), the breakage, pull-down or shading due to vines, and the possibility of bark beetle or other pest or pathogen attacks that would take advantage of a low-vigor monoculture situation such as in Stands 15 & 19.

Some, but not all, areas of the white pine plantations are infested with non-native invasive plants – including bittersweet - and/or wild grapes. Some areas of the white pine plantations have well-established understories of mixed hardwoods, and sometimes understories of witch hazel. Some areas contain large, seed-bearing black cherries and other areas are near large, seed-bearing oaks.

The most prudent approach to managing the white pine plantations might be to initiate a "conservative thinning strategy" in several stages that will attempt to re-invigorate the white pine for many decades to come and avoid the risk and mess of allowing large areas of tall, unstable, dead or progressively weakening trees develop. A successful, proactive approach would accomplish the thinning without triggering a release of aggressive vines (e.g. bittersweet and

grapes). Components of this approach would include (1) limiting the amount of light that gets to the forest floor by cutting only a minimum of trees in each round of thinning, (2) minimizing the ground disturbance caused by any thinning by limiting any use of motorized equipment to times when there is deep snow or frozen ground or by conducting the thinning as a hand-cut & leave operation, or some combination thereof, (3) actively suppressing the interfering vegetation, and (4) allowing native hardwoods and shrubs to actively occupy any new growing space that is created by the thinning. Rather than bring in revenue, the thinning would be a net expense. If, over time, this conservative approach does not seem to be working, the objective can shift to a conversion to hardwood dominated stands. Hopefully, by then, the process of successfully converting the nearby red pine stands will have been completed (so that the amount of harvesting occurring during a short span of time can be limited). If this strategy does work, the result will be a tall, vigorous pine forest with a vigorous mid-story of native hardwoods which, ultimately, after many decades, will replace most of the pines.

### **White Pine and Hardwoods with or without Hemlock:**

These four stands occupy about 97 acres. White pine with or without hemlock, and red oak are the main overstory species, with smaller amounts of hickory, black birch and red maple, as well as yellow birch, sugar maple, and white ash in wetter areas. These areas consist of native forests on land which, due to combinations of steepness, stoniness, seepiness or droughtiness, was probably never better than marginal for extensive grazing. Accordingly, farming was abandoned by the mid to late 1800's in these areas, and the land – we assume – grew back quickly to white pine. When this white pine was logged, it was apparently not “cut off” entirely. Hardwoods (especially red oak) grew back into larger openings; mid-story hemlocks were released; and slender pines were free to grow. Thinning in recent decades has continued to shape most of these areas. Today many of these pines are quite vigorous, large and impressive. In many respects, with its various canopy heights and mixed, long-lived species, the forest structure in these stands is ideal for water quality protection.

The discouraging presence of aggressive vines (e.g. bittersweet and grapes) in many areas is the main obstacle to a new round of harvesting. Instead of growing into areas of vigorous new trees, some of the openings created in the last round of thinning have filled in with bittersweet and grapes. This is especially true on soil with elevated moisture. These areas are in need of complete restoration if they are to be returned to a tall-forest condition some day.

The most prudent approach to managing these stands would be to protect the well-established, existing overstory by suppressing climbing vines and possibly by controlling low thickets of these vines in areas that are currently in partial shade. Unlike the areas in need of complete restoration mentioned above, the partially shaded areas have the advantage of overstory shade to help in the suppression of the aggressive vines. Ideally, native vegetation (e.g. black birch, witch hazel, even beech or striped maple) can be encouraged to take up any understory growing space.

### **Red Oak and Hardwoods Stands:**

These three main stands occupy about 194 acres and consist primarily of red oaks on upland soils, mixed with white oak (and sometimes black oak and/or chestnut oak), a limited amount of hickory (shagbark and pignut), red maple, black birch, and paper birch. In riparian areas and wetter areas, this mix of hardwoods becomes infused with white ash, yellow birch, and sugar maple. These areas consist of native forests on land which, due to combinations of steepness, stoniness, seepiness or droughtiness, was probably never better than marginal for extensive grazing. Accordingly, farming was abandoned early in these areas, and – we assume – the land grew back quickly to white pine with a strong component of oak. When this white pine was logged, around 1900, it was apparently “cut off” entirely. At that time, deer populations were very low and moose were absent altogether, and so the forest grew right back into (resprouted) oaks. Though this type of cut would be called a “clearcut” in layman’s terms, in actuality it was a “coppice cut” – i.e. a cut that regrows trees (hardwoods) from existing root systems. Most of the oaks, are from stump sprouts, meaning that the trees were already in place at the time of the circa 1900 cutting. Though the current stems are about 110 years old, the plant itself (i.e. the root system) is much older. Accordingly, these forest areas can be said to mainly date back to the mid- or latter part of the 19th century.

White pine and hemlock, though not abundant in these stands, play an important role in diversifying the habitat and structure of the forest where they do occur.

The size and quality of the oaks and other hardwoods varies wildly as a direct function of soil quality and moisture availability, ranging from small, poor-quality timber throughout Stand 9 and in the upper part of to large, impressive, good-quality timber in the lower parts of Stand 10 and in other places where moisture and soil depth are more conducive to good timber growth.

With thick understories of mountain laurel (in places) and witch hazel (in most places), there are few established non-native invasive plants or wild grapes.

In its present condition, these oak-hardwood areas are well-suited to protecting water quality. A prudent approach to managing these stands would recognize the desirability of the current forest structure by maintaining and improving the vigor of well-established trees, especially oaks and hickories, while beginning to create interspersed areas of young growth that would begin to diversify the overall age structure. This would be accomplished by selection system harvesting that combines thinning to favor well-established, well-formed trees and the creation of small gaps (up to about ½ acre) in areas that lack these. New trees would grow from seed, established seedlings, and from stump sprouts. Because the well-formed oaks would be retained, and most of the trees to be cut would be firewood or low-quality timber, this work would economically “break-even”. Most softwoods would be retained.

## **Red Maple Swamp and Shallow Marsh:**

These three stands comprise about 34 acres. A further area of red maple swamp (several acres) is included within the oak-hardwoods stand in RM-2. These stands occur in low areas in the landscape that naturally accumulate water and have always been wet. All of these areas are, have been, or could be, subject to beaver activity and flooding. Other co-occurring types include shrub swamp, deep marsh, and beaver pond. Also included are a few upland areas that are effectively stranded or cut off from other upland sections, such that these areas are not practically accessible for purposes of silviculture.

As wetlands and riparian zones, these areas buffer and filter any overland flow or other run-off and play an important role in protecting water quality and in storing and releasing water. There is no commercial potential in any of the timber or other wood products in these areas. Even if there were valuable timber here, there is no way to safely harvest it without risking damage to the site.

Not surprisingly, aggressive vines (e.g. bittersweet and grapes) and other non-native invasive plants are present in some areas, but, fortunately, not in all areas. In these wetland settings, there is no good way to actively control these plants. The most effective control will probably come from periodic beaver flooding – if that is allowed. Flooding, combined with reduction of the nearby seed sources in surrounding upland areas – especially along the wetland-upland edges where aggressive vines (e.g. bittersweet and grapes) and other non-native invasive plants can grow most prolifically, is perhaps the best strategy toward long-term reduction of these plants. Otherwise, a better-than-nothing approach would be to frequently cut any larger vines to limit seed production. Someday, hopefully, there will be more effective controls available for use in these settings.

**Main tree ages:** most overstory trees have their origin in the period 1900-1940. As discussed (see Stand 9), many of the ca. 100-year-old oaks are sprouts from the stumps of an earlier generation of oaks.

**Major events shaping this forest (forest-disturbance history):** Like most of the forests of Southern New England, this forest has been shaped by both natural and human factors; these factors are intertwined to such a thorough extent that, in effect, they cannot always be separated.

A specific history of this site would be an undertaking that goes beyond the scope of this plan. The possible uses of this land by Native Americans (i.e. native, pre-European people), and the uses of this land by these people after the onset of European fur trading and eventual trading-post and agricultural settlement, are not addressed in this plan. Direct European use of this land probably began with land clearing of the original (primary) forest by settlers, for purposes of farming, possibly as early as the 17<sup>th</sup> century, although locations such as Roberts Meadow may have already been cleared by Native Americans. In general, the tillable soils were cleared of stones as needed and crops were planted while the more rugged or wetter terrain was pastured with cattle and/or sheep, to a greater or lesser degree. While it lasted, farming kept the natural tendency toward reforestation fully or partially at bay. In the mid 1800's much of this area was in pasture (or sometimes, on steep, fertile land, in sugar bushes) but the long process of farm

abandonment had begun along with an overall reduction in the widespread intensity of farming use, which allowed the natural re-growth of forest to white pine (sometimes called old-field white pine). Some areas are still in old-field pine today. But other areas of pine regrowth were “cut off”, usually by clearcutting, giving rise to oak-hardwood and hemlock forests. Sometimes these oak-hardwood and hemlock forests were cut off, giving rise to a new hardwood forest, often with less oak and hemlock and more birch, especially black birch, as well as red maple. In a few instances, non-native softwoods were planted — by DPW — especially red pine, but, on the Kingsley farm parcel, also Norway spruce and Scots pine. White pine was also planted. Because all of this has occurred at various times in various places with varying degrees of intensity and consistency, the landscape-level forest is diverse in terms of species composition. However, in terms of structure, the forest is relatively uniform, with tall, closed and sometimes crowded canopies occupying most sites. Logging in the last five or more decades has mostly been limited to thinning, which does not create new stands of trees.

Forestry has been practiced since the early days of the watershed. We do not have a detailed history of early forest management, but a 1988 report by Karl Davies, the previous forester for DPW, sheds some light. Softwood plantations were established in the first few decades of the 1900’s on old fields and were intended to reduce soil erosion and reduce discoloration of the water from tannins in oak leaves. There may have been an interest in timber production. In the native hardwood forests, chestnut, which was affected by the chestnut blight (an introduced pest), was cut heavily in the 1920’s and 1930’s, for fuelwood for the Water Department boiler. Later, other hardwoods were cut. This practice continued until about 1950, when the Water Department switched to oil. These early thinnings are credited with helping develop the large oaks in some areas.

Most of the softwood plantations and some of the white pine was thinned (pulpwood) in the 1950’s and early 1960’s — interestingly, this practice faded when home freezers became popular and the need for barrel staves for salted meat evaporated (Fred Hunt, pers. Comm.). Some of the white pine was pruned at that time to develop clear (knot-free) lumber, but thinnings were not always carried out to take advantage of this. There is no record of activity in the late 1960’s and through the 1970’s.

An active era of forest management began in 1981 on the Mountain Street watershed and in the mid 1980’s at the Ryan watershed. By the late 1980’s, an effort was underway to carry out improvement cuts, thinnings, and initial regeneration cuts across both watersheds. This work, consisting of numerous permitted harvests marked by Karl Davies and carried out by many different loggers under his supervision, continued until around 2000, when work was put on hold by DPW decision. Karl Davies passed away in 2003, and no further work has been carried out on the watershed. The general affect of this work was to reduce competition among overstory trees, refocus future growth on trees with good form and growth potential, and begin to develop understories of desirable seedlings. Also at that time, there was a strong interest in generating revenue for acquisition of additional watershed lands.

The current era of forest management began in 2011 with a focus on establishing long-term forest management plans for the watershed lands. These plans (including the present plan) were

intended to take stock of forest conditions and make recommendations that would help improve or maintain desirable forest conditions from a water-quality protection standpoint.

**Overall forest health:** Most forest areas are overcrowded and thus are not as vigorous as they could otherwise be, but the only current or anticipated decline phenomena are found in the red pine, the hemlock, and the white ash. Red pine is declining in general throughout the region as well as on other DPW properties, so it is no surprise that the red pine is declining here also (see discussion above in section of red pine plantations). Red pine in Stand 17 exhibits the most advanced stage of decline, with significant areas of outright mortality. Red pine in Stand 16 also exhibited a significant area of outright mortality, but this may be largely attributable to beaver activity. Ideally, the red pine would be replaced with a native forest mix. Silviculturally, this should not be difficult. However, the aggressive nature of grapes and bittersweet will make efforts to accomplish this transition very difficult.

Hemlock (i.e. Eastern hemlock), a native tree capable of reaching large size and advanced age, is experiencing a well-documented regional decline due to the advance of two introduced pests, the hemlock woolly adelgid and the elongate hemlock scale. Tall, overstory hemlock was found upstream from the Upper Reservoir along Roberts Meadow and Marble Brooks, and was found along the northern shore of the Upper Reservoir and along the southern shore of the Middle Reservoir. Compared to the Ryan & West-Whately and the Mountain Street Reservoirs, hemlock was not an important part of the overstory. However, in some areas, hemlock is, or could be, an important part of the midstory and future overstory. The deep shade of hemlock could be an important part of a comprehensive strategy to control grapes and bittersweet. However, the expectation is that hemlock will decline and play a reduced role in the future. This is unfortunate.

White ash, a native tree also capable of reaching large size and advanced age, is in poor health across its range. This phenomenon is not well explained, but the decline is recognizable by dieback at the top of the tree crown, an indicator of poor vigor that ultimately ends with the tree becoming a standing dead tree. At present, a new introduced pest, the emerald ash borer is moving into the region and threatens to cause widespread mortality in ash. White ash is not a major component of this forest, but, with its ability to grow to huge size, should, normally, play an important role in certain wetland settings and on some of the richest soils. However, as with hemlock, the expectation is that white ash will decline and play a very reduced role in the future.

Perhaps more importantly for the long-term health of the forest, the prevalence of non-native invasive plant species — most notably oriental bittersweet — in conjunction with the action of wild (native) grape vines, threatens to undermine the longer-term prospects for growing any type of desirable future forest at all (see Desired Forest Condition below). Other non-native invasive plants noted here included, most notably, bush honeysuckle (especially in Stand 25), with minor amounts of multiflora rose, Japanese barberry and autumn olive. The infestation is concentrated in the plantations (and in shrub swamp areas) at this time, and is already hampering DPW's ability to salvage (harvest) and capture the value of the declining red pine plantations, thin the white pine plantations, diversify the structure of native pine and oak stands, and, overall, develop a sustainable, multi-aged mix of native trees over time. If left unchecked, this mix of interfering

vegetation, driven mainly by the action of vines, will continue to spread and thereby increase the level of interference with desirable forest conditions and processes.

**Invasive species** are present and pose a long-term threat to desired forest conditions. See discussion of forest health above and see also the Stand Descriptions section. Oriental bittersweet was, by far, the most serious problem. Fortunately, no buckthorn (glossy or European) was found.

**Desired Forest Condition:** The reservoirs are filled with water that drains out of the surrounding forested landscape. This land area, referred to as the “watershed”, is largely covered with forest. The forested-land watershed plays an essential role in collecting, filtering, storing, and releasing water into the reservoirs through surface streams and subsurface flow. The condition of the forest affects the quality and amount of the water flowing into the reservoirs. For watershed purposes, the ideal forest condition is a diverse forest of vigorous, site-adapted native trees growing to mature size (height and diameter) within a forest framework that is constantly regenerating with desirable new trees — in effect, a multi-aged forest of diverse, site-adapted species. This type of forest is considered to be the forest condition that will, over time, provide, sustainably, the highest-quality water. Accordingly, the objective of forest management on the watershed is to create and maintain this desired condition and, as necessary, identify threats to the desired condition, and design effective responses to these threats. Where appropriate, timber management (the use of logging within a silvicultural framework) is an effective tool to make beneficial adjustments to forest structure, so that the desired conditions are achieved or maintained.

**Main habitat types** are maturing pine-oak-hardwood forest with vigorous understory growth in some areas, tall softwood plantations sometimes with limited understory growth, and a mix of wetlands including shrub swamp, shallow marsh, beaver pond, and other wetland, riparian, and stream features. Upland early successional habitat is lacking, as is very mature forest. Given the age of the forest (discussed above) and the lack of any heavier cutting in recent decades, it is no surprise that these two habitat types are lacking.

**Unique cultural and physical features:** (1) Roberts Meadow Brook and Marble Brook are major streams that feeds the historical back-up drinking water system for the City of Northampton; (2) there are roughly 28.5 acres of open water in three man-made reservoirs (Upper, Middle and Lower); (3) there are significant areas of native oak-hardwood and white pine forest; (4) there are extensive softwood plantations, reflecting ideas about watershed management that prevailed at one time; (5) due to the significant road frontage (ca. 5.75 miles), the forests of the watershed are an important component of local landscape scenery.

**Water resources concerns are “elevated”:** Most of this acreage falls within the watershed of the back-up drinking water system for the City of Northampton, and includes the lowest reaches of its major tributaries. Although nothing currently occurring on this property constitutes a major threat to water quality, there are a number of ATV trails (these are addressed in the plan — see Forest Stand & Boundary Maps) that pose an ongoing risk of sedimentation, and there is a longer-term threat posed by non-native invasive plants (discussed above).

**Property-wide stewardship concerns include:** (1) identifying, marking and posting boundaries, and addressing issues of encroachment and unauthorized trail use that are identified in this plan; (2) controlling interfering vegetation (non-native invasive plants and native plants) to limit its potential harm to the forest (described above) and to allow silvicultural techniques to be applied; (3) using silviculture to begin the process of transitioning from red pine plantations to native forest mixes (without exacerbating the problem of non-native invasive plants and native plants); (4) using silviculture where appropriate to improve forest vigor and begin to establish areas of young, desirable growth; (5) protecting the wood turtle in the western half of the property (state-listed as a species of “Special Concern” under the MA Endangered Species Act) if the land near Marble Brook is to be used.

### **Role/Impact wrt. the local economy**

Even though it seems unlikely at this time that the City of Northampton will draw drinking water from this system, the most important economic role of this forest is to remain in a condition of being able supply water to the reservoirs. The value of high-quality water produced by a forested watershed is much more significant than the value of any wood products. Income from forest products plays a secondary role, and harvesting is designed to shape watershed forest conditions rather than to meet economic goals. From a “woodlot perspective”, the combination of the Kingsley Parcel and the Roberts Meadow parcels is relatively large by Massachusetts standards, and can contribute positively to the local economy, providing work for foresters, loggers, truckers, and possibly local sawmills, firewood operations, and wood-chip-burning facilities (e.g. Cooley Dickinson Hospital). There has been no harvesting of timber on these lands over the last 10 years. Over the next ten years, the economic role played by timber could increase. Much of the volume that might be harvested is low-grade material, including firewood, softwood pulp, and potential chipwood. However, there is also an appreciable amount of red pine timber value that could be harvested if this can be done without worsening the infestation of grapes, bittersweet, and other, non-native vegetation.

**Role/Impact wrt. nearby Protected Lands:** Nearby protected lands include other lands owned by the City of Northampton (Roberts Hill, Sawmill Hills, Mineral Hills) as well as land under CR (e.g. the Marble Brook CR held by the DPW and other land under a CR held by the Kestrel Trust). The discussion below refers to these lands.

**Water supply** No impact is expected on nearby protected lands. Some of these lands are already under Forest Stewardship Plans or are being brought under at this time.

**Wildlife habitat** No impact is expected. Any management undertaken is not expected to alter wildlife habitat in a significant way.

**Recreation** Successful implementation of this plan will curtail ATV use on this parcel and may help curtail ATV use on nearby protected lands. There are a number of hiking trails with unauthorized or uncertain designation. These will be addressed in the implementation of this plan.

**Other than a potential reduction in unauthorized uses, the between-property impact of any management is expected to be essentially non-existent.**

### Summary of Management Recommendations

**The landowner's main goals include** (1) completing this plan as a way of taking stock of the property and identifying major concerns and opportunities going forward; (2) enrolling the property in DCR's Forest Stewardship Program and in DCR's Green Certification program; (3) addressing the property-wide concerns stated above.

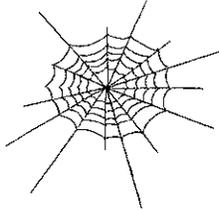
**The property's potential to achieve the landowner's goals is good**, with notable challenges including (1) the presence and threat of interfering vegetation, (2) the challenge of dealing with unauthorized uses (e.g. ATV riding), (3) the extensive road frontage, which provides significant public exposure to any efforts at management here (e.g. logging and/or invasive species control) but also to any failure to manage (e.g. mortality of red pine stands and/or increase of invasive species), (4) the elevated urgency created by the accelerating decline in red pine and the urgency created by the need to reduce overcrowding in the white pine plantations.

### **Working towards these goals, the main recommendations include**

1. Complete this plan and file all paperwork with DCR
2. Mark all property boundaries (locate, blaze, paint, and post).
3. Address status and use of ATV trails, hiking trails, and encroachments.
4. Begin a process of controlling undesirable vegetation, converting red pine plantations to native forest mixes, reducing overcrowding in white pine plantations, and diversifying forest structure in native forest areas.
5. Develop an effective way of gaining public understanding and acceptance of the objectives and methods of management of these forested areas.

## Stewardship Issues

Massachusetts is a small state, but it contains a tremendous variety of ecosystems, plant and animal species, management challenges, and opportunities. This section of your plan will provide background information about the Massachusetts forest landscape as well as issues that might affect your land. **The Stand Descriptions and Management Practices sections of your plan will give more detailed property specific information on these subjects tailored to your management goals.**



**Biodiversity:** Biological diversity is, in part, a measure of the variety of plants and animals, the communities they form, and the ecological processes (such as water and nutrient cycling) that sustain them. With the recognition that each species has value, individually and as part of its natural community, maintaining biodiversity has become an important resource management goal.

While the biggest threat to biodiversity in Massachusetts is the loss of habitat to development, another threat is the introduction and spread of invasive non-native plants. Non-native invasives like European Buckthorn, Asiatic Bittersweet, and Japanese Honeysuckle spread quickly, crowding out or smothering native species and upsetting and dramatically altering ecosystem structure and function. Once established, invasives are difficult to control and even harder to eradicate. Therefore, vigilance and early intervention are paramount.

Another factor influencing biodiversity in Massachusetts concerns the amount and distribution of forest growth stages. Wildlife biologists have recommended that, for optimal wildlife habitat on a landscape scale, 5-15% of the forest should be in the seedling stage (less than 1" in diameter). Yet we currently have no more than 2-3% early successional stage seedling forest across the state. There is also a shortage of forest with large diameter trees (greater than 20"). See more about how you can manage your land with biodiversity in mind in the "Wildlife" section below. (Also refer to *Managing Forests to Enhance Wildlife Diversity in Massachusetts* and *A Guide to Invasive Plants in Massachusetts* in the binder pockets.)



**Rare Species:** Rare species include those that are **threatened** (abundant in parts of its range but declining in total numbers, those of **special concern** (any species that has suffered a decline that could threaten the species if left unchecked), and **endangered** (at immediate risk of extinction and probably cannot survive without direct human intervention). Some species are threatened or endangered globally, while others are common globally but rare in Massachusetts.

Of the 2,040 plant and animal species (not including insects) in Massachusetts, 424 are considered rare. About 100 of these rare species are known to occur in woodlands. Most of these are found in wooded wetlands, especially vernal pools. These temporary shallow pools dry up by late summer, but provide crucial breeding habitat for rare salamanders and a host of other unusual forest dwelling invertebrates. Although many species in Massachusetts are adapted to and thrive in recently disturbed forests, rare species are often very sensitive to any changes in their habitat

Indispensable to rare species protection is a set of maps maintained by the Division of Fisheries and Wildlife's Natural Heritage & Endangered Species Program (NHESP) that show current and historic locations of rare species and their habitats. The maps of your property will be compared to these rare

species maps and the result indicated on the upper right corner of the front page of the plan. Prior to any regulated timber harvest, if an occurrence does show on the map, the NHESP will recommend protective measures. Possible measures include restricting logging operations to frozen periods of the year, or keeping logging equipment out of sensitive areas. You might also use information from NHESP to consider implementing management activities to improve the habitat for these special species.



**Riparian and Wetlands Areas:** Riparian and wetland areas are transition areas between open water features (lakes, ponds, streams, and rivers) and the drier terrestrial ecosystems. More specifically, a **wetland** is an area that has hydric (wet) soils and a unique community of plants that are adapted to live in these wet soils. Wetlands may be adjacent to streams or ponds, or a wetland may be found isolated in an otherwise drier landscape. A **riparian area** is the transition zone between an open water feature and the uplands (see Figure 1). A riparian zone may contain wetlands, but also includes areas with somewhat better drained soils. It is easiest to think of riparian areas as the places where land and water meet.

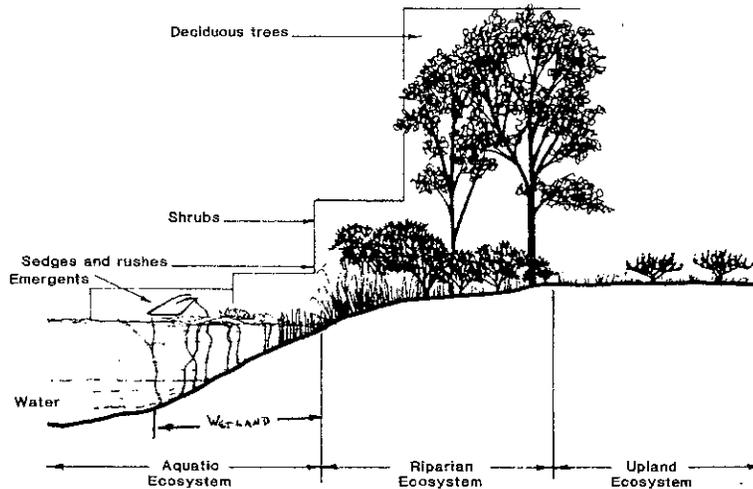


Figure 1: Example of a riparian zone.

The presence of water in riparian and wetland areas make these special places very important. Some of the functions and values that these areas provide are described below:

**Filtration:** Riparian zones capture and filter out sediment, chemicals and debris before they reach streams, rivers, lakes and drinking water supplies. This helps to keep our drinking water cleaner, and saves communities money by making the need for costly filtration much less likely.

**Flood control:** By storing water after rainstorms, these areas reduce downstream flooding. Like a sponge, wetland and riparian areas absorb stormwater, then release it slowly over time instead of in one flush.

**Critical wildlife habitat:** Many birds and mammals need riparian and wetland areas for all or part of their life cycles. These areas provide food and water, cover, and travel corridors. They are often the most important habitat feature in Massachusetts' forests.

**Recreational opportunities:** Our lakes, rivers, streams, and ponds are often focal points for recreation. We enjoy them when we boat, fish, swim, or just sit and enjoy the view.

In order to protect wetlands and riparian areas and to prevent soil erosion during timber harvesting activities, Massachusetts promotes the use of "Best Management Practices" or BMPs. Maintaining or reestablishing the protective vegetative layer and protecting critical areas are the two rules that underlie these common sense measures. DCR's Massachusetts Forestry Best Practices Manual (included with this plan) details both the legally required and voluntary specifications for log landings, skid trails, water bars, buffer strips, filter strips, harvest timing, and much more.

The two Massachusetts laws that regulate timber harvesting in and around wetlands and riparian areas are the Massachusetts Wetlands Protection Act (CH 131), and the Forest Cutting Practices Act (CH132). Among other things, CH132 requires the filing of a cutting plan and on-site inspection of a harvest operation by a DCR Service Forester to ensure that required BMPs are being followed when a commercial harvest exceeds 25,000 board feet or 50 cords (or combination thereof).



**Soil and Water Quality:** Forests provide a very effective natural buffer that holds soil in place and protects the purity of our water. The trees, understory vegetation, and the organic material on the forest floor reduce the impact of falling rain, and help to insure that soil will not be carried into our streams and waterways.

To maintain a supply of clean water, forests must be kept as healthy as possible. Forests with a diverse mixture of vigorous trees of different ages and species can better cope with periodic and unpredictable stress such as insect attacks or windstorms.

Timber harvesting must be conducted with the utmost care to ensure that erosion is minimized and that sediment does not enter streams or wetlands. Sediment causes turbidity which degrades water quality and can harm fish and other aquatic life. As long as Best Management Practices (BMPs) are implemented correctly, it is possible to undertake active forest management without harming water quality.



**Forest Health:** Like individual organisms, forests vary in their overall health. The health of a forest is affected by many factors including weather, soil, insects, diseases, air quality, and human activity. Forest owners do not usually focus on the health of a single tree, but are concerned about catastrophic events such as insect or disease outbreaks that affect so many individual trees that the whole forest community is impacted.

Like our own health, it is easier to prevent forest health problems than to cure them. This preventative approach usually involves two steps. First, it is desirable to maintain or encourage a wide diversity of tree species and age classes within the forest. This diversity makes a forest less susceptible to a single devastating health threat. Second, by thinning out weaker and less desirable trees, well-spaced healthy individual trees are assured enough water and light to thrive. These two steps will result in a forest of vigorously growing trees that is more resistant to environmental stress.



**Fire:** Most forests in Massachusetts are relatively resistant to catastrophic fire. Historically, Native Americans commonly burned certain forests to improve hunting grounds. In modern times, fires most often result from careless human actions. The risk of an unintentional and damaging fire in your woods could increase as a result of logging activity if the slash (tree tops, branches, and debris) is not treated correctly.

Adherence to the Massachusetts slash law minimizes this risk. Under the law, slash is to be removed from buffer areas near roads, boundaries, and critical areas and lopped close to the ground to speed decay. Well-maintained woods roads are always desirable to provide access should a fire occur.

Depending on the type of fire and the goals of the landowner, fire can also be considered as a management tool to favor certain species of plants and animals. Today the use of prescribed burning is largely restricted to the coast and islands, where it is used to maintain unique natural communities such as sandplain grasslands and pitch pine/scrub oak barrens. However, state land managers are also attempting to bring fire back to many of the fire-adapted communities found elsewhere around the state.



**Wildlife Management:** Enhancing the wildlife potential of a forested property is a common and important goal for many woodland owners. Sometimes actions can be taken to benefit a particular species of interest (e.g., put up Wood Duck nest boxes). In most cases, recommended management practices can benefit many species, and fall into one of three broad strategies. These are **managing for diversity, protecting existing habitat, and enhancing existing habitat.**

**Managing for Diversity** – Many species of wildlife need a variety of plant communities to meet their lifecycle requirements. In general, a property that contains a diversity of habitats will support a more varied wildlife population. A thick area of brush and young trees might provide food and cover for grouse and cedar waxwing; a mature stand of oaks provides acorns for foraging deer and turkey; while an open field provides the right food and cover for cottontail rabbits and red fox. It is often possible to create these different habitats on your property through active management. The appropriate mix of habitat types will primarily depend on the composition of the surrounding landscape and your objectives. It may be a good idea to create a brushy area where early successional habitats are rare, but the same practice may be inappropriate in the area's last block of mature forest.

**Protecting Existing Habitat** – This strategy is commonly associated with managing for rare species or those species that require unique habitat features. These habitat features include vernal pools, springs and seeps, forested wetlands, rock outcrops, snags, den trees, and large blocks of unbroken forest. Some of these features are rare, and they provide the right mix of food, water, and shelter for a particular species or specialized community of wildlife. It is important to recognize their value and protect their function. This usually means not altering the feature and buffering the resource area from potential impacts.

**Enhancing Existing Habitat** – This strategy falls somewhere between the previous two. One way the wildlife value of a forest can be enhanced is by modifying its structure (number of canopy layers, average tree size, density). Thinning out undesirable trees from around large crowned mast (nut and fruit) trees will allow these trees to grow faster and produce more food. The faster growth will also accelerate the development of a more mature forest structure, which is important for some species. Creating small gaps or forest openings generates groups of seedlings and saplings that provide an additional layer of cover, food, and perch sites.

Each of these three strategies can be applied on a single property. For example, a landowner might want to increase the habitat diversity by reclaiming an old abandoned field. Elsewhere on the property, a stand of young hardwoods might be thinned to reduce competition, while a “no cut” buffer is set up around a vernal pool or other habitat feature. The overview, stand description and management practice sections of this plan will help you understand your woodland within the context of the surrounding landscape and the potential to diversify, protect or enhance wildlife habitat.



**Wood Products:** If managed wisely, forests can produce a periodic flow of wood products on a sustained basis. Stewardship encompasses finding ways to meet your current needs while protecting the forest’s ecological integrity. In this way, you can harvest timber and generate income without compromising the opportunities of future generations.

Massachusetts forests grow many highly valued species (white pine, red oak, sugar maple, white ash, and black cherry) whose lumber is sold throughout the world. Other lower valued species (hemlock, birch, beech, red maple) are marketed locally or regionally, and become products like pallets, pulpwood, firewood, and lumber. These products and their associated value-added industries contribute between 200 and 300 million dollars annually to the Massachusetts economy.

By growing and selling wood products in a responsible way you are helping to our society’s demand for these goods. Harvesting from sustainably managed woodlands – rather than from unmanaged or poorly managed forest – benefits the public in a multitude of ways. The sale of timber, pulpwood, and firewood also provides periodic income that you can reinvest in the property, increasing its value and helping you meet your long-term goals. Producing wood products helps defray the costs of owning woodland, and helps private landowners keep their forestland undeveloped.



**Cultural Resources:** Cultural resources are the places containing evidence of people who once lived in the area. Whether a Native American village from 1,700 years ago, or the remains of a farmstead from the 1800’s, these features all tell important and interesting stories about the landscape, and should be protected from damage or loss.

Massachusetts has a long and diverse history of human habitation and use. Native American tribes first took advantage of the natural bounty of this area over 10,000 years ago. Many of these villages were located along the coasts and rivers of the state. The interior woodlands were also used for hunting, traveling, and temporary camps. Signs of these activities are difficult to find in today’s forests. They were obscured by the dramatic landscape impacts brought by European settlers as they swept over the area in the 17<sup>th</sup> and 18<sup>th</sup> centuries.

By the middle 1800’s, more than 70% of the forests of Massachusetts had been cleared for crops and pastureland. Houses, barns, wells, fences, mills, and roads were all constructed as woodlands were converted for agricultural production. But when the Erie Canal connected the Midwest with the eastern cities, New England farms were abandoned for the more productive land in the Ohio River valley, and the landscape began to revert to forest. Many of the abandoned buildings were disassembled and moved, but the supporting stonework and other changes to the landscape can be easily seen today.

One particularly ubiquitous legacy of this period is stone walls. Most were constructed between 1810 and 1840 as stone fences (wooden fence rails had become scarce) to enclose sheep within pastures, or to

exclude them from croplands and hayfields. Clues to their purpose are found in their construction. Walls that surrounded pasture areas were comprised mostly of large stones, while walls abutting former cropland accumulated many small stones as farmers cleared rocks turned up by their plows. Other cultural features to look for include cellar holes, wells, old roads and even old trash dumps.

### **History of Natural Disturbance:**

As noted above, the mid 19th century was the height of forestland clearing for agriculture and pasturing. The availability of richer, more productive farmland in the Midwest resulted in farm abandonment and subsequent regrowth of white pine, chestnut, and mixed hardwoods including red oak. In the early 20th century these stands, particularly white pine, were cut to supply the wood container industry. Farm activity on the newly cleared land was truncated by World Wars I and II and brought about another wave of farm abandonment and regrowth. Natural disturbances since 1900 include the Chestnut blight of 1900-1908, the hurricane of 1938, the Gypsy Moth outbreak of 1980-1982, wind events, and ice damage, most notably in December 2008.



**Recreation and Aesthetic Considerations:** Recreational opportunities and aesthetic quality are the most important values for many forest landowners, and represent valid goals in and of themselves. Removing interfering vegetation can open a vista or highlight a beautiful tree, for example. When a landowner's goals include timber, thoughtful forest management can be used to accomplish silvicultural objectives while also reaching recreational and/or aesthetic objectives. For example, logging trails might be designed to provide a network of cross-country ski trails that lead through a variety of habitats and reveal points of interest.

If aesthetics is a concern and you are planning a timber harvest, obtain a copy of this excellent booklet: *A Guide to Logging Aesthetics: Practical Tips for Loggers, Foresters & Landowners*, by Geoffrey T. Jones, 1993. (Available from the Northeast Regional Agricultural Engineering Service, (607) 255-7654, for \$7). Work closely with your consultant to make sure the aesthetic standards you want are included in the contract and that the logger selected to do the job executes it properly. The time you take to plan ahead of the job will reward you and your family many times over with a fuller enjoyment of your forest, now and well into the future.

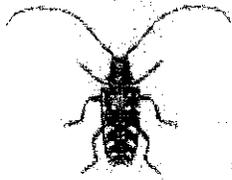


**Invasive Species Management:** Invasive species pose immediate and long-term threats to the woodlands of MA. Defined as a non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human, animal, or plant health, invasives are well-adapted to a variety of environmental conditions, out-compete more desirable native species, and often create monocultures devoid of biological diversity. The websites of the Invasive Plant Atlas of New England, [www.nbii-nin.ciesin.columbia.edu/ipane](http://www.nbii-nin.ciesin.columbia.edu/ipane), and the New England Wildflower Society,

[www.newfs.org](http://www.newfs.org) are excellent sources of information regarding the identification and management of invasive plants. Some of the common invasive plants found in MA are listed below.

- Oriental Bittersweet (*Celastrus orbiculata*)
- Glossy Buckthorn (*Frangula alnus*)
- Multiflora Rose (*Rosa multiflora*)
- Japanese Barberry (*Berberis thunbergii*)
- Japanese Knotweed (*Fallopia japonica*)
- Autumn Olive (*Eleaagnus umbellata*)

Early detection and the initiation of control methods soon after detection are critical to suppressing the spread of invasive species. Selective application of the proper herbicide is often the most effective control method. See the next section for information on the use of chemicals in forest management activities.



Asian Longhorned Beetle

### **Pesticide Use**

Pesticides such as herbicides, insecticides, fungicides, and rodenticides are used to control “pests”. A pest is any mammal, bird, invertebrate, plant, fungi, bacteria or virus deemed injurious to humans and/or other mammals, birds, plants, etc. The most common forest management use of a pesticide by woodland owners is the application of herbicide to combat invasive species. MA DCR suggests using a management system(s) that promotes the development and adoption of environmentally friendly no-chemical methods of pest management that strives to avoid the use of chemical pesticides. If chemicals are used, proper equipment and training should be utilized to minimize health and environmental risks. In Massachusetts, the application of pesticides is regulated by the MA Pesticide Control Board. For more information, contact MA Department of Agricultural Resources (MDAR), Pesticide Bureau at (617) 626-1776

**Please refer to FSC Pesticides Policy: Guidance on Implementation (FSC-GUI30-001 Version 2-0 EN, May 5, 2007) for information on chemicals banned from use on MA Private Lands Group Certification member properties.**

**This is your Stewardship Plan.** It is based on the goals that you have identified. The final success of your Stewardship Plan will be determined first, by how well you are able to identify and define your goals, and second, by the support you find and the resources you commit to implement each step.

It can be helpful and enjoyable to visit other properties to sample the range of management activities and see the accomplishments of others. This may help you visualize the outcome of alternative management decisions and can either stimulate new ideas or confirm your own personal philosophies. Don't hesitate to express your thoughts, concerns, and ideas. Keep asking questions! Please be involved and enjoy the fact that you are the steward of a very special place.



STAND DESCRIPTIONS

**Roberts Meadow Watershed:**

**Notes Applying to All Stands on Management Units RM-2 – RM-10**

**Stand Objectives:** For all stands, the objectives are Forest Stewardship & Green Certification.

**Delineations of Stands and Delineation of Management Units:** Stand delineation and resulting stand acreage at Roberts Meadow watershed reflects the arrangement, size and distribution of forest types occurring there. The delineation of stands is closely reflects delineations done in 1987 by Karl Davies, who was then forester for DPW. Areas under water and areas that are non-forested (e.g. the grassy area below the Middle reservoir dam, the Musante Beach area, the water tank and beach parking area, and the small area of land sandwiched between Reservoir Road and the Middle and Lower Reservoirs) are generally not forested and are not covered by this plan. A total of 27 stands was delineated. For practical reasons, including the dissection of the property by many public roads, the stands were grouped into larger “management units”. These are labeled RM-2 through RM-10. The units are “stand-alone” areas that are generally comprised of a single tax parcel and may be managed as individual units. The units, and the stands they contain, are shown in the following tables (**Note: R\* refers to invasive species rank**).

**RM-2 Sylvester Farm West**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
9	OH	92.3	12.1	91	3.4	10	60	2	15
11	SS	2.0	N/A	N/A	N/A	N/A	N/A	2	0
12	RP	3.4	10.7	212	9.5	11	60	3	1
27	BR	8.3	N/A	N/A	N/A	N/A	N/A	3	0

105.98

16

**RM-3 Sylvester Farm East**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
10	OH	90.15	11.8	90	3.5	8	60	1	15
11	SS	12.7	N/A	N/A	N/A	N/A	N/A	2	0
13	RP	1.8	10.8	213	23.1	11	60	1	0
14	WH	3.7	12.8	185	19.2	9	60	1	1
15	WP	24.5	13.1	194	18.4	12	65	3	4
16	RP	2.0	11.5	153	13.1	7	65	3	0

**STAND DESCRIPTIONS**

134.85

20

**RM-4 Upper Reservoir**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
5	WH	71.70	14.7	119	10.1	9	70	3	12
6	RP	5.0	9.6	236	7.8	7	65	3	1
7	RP	7.4	11.3	196	10.7	8	70	3	1
8	RP	1.0	10.1	153	10.7	10	60	2	0
									14
									85.05

**RM-5 Kennedy Road East**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
17	RP	19.53	11.0	166	8.7	12	65	3	0
									0
									19.53

**RM-6 Reservoir Road West**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
25	WH	3.71	9.0	60	0.5	8	65	3	1

**RM-7, 8 & 9 Middle & Lower Reservoirs**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
22	WH	17.51	14.3	123	10.0	5	65	1	3
23	RP	4.50	9.4	138	6.8	13	65	3	1
24	WH	3.48	14.0	165	11.6	10	65	2	1
									4
									25.49

**RM-10 Reservoir Road East**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
18	OH	12.00	12.4	105	5.5	9	70	2	2
19	WP	22.91	12.6	173	8.9	14	65	3	4
20	RP	10.42	13.1	173	14.7	11	66	2	2

*STAND DESCRIPTIONS*

21	RP	1.98	10.4	158	12.5	12	65	2	1
26	SS	19.05	N/A	N/A	N/A	N/A	N/A	3	0
66.36								8	

**Roberts Meadow Total**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
RM		441.0			6.2	8			62.1

**Ranking system for non-native invasive plant species:** To assess the extent and severity of non-native invasive vegetation, all forested stands were ranked using the following system (see below). This same ranking system was used in the 2012 Forest Stewardship Plans completed for the Northampton DPW for the water supply property within watersheds of the City's active drinking water reservoirs (Ryan & West-Whately Reservoirs and at the Mountain Street Reservoir). Because of the ability of non-native invasive vegetation to aggressively interfere with desired silvicultural outcomes, any stands ranked 3, 4 or 5 were considered "not suitable" for silviculture. Non-native invasive plants detract from desirable watershed forest conditions by aggressively competing with desirable native vegetation, including tree seedlings. Therefore, a major objective of watershed management is to prevent any spread of these plants. The non-native invasive plant that currently and foreseeably poses the single greatest risk on DPW properties is oriental (i.e. asiatic) bittersweet, a vine that is commonly found across the watershed. Buckthorn spp. (both European and glossy buckthorns), which also competes very aggressively with desirable native vegetation was not noted.

(Rank = 1) ESSENTIALLY ABSENT (none observed or, if any, then extremely sparse; no appreciable invasive plant seed bank expected).

(Rank = 2) MINOR AND READILY TREATABLE. (Minor and readily treatable, and therefore still suitable for silviculture if treated; possible presence of localized invasive plant seed bank, but widespread invasive plant seed bank not expected).

— (stands ranked 3 or higher were considered not suitable for silviculture) —

(Rank = 3) MODERATE TO SEVERE. Moderate to severe, and therefore cannot be considered available for silviculture within a 5-10 year period/until 5-10 years after receiving treatment and, under monitoring with follow-up treatment as needed until plants and seedbank are controlled, and the area is downgraded to (2) or (1).

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*STAND DESCRIPTIONS*

(Rank = 4) SEVERE. Severe infestation with no expectation of silviculture within 10 years even if treated. Often, the major difference between a rank of 4 and 5 is that a stand with a rank of 4 still has a forest overstory. However, there is no expectation that the existing overstory will be replaced by a new overstory of desirable trees as, over time, ongoing natural (and/or man-made) disturbances occur.

(Rank = 5) IN NEED OF RESTORATION: the area no longer meets any criteria of a desirable watershed forest — the site is no longer dominated by desirable forest vegetation and/or there is no expectation that the site will be, or will continue to be, dominated by desirable forest vegetation within any foreseeable timeframe without complete intervention/restoration.

*STAND DESCRIPTIONS*

The rankings by stand and total acreage by rank for each unit are shown in the tables below:

**Non-Native Invasive Plant Rankings (by acreage)**

**RM-2 Sylvester Farm West**

Stand	Acres	R*	Rank =1	Rank =2	Rank =3	Rank =4	Rank =5
9	92.3	2	0.0	92.3	0.0	0.0	0.0
11	2.0	2	0.0	2.0	0.0	0.0	0.0
12	3.4	3	0.0	0.0	3.4	0.0	0.0
27	8.3	3	0.0	0.0	8.3	0.0	0.0
	105.98		0.0	94.3	11.7	0.0	0.0

**RM-3 Sylvester Farm East**

Stand	Acres	R*	Rank =1	Rank =2	Rank =3	Rank =4	Rank =5
10	90.2	1	90.2	0.0	0.0	0.0	0.0
11	12.7	2	0.0	12.7	0.0	0.0	0.0
13	1.8	1	1.8	0.0	0.0	0.0	0.0
14	3.7	1	3.7	0.0	0.0	0.0	0.0
15	24.5	3	0.0	0.0	24.5	0.0	0.0
16	2.0	3	0.0	0.0	2.0	0.0	0.0
	134.85		95.7	12.7	26.5	0.0	0.0

**RM-4 Upper Reservoir**

Stand	Acres	R*	Rank =1	Rank =2	Rank =3	Rank =4	Rank =5
5	71.7	3	0.0	0.0	70.2	0.0	1.5
6	5.0	3	0.0	0.0	2.5	0.0	2.5
7	7.4	3	0.0	0.0	6.4	0.0	1.0
8	1.0	2	0.0	1.0	0.0	0.0	0.0
	85.05		0.0	1.0	79.1	0.0	5.0

*STAND DESCRIPTIONS*

**RM-5 Kennedy Road East**

Stand	Acres	R*	Rank =1	Rank =2	Rank =3	Rank =4	Rank =5
17	19.5	3	0.0	0.0	19.5	0.0	0.0
	19.53		0.0	0.0	19.5	0.0	0.0

**RM-6 Reservoir Road West**

Stand	Acres	R*	Rank =1	Rank =2	Rank =3	Rank =4	Rank =5
25	3.7	3	0.0	0.0	3.7	0.0	0.0
			0.0	0.0	3.7	0.0	0.0

**RM-7, 8 & 9 Middle & Lower Reservoirs**

Stand	Acres	R*	Rank =1	Rank =2	Rank =3	Rank =4	Rank =5
22	17.5	1	17.5	0.0	0.0	0.0	0.0
23	4.5	3	0.0	0.0	4.5	0.0	0.0
24	3.5	2	0.0	3.5	0.0	0.0	0.0
	25.49		17.5	3.5	4.5	0.0	0.0

**RM-10 Reservoir Road East**

Stand	Acres	R*	Rank =1	Rank =2	Rank =3	Rank =4	Rank =5
18	12.0	2	0.0	12.0	0.0	0.0	0.0
19	22.9	3	0.0	0.0	22.9	0.0	0.0
20	10.4	2	0.0	10.4	0.0	0.0	0.0
21	2.0	2	0.0	2.0	0.0	0.0	0.0
26	19.0	3	0.0	0.0	19.0	0.0	0.0
	66.36		0.0	24.4	42.0	0.0	0.0

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*STAND DESCRIPTIONS*

**Roberts Meadow Totals**

Stand	Acres		Rank =1	Rank =2	Rank =3	Rank =4	Rank =5
RM	441.0	Total	113	136	187	0	5
		%	25.7%	30.8%	42.4%	0.0%	1.1%

**Roberts Meadow & Kingsley Farm Totals**

Stand	Acres		Rank =1	Rank =2	Rank =3	Rank =4	Rank =5
ALL	537.5	Total	113.2	185.7	199.5	34.2	5.0
		%	21.1%	34.5%	37.1%	6.4%	0.9%

Discussion of invasives ranking: Whether for Roberts Meadow alone or for Roberts Meadow and Kingsley farm combined, approximately one quarter of the acreage was ranked 1, while another one third of the acreage was ranked 2. Altogether, about 55% of the acreage was ranked 1 or 2. Of this acreage (roughly 300 acres for both properties combined), non-native invasive plants were effectively absent or were at a level that was either compatible with silviculture if treated.

Roughly 37% of all acreage (or 42 % of just Roberts Meadow) had a ranking of 3. These are areas that have a level of infestation of non-native invasive plants that most likely makes them non-suitable for silvicultural treatments within the next 10 years, even with treatment. Even if treated, it is expected that any harvesting in these areas would lead to a significant increase in non-native invasive plants. Because avoiding an increase in non-native invasive plants is a key concern of this plan, areas ranked 3 were not scheduled for any silvicultural treatments. However, Stand 17 is an exception. Though it has a rank of 3, the red pine overstory is declining rapidly, and salvage harvesting may be necessary. (Please see further discussion of this Stand 17 in the Stand Descriptions section).

Only two stands had a ranking of 4, comprising 6.4% of the total acreage. These were both at Kingsley Farm. One stand is a red pine plantation that is quickly deteriorating, with oriental bittersweet (and other non-native invasives) and wild grapes taking advantage of new canopy gaps. The overstory is in a process of being replaced by these undesirable plants, though, currently, overstory trees still form most of the canopy. The other stand is a shrub swamp and marsh with the same set of invasives growing on included upland portions of the stand. Though parts of the stand are not suitable for trees at all (due to flooding), the parts that are suitable for trees are in a process of being replaced by the same subset of undesirable plants.

*STAND DESCRIPTIONS*

No entire stand was ranked 5. In parts of Stands 5, 6 & 7, however, there were areas that met the definition of Rank = 5. In these areas, which occur in small openings created by the last logging over 20 years ago, bittersweet (and grapes) are forming a new overstory. These areas were irregular in shape and totaled an estimated 5 acres (see Forest Stand & Boundary Map for RM-4), or about 1% of the total acreage. The roughly 5 acres has been allocated across Stands 5, 6, & 7 to give a sense of the scope of the problem.

For comparative purposes, the rankings for the Ryan & West-Whately Reservoirs and Mountain Street Reservoir are provided below. Comparing the three watersheds in terms of overall severity, it would seem that Roberts Meadow and Kingsley Farm fall somewhere in the middle between the Ryan & West-Whately watershed and the Mountain Street watershed. The Mountain Street watershed has the most severe infestation overall.

Table 3A: Ranking of Invasives by Stand: Ryan & West-Whately Reservoirs

Stand	Overall Invasives Rank 1 - 5	Acres Ranked 1	Acres Ranked 2	Acres Ranked 3	Acres Ranked 4	Acres Ranked 5
	Total	875.4	1363.9	76.0	9.7	20.7
	% of Total	37.3%	58.1%	3.2%	0.4%	0.9%

Table 3A: Ranking of Invasives by Stand: Mountain Street Reservoir

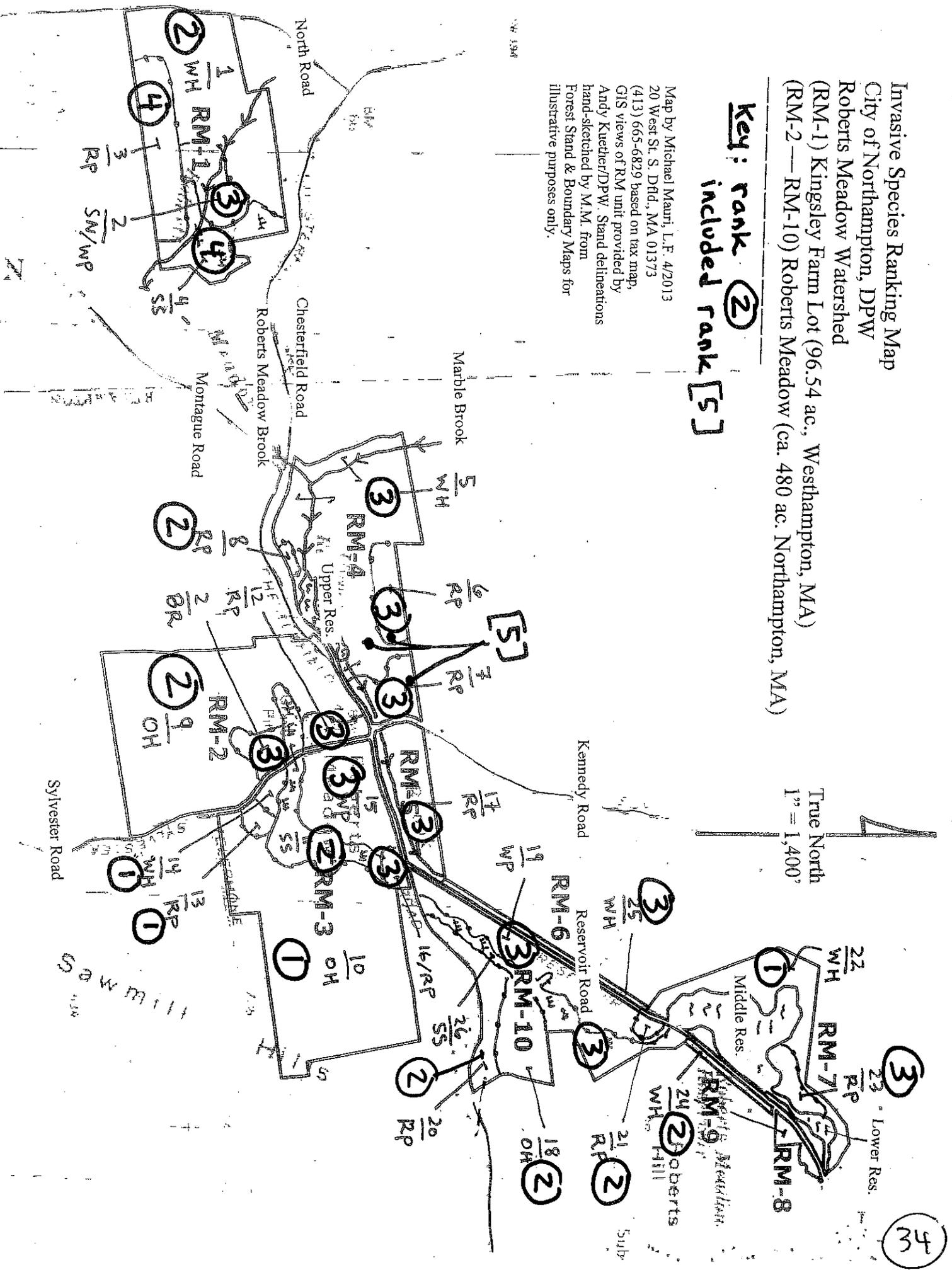
Stand	Overall Invasives Rank 1 - 5	Acres Ranked 1	Acres Ranked 2	Acres Ranked 3	Acres Ranked 4	Acres Ranked 5
	Total	72.3	2.8	421.7	28.0	34.2
	% of total	12.9%	0.5%	75.4%	5.0%	6.1%

**Mapping of invasive plant distribution:** The following map (“Invasive Species Ranking Map”) shows the ranking of each stand.

Invasive Species Ranking Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 (RM-1) Kingsley Farm Lot (96.54 ac., Westhampton, MA)  
 (RM-2) Roberts Meadow (ca. 480 ac. Northampton, MA)

**Key:** rank (2)  
 included rank [5]

Map by Michael Mauri, L.F. 4/2013  
 20 West St. S. DfId, MA 01373  
 (413) 665-6829 based on tax map,  
 GIS views of RM unit provided by  
 Andy Kueher/DPW. Stand delineations  
 hand-sketched by M.M. from  
 Forest Stand & Boundary Maps for  
 illustrative purposes only.



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## STAND DESCRIPTIONS

**Method for volume growth rate:** For all stands, stewardship-plan growth rates were based on the DCR/USFS Forest-Inventory-and-Analysis published average rate of 162 board feet per acre per year. If any adjustments were made to this figure, this was discussed in the specific stand description. If a stand was not forested, then a growth rate of zero bf/acre/yr was used.

**Field method for volume per acre:** For all forested stands with timber, a nested point-sampling cruise was conducted using a BAF-10 prism for "count trees" and a BAF-40 prism for volume trees (diameter and height) (see "Using a large-angle gauge to select trees for measurement in variable plot sampling", Marshall, Lles and Bell, Canadian Journal of Forest Research 34: 840-845 (2004)). See also: "Is BAF 10 a Good Choice for Point Sampling, Wiant, Yandle and Andreas, Journal of Forestry, pp. 23 & 24, June, 1984. Product volumes are calculated in an Excel spreadsheet using formulas published in Mawson and Rivers.

**Field method for site index:** Site index is a rough measure of soil fertility for species-specific tree growth. The site index is considered to be the height, in feet, of a vigorous, free-to-grow tree at age 50. A higher site index represents greater soil fertility for the species in question. Site indices published in the NRCS Soil Survey of Hampshire County, Central Part, Spring, 2013 were used. As needed, the published site indices were adjusted to reflect field observations of tree vigor and other and in-stand features.

**Are there slopes greater than 30%?** No, with the exception of short runs of steep land affiliated with ledge outcrops scattered in Stands 9 & 10.

**Is this soil highly erodible?** No.

**Protection from fire:** With the exception of one area, there was no evidence of recent wildfire. The one area with evidence of fire (estimated several acres, but is possibly larger) is within Stand 10, to the east of the current ATV trail, on the steep slope. Numerous trees had fire scars on their uphill side, which is a typical indicator of fire spreading across the forest floor. The fire may have occurred more than 20 years ago. Other than scarring a number of trees, this fire does not appear to have had any negative effect on the forest.

In general, the main threat of wildfire is careless, unauthorized recreational use. The ATV trails through several of the parcels probably constitute the greatest risk of an accidental fire, though this risk is minimal.

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**Soils occurring at Roberts Meadow:** The USDA NRCS Soil Survey of Hampshire County, Central Part, Spring, 2013, lists a number of soils for the area covered by this plan. These soils are listed in the table below. The general properties of the soils are further described in the section below. The NRCS “map unit” assigned to each soil helps identify the extent of the soil on the soil maps provided below. Soils are further discussed on a stand by stand basis throughout the remainder of the Stand Descriptions section.

**Roberts Meadow Soils**

Map Unit	Short Name	Name
8A	Limerick	Limerick silt loam, 0 to 3 percent slopes
88B	Ridgebury	Ridgebury fine sandy loam, 3 to 8 percent slopes, very stony
88A	Ridgebury	Ridgebury fine sandy loam, 0 to 3 percent slopes, very stony
711E	Charlton-Hollis	Charlton-Rock outcrop-Hollis complex, steep (Charlton)
711E	Charlton-Hollis	Charlton-Rock outcrop-Hollis complex, steep (Hollis)
711E	Charlton-Hollis	Charlton-Rock outcrop-Hollis complex, steep outcrop
5A	Saco	Saco silt loam, 0 to 3 percent slopes
4A	Rippowam	Rippowam fine sandy loam, 0 to 3 percent slopes
441 B	Gloucester	Gloucester sandy loam, 3 to 8 percent slopes, very stony
406D	Charlton	Charlton fine sandy loam, 15 to 25 percent slopes, very stony
406C	Charlton	Charlton fine sandy loam, 8 to 15 percent slopes, very stony
406B	Charlton	Charlton fine sandy loam, 3 to 8 percent slopes, very stony
31A	Walpole	Walpole fine sandy loam, 0 to 3 percent slopes
311C	Woodbridge	Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony
311B	Woodbridge	Woodbridge fine sandy loam, 3 to 8 percent slopes, very stony
306D	Paxton	Paxton fine sandy loam, 15 to 25 percent slopes, very stony
306C	Paxton	Paxton fine sandy loam, 8 to 15 percent slopes, very stony
2A	Pootatuck	Pootatuck very fine sandy loam, 0 to 3 percent slopes, occasionally flooded
260B	Sudbury	Sudbury fine sandy loam, 3 to 8 percent slopes
260A	Sudbury	Sudbury fine sandy loam, 0 to 3 percent slopes
254C	Merrimac	Merrimac fine sandy loam, 8 to 15 percent slopes
254B	Merrimac	Merrimac fine sandy loam, 3 to 8 percent slopes
253D	Hinckley	Hinckley loamy sand, 15 to 25 percent slopes
253C	Hinckley	Hinckley loamy sand, 8 to 15 percent slopes
253B	Hinckley	Hinckley loamy sand, 3 to 8 percent slopes
600	Old Gravel Pit	Pits, gravel

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**Description of Soils at Roberts Meadow Watershed:** (the text below was provided by NRCS).

**Map unit:** 4A - Rippowam fine sandy loam, 0 to 3 percent slopes

The Rippowam component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on alluvial flats. The parent material consists of loamy alluvium over sandy and gravelly alluvium derived from granite and gneiss. **Depth to a root restrictive layer is greater than 60 inches.** The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. **Available water to a depth of 60 inches is low.** Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 9 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 6 percent. This soil meets hydric criteria.

**Map unit:** 5A - Saco silt loam, 0 to 3 percent slopes

The Saco component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on alluvial flats. The parent material consists of coarse-silty alluvium. **Depth to a root restrictive layer is greater than 60 inches.** The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. **Available water to a depth of 60 inches is high.** Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 3 inches during January, February, March, April, May, June, September, October, November, December. Organic matter content in the surface horizon is about 6 percent. This soil meets hydric criteria.

**Map unit:** 8A - Limerick silt loam, 0 to 3 percent slopes

The Limerick component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on alluvial flats. The parent material consists of silty alluvium. **Depth to a root restrictive layer is greater than 60 inches.** The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. **Available water to a depth of 60 inches is very high.** Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 9 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 4 percent. This soil meets hydric criteria.

**Map unit:** 31A - Walpole fine sandy loam, 0 to 3 percent slopes

The Walpole component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on terraces. The parent material consists of sandy glaciofluvial deposits. **Depth to a root restrictive layer is greater than 60 inches.** The natural

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drainage class is poorly drained. Water movement in the most restrictive layer is high. **Available water to a depth of 60 inches is low.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 5 percent.. This soil meets hydric criteria.

**Map unit:** 88A - Ridgebury fine sandy loam, 0 to 3 percent slopes, very stony

**Map unit:** 88B - Ridgebury fine sandy loam, 3 to 8 percent slopes, very stony

The Ridgebury component makes up 85 percent of the map unit. Slopes are 0 to 8 percent. This component is on depressions. The parent material consists of friable loamy eolian deposits over dense loamy lodgment till derived from granite and gneiss. **Depth to a root restrictive layer, densic material, is 10 to 25 inches.** The natural drainage class is poorly drained. Water movement in the most restrictive layer is very low. **Available water to a depth of 60 inches is low.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 3 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 6 percent. This soil meets hydric criteria.

**Map unit:** 253B - Hinckley loamy sand, 3 to 8 percent slopes

**Map unit:** 253C - Hinckley loamy sand, 8 to 15 percent slopes

**Map unit:** 253D - Hinckley loamy sand, 15 to 25 percent slopes

The Hinckley component makes up 80 percent of the map unit. Slopes are 3 to 25 percent. This component is on outwash plains. The parent material consists of loose sandy and gravelly glaciofluvial deposits. **Depth to a root restrictive layer is greater than 60 inches.** The natural drainage class is excessively drained. Water movement in the most restrictive layer is high. **Available water to a depth of 60 inches is low.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.

**Map unit:** 254B - Merrimac fine sandy loam, 3 to 8 percent slopes

**Map unit:** 254C - Merrimac fine sandy loam, 8 to 15 percent slopes

The Merrimac component makes up 85 percent of the map unit. Slopes are 3 to 15 percent. This component is on outwash plains. The parent material consists of friable loamy eolian deposits over loose sandy glaciofluvial deposits derived from granite and gneiss. **Depth to a root restrictive layer is greater than 60 inches.** The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is

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Roberts Meadow Reservoir Town(s) Northampton Owner(s) City of Northampton DPW

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high. **Available water to a depth of 60 inches is low.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This soil does not meet hydric criteria.

**Map unit:** 260A - Sudbury fine sandy loam, 0 to 3 percent slopes

**Map unit:** 260B - Sudbury fine sandy loam, 3 to 8 percent slopes

The Sudbury component makes up 85 percent of the map unit. Slopes are 0 to 8 percent. This component is on outwash plains. The parent material consists of friable loamy eolian deposits over loose sandy glaciofluvial deposits. **Depth to a root restrictive layer is greater than 60 inches.** The natural drainage class is moderately well drained. Water movement in the most restrictive layer is high. **Available water to a depth of 60 inches is low.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during January, February, March, April, December. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.

**Map unit:** 306C - Paxton fine sandy loam, 8 to 15 percent slopes, very stony

**Map unit:** 306D - Paxton fine sandy loam, 15 to 25 percent slopes, very stony

The Paxton component makes up 85 percent of the map unit. Slopes are 8 to 15 percent. This component is on hills on uplands. The parent material consists of friable loamy eolian deposits over dense loamy lodgment till derived from granite and gneiss. **Depth to a root restrictive layer, densic material, is 20 to 37 inches.** The natural drainage class is well drained. Water movement in the most restrictive layer is very low. **Available water to a depth of 60 inches is moderate.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 24 inches during February, March, April. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.

**Map unit:** 2A - Pootatuck very fine sandy loam, 0 to 3 percent slopes, occasionally flooded

The Pootatuck, occasionally flooded component makes up 88 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains on valleys. The parent material consists of loamy alluvium over sandy alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 21 inches during January, February, March, April, May, October, November, December. Organic matter content in

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*STAND DESCRIPTIONS*

the surface horizon is about 4 percent. This soil does not meet hydric criteria.

**Map unit:** 311B - Woodbridge fine sandy loam, 3 to 8 percent slopes, very stony

**Map unit:** 311C - Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony

The Woodbridge component makes up 85 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills on uplands. The parent material consists of friable loamy eolian deposits over dense loamy lodgment till derived from granite and gneiss.

**Depth to a root restrictive layer, densic material, is 18 to 35 inches.** The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low. **Available water to a depth of 60 inches is moderate.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.

**Map unit:** 406B - Charlton fine sandy loam, 3 to 8 percent slopes, very stony

**Map unit:** 406C - Charlton fine sandy loam, 8 to 15 percent slopes, very stony

**Map unit:** 406D - Charlton fine sandy loam, 15 to 25 percent slopes, very stony

The Charlton component makes up 85 percent of the map unit. Slopes are 3 to 25 percent. This component is on hills on uplands. The parent material consists of friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss. **Depth to a root restrictive layer is greater than 60 inches.** The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. **Available water to a depth of 60 inches is moderate.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.

**Map unit:** 441B - Gloucester sandy loam, 3 to 8 percent slopes, very stony

The Gloucester, very stony component makes up 87 percent of the map unit. Slopes are 3 to 8 percent. This component is on moraines on uplands. The parent material consists of sandy and gravelly supraglacial till derived from gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about

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95 percent. This soil does not meet hydric criteria.

**Map unit:** 711E - Charlton-Rock-outcrop-Hollis complex, steep

**Component:** Charlton (35%)

The Charlton component makes up 35 percent of the map unit. Slopes are 25 to 45 percent. This component is on hills on uplands. The parent material consists of friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss.

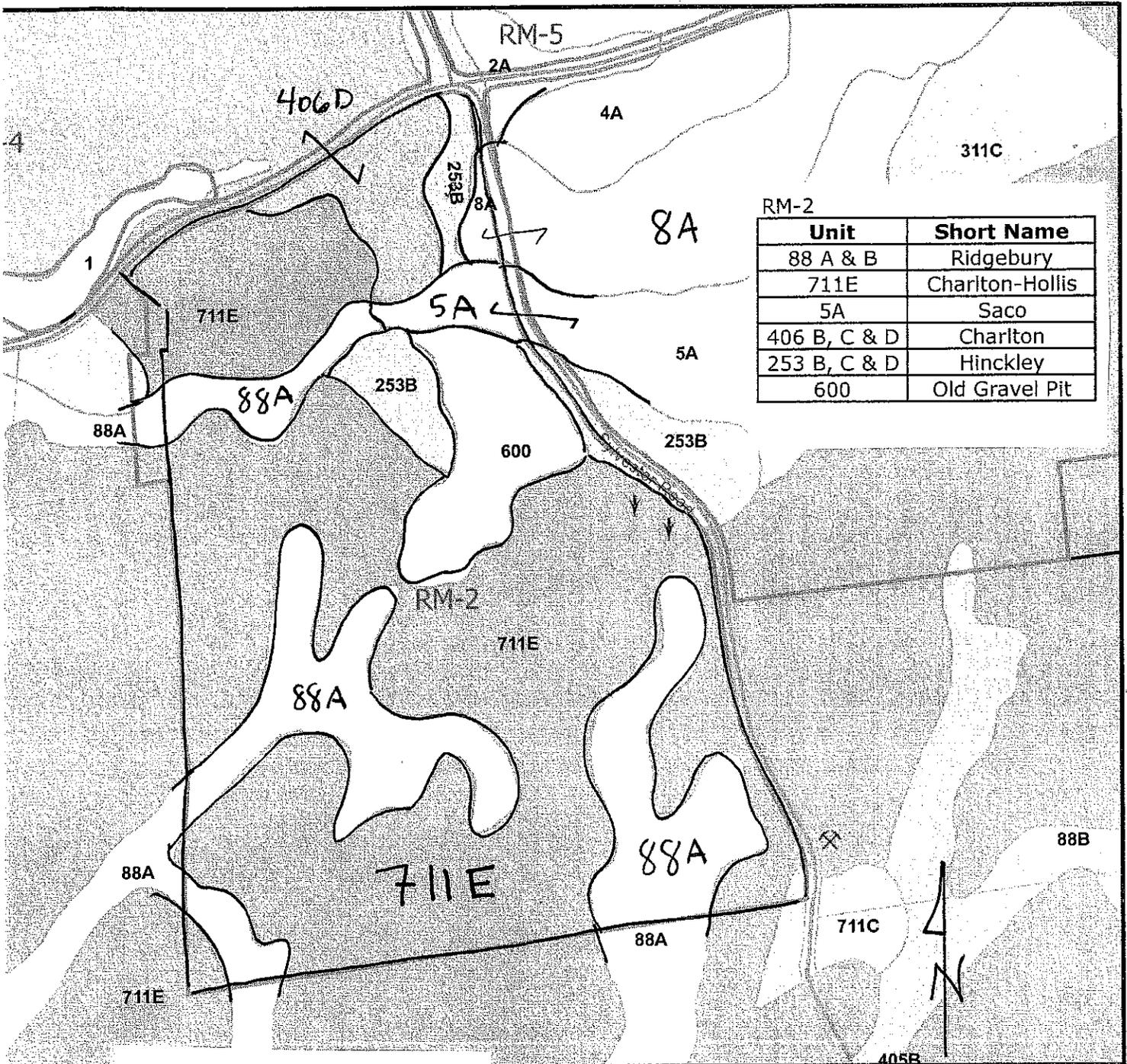
**Depth to a root restrictive layer is greater than 60 inches.** The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high.

**Available water to a depth of 60 inches is moderate.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.

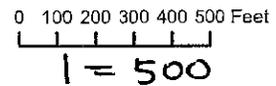
**Component:** Rock outcrop (25%)

**Component:** Hollis (20%)

The Hollis component makes up 20 percent of the map unit. Slopes are 25 to 45 percent. This component is on hills on uplands. The parent material consists of friable loamy basal till over granite and gneiss. **Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches.** The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. **Available water to a depth of 60 inches is very low.** Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.



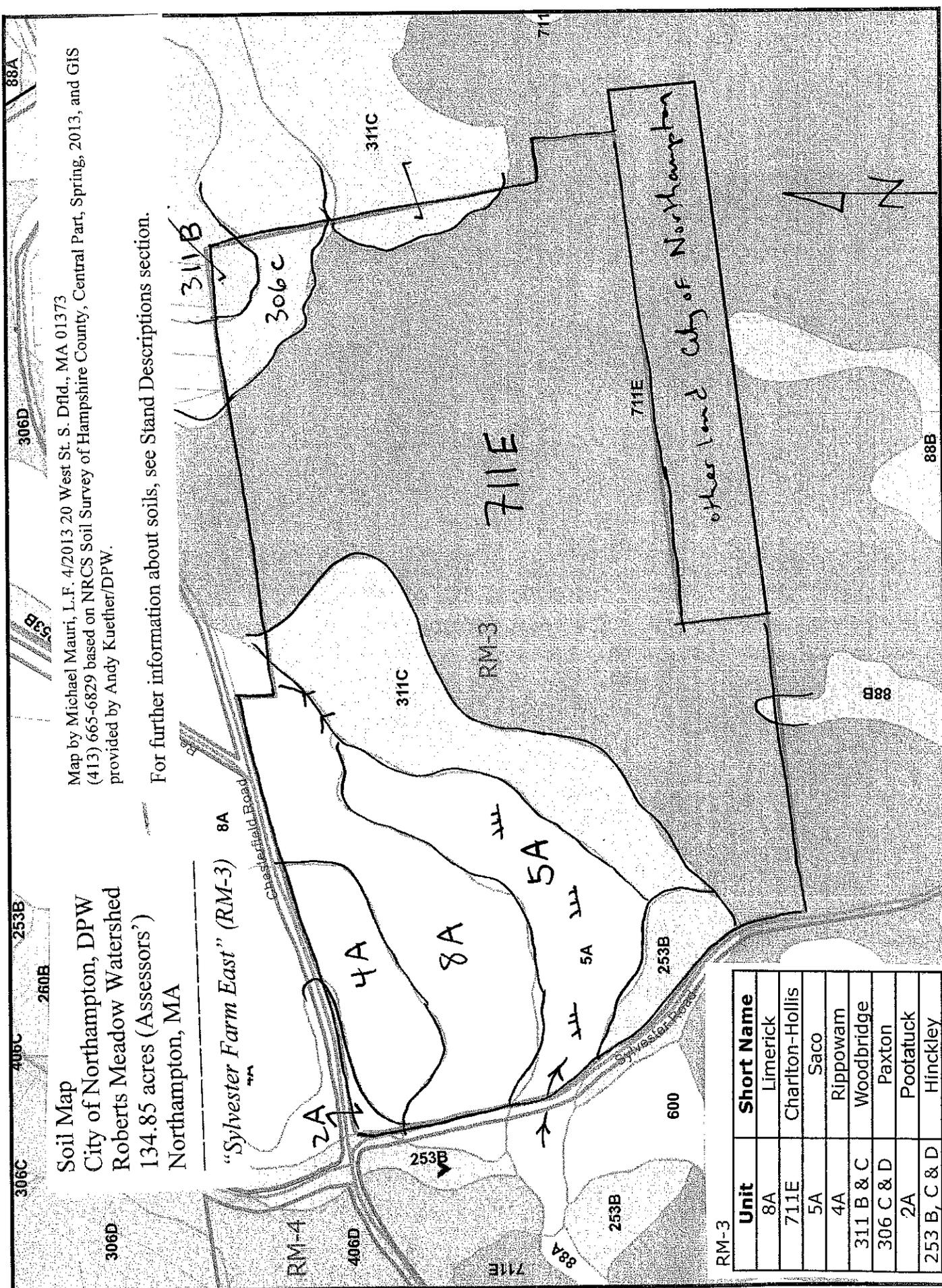
Soil Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 105.98 acres (Assessors')  
 Northampton, MA



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 "Sylvester Farm West" (RM-2)

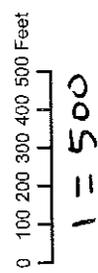
Map by Michael Mauri, L.F. 4/2013 20 West St. S. Dfld., MA 01373  
 (413) 665-6829 based on NRCS Soil Survey of Hampshire County, Central Part, Spring, 2013, and GIS  
 provided by Andy Kuether/DPW.

For further information about soils, see Stand Descriptions section.



Map by Michael Mauri, L.F. 4/2013 20 West St. S. Dfld., MA 01373  
(413) 665-6829 based on NRCS Soil Survey of Hampshire County, Central Part, Spring, 2013, and GIS provided by Andy Kuetner/DPW.

For further information about soils, see Stand Descriptions section.



Forest Management  
Roberts Meadow Section

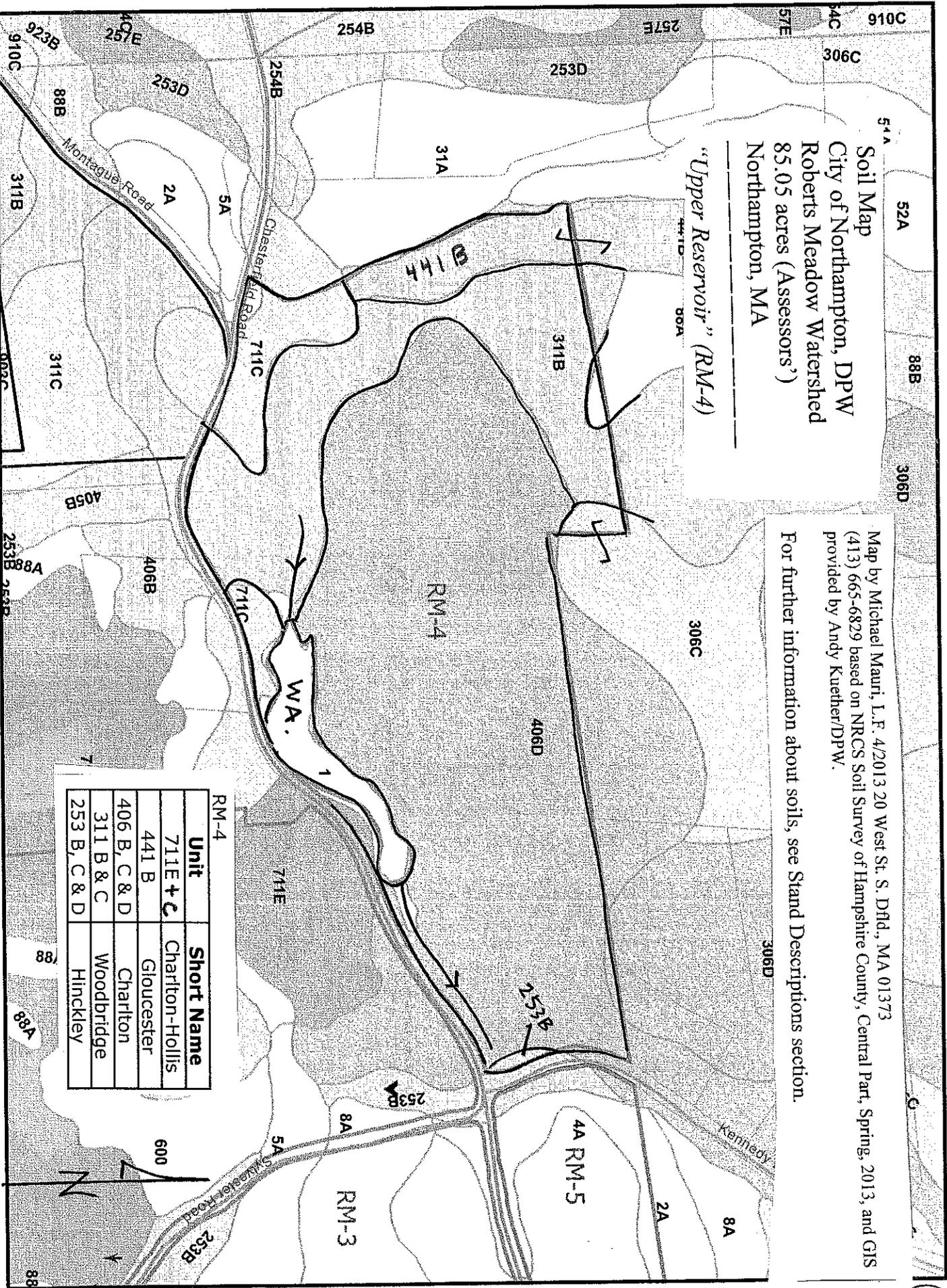
Northampton Public Works  
2013-04-01 AK

Soil Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 85.05 acres (Assessors')  
 Northampton, MA

"Upper Reservoir" (RM-4)

Map by Michael Mauri, L.F. 4/2013 20 West St. S. Dhd., MA 01373  
 (413) 665-6829 based on NRCS Soil Survey of Hampshire County, Central Part, Spring, 2013, and GIS  
 provided by Andy Kuether/DPW.

For further information about soils, see Stand Descriptions section.



Unit	Short Name
711E + C	Charlton-Hollis
441 B	Gloucester
406 B, C & D	Charlton
311 B & C	Woodbridge
253 B, C & D	Hinckley

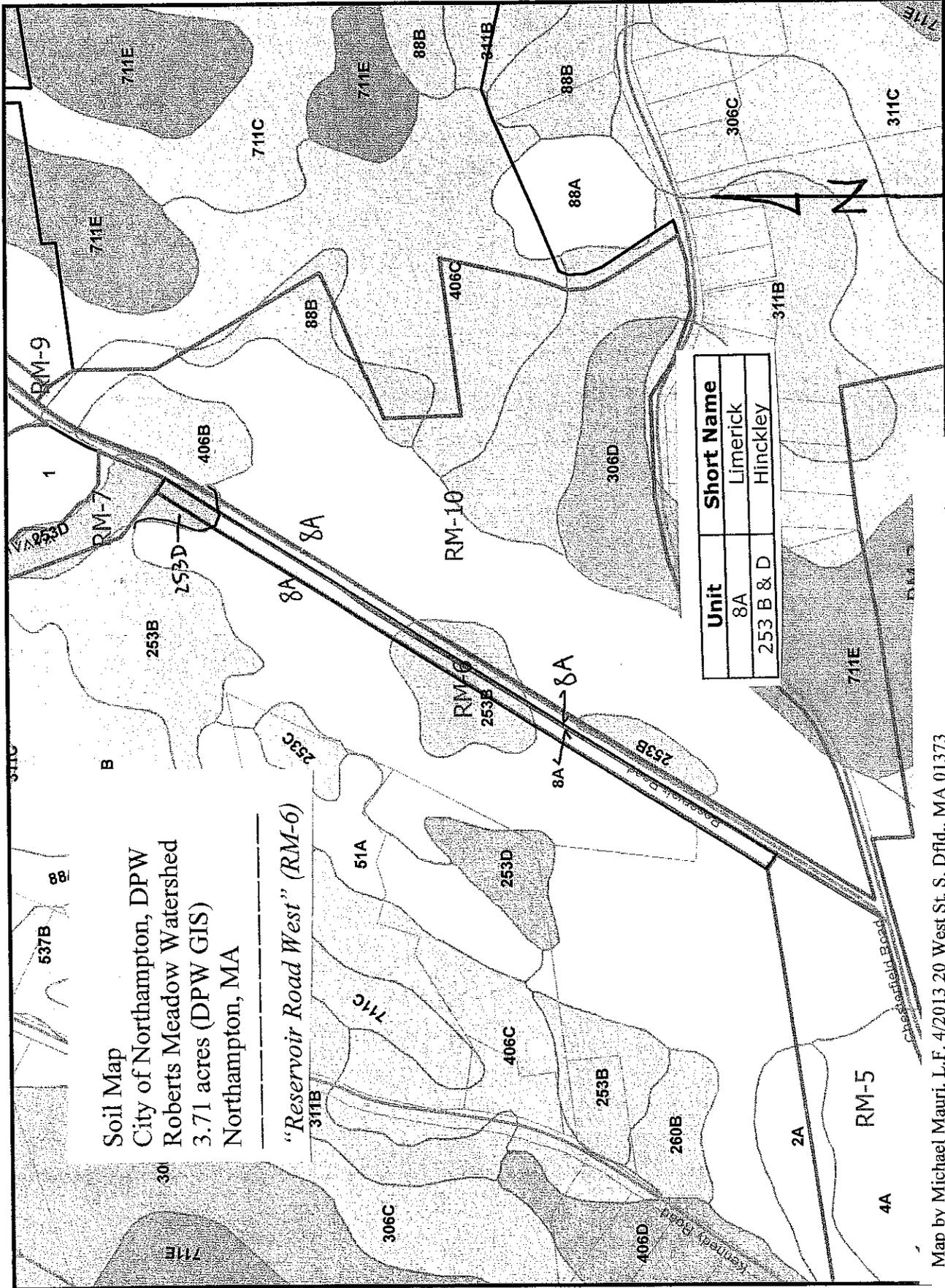
0 100 200 300 400 500 Feet

1" = 500'



(F)





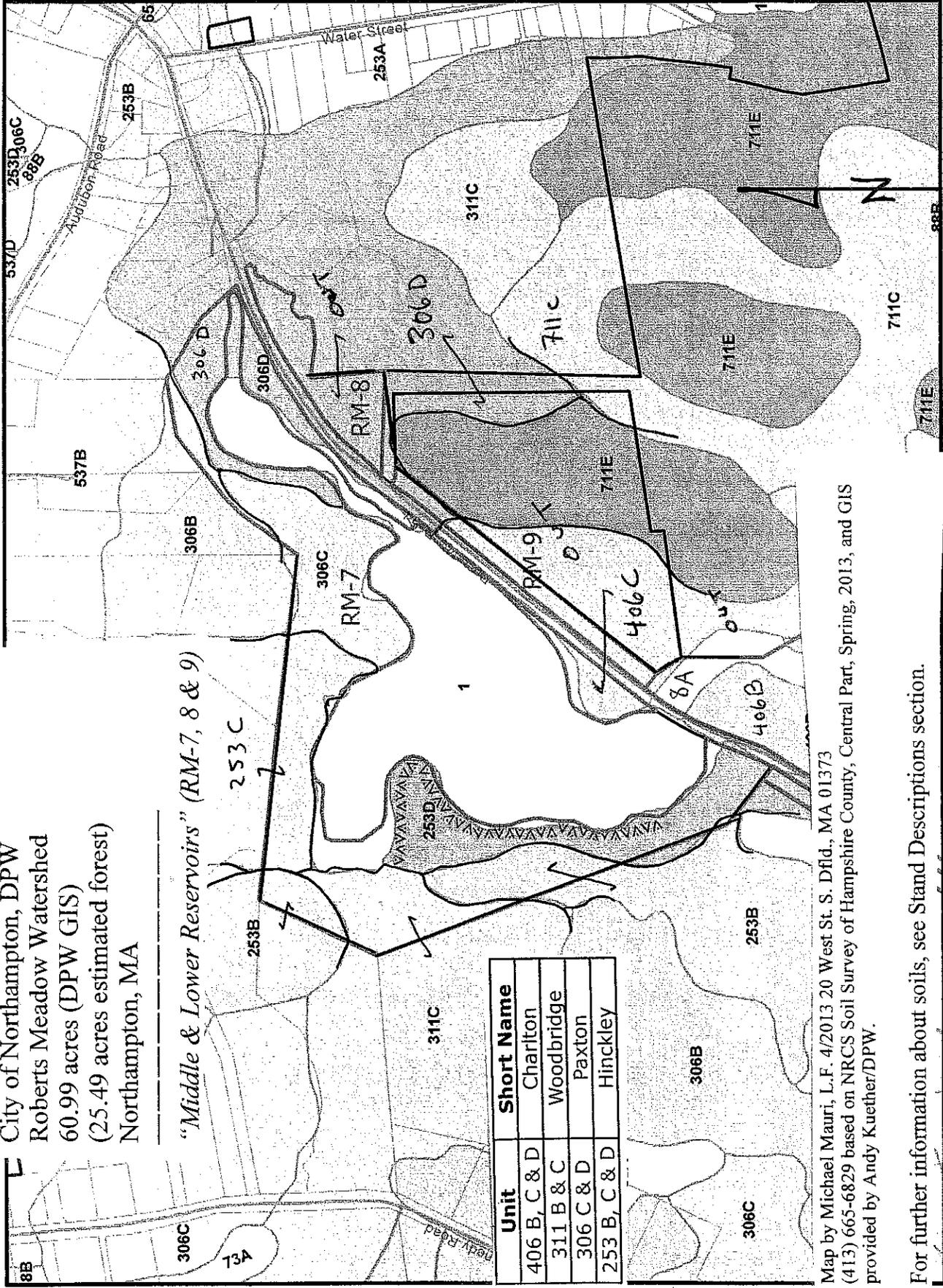
Map by Michael Mauri, L.F. 4/2013 20 West St. S. Dfld., MA 01373  
 (413) 665-6829 based on NRCS Soil Survey of Hampshire County, Central Part, Spring, 2013, and GIS  
 provided by Andy Kueher/DPW.

For further information about soils, see Stand Descriptions section.

Soil Map

City of Northampton, DPW  
 Roberts Meadow Watershed  
 60.99 acres (DPW GIS)  
 (25.49 acres estimated forest)  
 Northampton, MA

"Middle & Lower Reservoirs" (RM-7, 8 & 9)



Unit	Short Name
406 B, C & D	Charlton
311 B & C	Woodbridge
306 C & D	Paxton
253 B, C & D	Hinckley

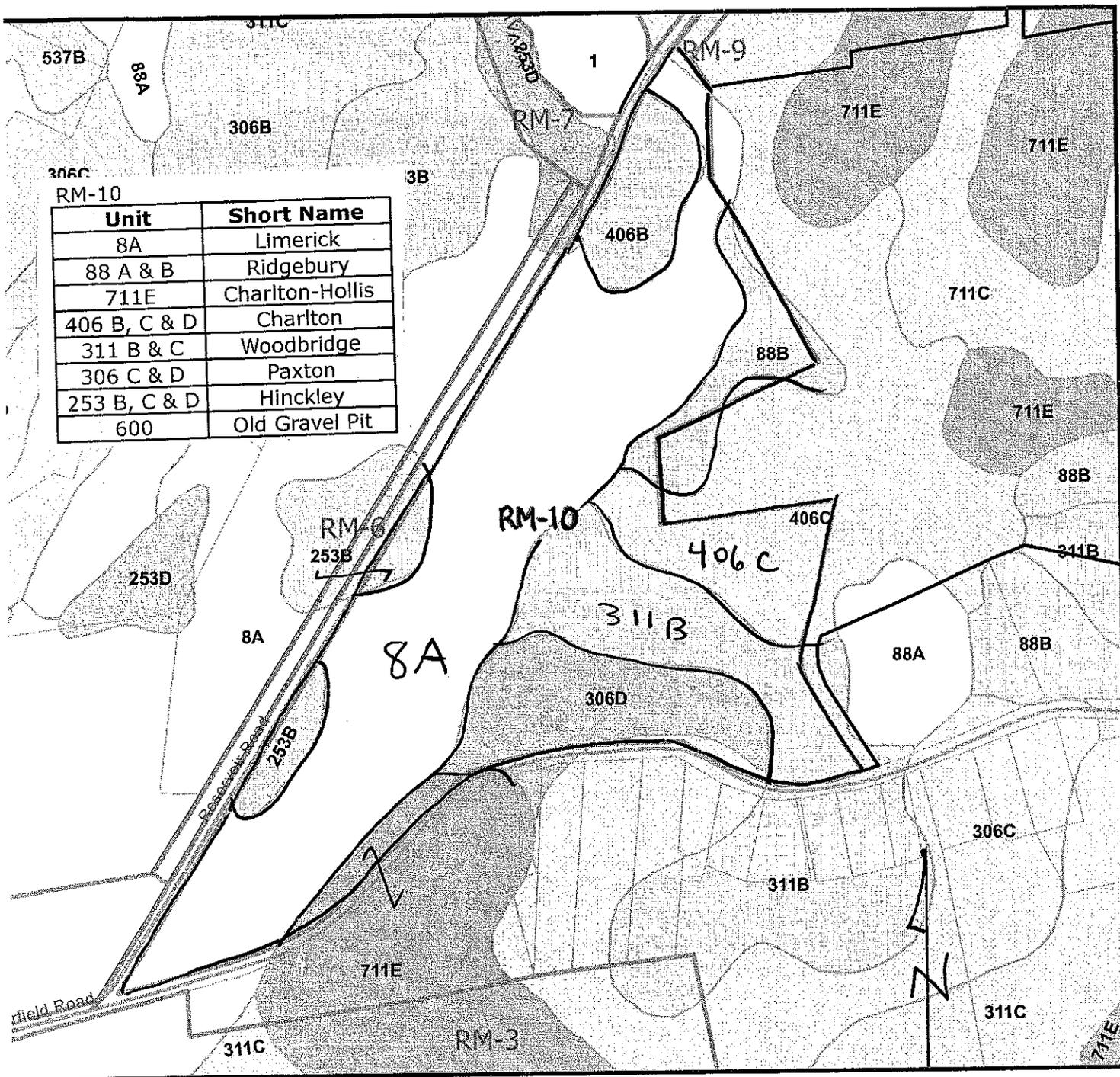
Map by Michael Mauri, L.F. 4/2013 20 West St. S. Dfld., MA 01373  
 (413) 665-6829 based on NRCS Soil Survey of Hampshire County, Central Part, Spring, 2013, and GIS  
 provided by Andy Kuether/DPW.

For further information about soils, see Stand Descriptions section.

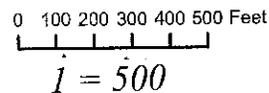
Northampton Public Works  
 2013-04-01 AK

Forest Management  
 Roberts Meadow Section





Soil Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 66.36 acres (DPW GIS)  
 Northampton, MA



*"Reservoir Road East" (RM-10)*

Map by Michael Mauri, L.F. 4/2013 20 West St. S. Dfld., MA 01373  
 (413) 665-6829 based on NRCS Soil Survey of Hampshire County, Central Part, Spring, 2013, and GIS  
 provided by Andy Kuether/DPW.

For further information about soils, see Stand Descriptions section.

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*STAND DESCRIPTIONS*

**Roberts Meadow Watershed:**  
**Stand Descriptions for Management Units RM-2 – RM-10**

The remainder of this section is devoted to specific stand descriptions. The stands are grouped by management unit (RM-2 through RM-10). Each stand is shown on the relevant Forest Stand & Boundary Map (one map for each management unit (RM-2 through RM-10)). The maps can be found after the Management Practices section of this Forest Stewardship Plan.

**RM-2 Sylvester Farm West**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
9	OH	92.3	12.1	91	3.4	10	60	1	15
11	SS	2.0	N/A	N/A	N/A	N/A	N/A	2	0
12	RP	3.4	10.7	212	9.5	11	60	3	1
27	BR	8.3	N/A	N/A	N/A	N/A	N/A	3	0
		105.98							16

\*R = Invasive species rank

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
9	OH	92.3	12.1	91	3.4	10	60	2	15

**Special water quality concerns (for stands within a reservoir watershed):** The southern and central portions of this stand do not drain into the reservoir watershed. In the northern section, avoid any inputs of sediments into the east-west stream. If any logging occurs in this area, it should be possible to avoid any stream crossings by entering the stand from the north and the south. Any work near streams will be designed to avoid sedimentation. Otherwise, there are no particular risks of sediment inputs from this stand over the next 10 years. Much of the area west of Stand 30 and all of the area south of Stand 30 drain out of the watershed system.

**Silvicultural Status (options are "suitable" or "not suitable"):** suitable.

**Overstory: Forest Type and Condition:** Stand 9 consists of tall, closed-canopy forest of pole-sized and timber-sized red oak and other hardwoods, sometimes with a strong component of tall white pine timber, surrounding a central red maple swamp. A number of streams flow through this stand. The soil is stony and the terrain is very uneven; bedrock is close to the surface in most areas of the stand, and there are numerous ledge knolls and exposures of fractured bedrock. Mixed in with the red oak are minor amounts of the following hardwoods: white oak, scarlet oak and black oak, red maple, shagbark hickory (and even less pignut hickory) and white ash. Mixed in with the red maple swamp are a strong component of white ash and yellow birch, with less elm, black gum and white pine. The wetland edges and the riparian areas feature a blend of the red-oak type and the red-maple type. Hemlock occurs on a scattered basis, usually as a single midstory tree, with scattered small concentrations (such as the one just west of the old gravel pit).

Though many of the overstory trees are only of firewood size, this is a mature forest, with the hardwoods dating to approximately 1900. So many of the oaks and red maples seem to be of sprout origin, indicating that the oaks were already present at the time of the ca.1900 cutting, which means that the root systems of the present trees may date back to the 1870's or before. Reflecting soil conditions (see below) in this stand, growth has been slow (trees are growing roughly one inch every 10 years, or 10 inches in a century), timber quality does not look good and is expected to be poor (with shake, rot, or "mineral", a type of defect). Repeated gypsy moth infestations (last in 1979-1981) have probably slowed growth as well. There is a very noticeable difference in the size, height, and apparent quality between the oaks growing in riparian and wetland edge areas (these are much bigger and look much better) and those growing on side-hills and on knolls. This difference suggests that water is the limiting factor (specifically moisture

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## STAND DESCRIPTIONS

availability during the growing season). The ability of white pine to grow on this site is better than oak, and the quality of the pine timber is probably average.

Although timber quality is below average, this stand is, nonetheless, an intact and functioning oak forest, with, effectively, no intrusion of grapes or of bittersweet and other invasives.

### Understory:

**Desirable Tree Regeneration (species and distribution) for future overstory:** In the area south of Stand 30 there are many stout white pine saplings that may survive and grow into canopy gaps. Apparently, the white pines are able to remain competitive against the overstory scarlet oaks. Regeneration is completely lacking in most areas due to overstory shade.

**Interfering native vegetation:** Wild grapes were generally absent from this stand. In upland areas, mountain laurel was sometimes quite thick, and witch hazel was widespread and often thick throughout. Beech and striped maple occurred sporadically. Together, mountain laurel, witch hazel, beech and striped maple would interfere with the establishment of desirable trees in a thinning or shelterwood type cut. In heavier cutting, however, desirable trees would have a better chance of outcompeting the mountain laurel and witch hazel.

**Other native understory vegetation (species and distribution):** Most of the upland ground vegetation is sparse due to overstory shade and the midstory shade of mountain laurel and witch hazel. Musclewood, ironwood, shadbush, and highbush blueberry are established throughout the stand. In the central shrub swamp, winterberry, cinnamon fern and sphagnum moss are abundant, with highbush blueberry occurring as well. Black gum was noted in the upland-shrub-swamp interface area. The black gums were mostly small, midstory trees. Canada mayflower and starflower are probably fairly abundant in upland areas. On the dry knoll-tops there is sometimes thick huckleberry with lowbush blueberry and bracken fern.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 2 overall. The severity level would have been = 1 if it were not for a few individual plants of bittersweet, multiflora rose, Japanese barberry, and autumn olive just to the northwest of Stand 30. These were found mainly in the beds of old access roads coming out of the gravel pit (Stand 30) (which hosts free-to-grow seed sources of these same invasives). The affected area of Stand 9 is perhaps 2 acres in size. Throughout other parts of Stand 9, invasives were not noted.

**Soils (type, moisture, drainage and productivity):** Soils are Charlton-rock-outcrop-Hollis and Ridgebury (See "Overview of Soils" above).

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## STAND DESCRIPTIONS

**For tree growth purposes:** These soils are well-suited to growing a range of native trees, but only some areas are well-suited to growing large, high-quality timber. These more productive areas occur on a scattered basis in deeper pockets or well-drained soil. The fertility of other areas is limited by factors such as lack of soil depth and/or poor drainage.

**For logging purposes:** The Ridgebury soil is poorly suited to logging unless conditions are very frozen. The Charlton-rock-outcrop-Hollis is a mixed bag, with some areas readily operable, and others extremely challenging due to steep slopes, exposed ledge, and wet or riparian areas that need to be crossed or avoided. Overall, this is a challenging site. The road into Stand 30 provides excellent access into the central part of the stand.

### Habitat:

**General Habitat:** Tall, closed-canopy oak-hardwood forest, often with a component of tall white pine, with hard-mast-bearing trees (oaks and, to a minor extent, hickories) and scattered medium-sized downed trees that were probably killed by gypsy moths in the early 1980's. A few red oaks and white pines are quite tall and large. There are a number of streams with various in-stream features such as deep pools and cascades over large stones. There is a central red maple swamp covering several acres, surrounded by knolls of exposed ledge. Ledge outcrops and overhangs and heaps of small boulders occur throughout the stand. Many of these are used by porcupines.

As is the case across most of the DPW watershed, early successional upland habitat was completely lacking from this stand.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): Yes, two possible vernal pools were located in the vicinity of Sylvester Road (See Forest Stand and Boundary Map. The vernal pool north of the trail had wood frogs singing on 4/8/2013. What seemed to be a vernal pool just south of the gated entrance to Stand 30 was almost completely dry on 4/8/2013 and did not seem to be a vernal pool. There may be vernal pools that were not detected.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): protect the possible vernal pools and the integrity of all riparian areas by keeping these in "no-cut" zones (or, if streams need to be crossed, by keeping the number of crossings to a minimum as well as locating and using these on stable ground).

**Special risks to habitat:** The possibility of bittersweet and grapes spreading from adjoining areas.

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Stand Descriptions Page 19

Roberts Meadow Reservoir Town(s) Northampton Owner(s) City of Northampton DPW

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## STAND DESCRIPTIONS

**Desired habitat modifications (options will vary, including "none"):** (1) Treatment of invasives near Stand 30; (2) create 5-8 acres of early successional habitat.

**Historical/archaeological/contemporary:** Other than a short stone wall in the northern part of the stand, this stand is notable for its *lack* of old walls, fences and other indications of past agricultural use. Undoubtedly, this is a direct reflection of the very rugged and difficult terrain. See Stand 12 and Stand 30 for further discussion.

There is a hiking trail that follows an old ROW bed. This may be an ATV trail, but in winter 2013 there was only evidence of hiking. The trail does not have any official designation as a trail.

**Management history:** No evidence of logging in recent decades. There is no record of any thinning under the direction of previous DPW forester Karl Davies. The 1979-1981 gypsy moth infestation tended to weaken and kill many subdominant trees, reducing crowding at that time and serving as a kind of thinning.

**Desired future condition:** A continuation of the current forest type with the addition of areas of a younger age class (temporary early successional habitat) if possible. The forest should be free of the influence of non-native invasive plants, grapes and other interfering factors.

**Silvicultural ideas:** No silviculture is needed in the central swamp. The canopy in most upland areas of the stand has grown back together after the early 1980's die-back caused by gypsy moths (see above) and are now somewhat overcrowded. Ideally, any area with well-formed trees could be thinned so that well-established trees could continue to remain vigorous and produce seed over time. In any concentrated area of poorly-formed trees, a regeneration cut could convert the current overstory to an area of young growth. This would contribute to the long-term structural diversity of the forest and add (temporarily) a much-needed component of early successional habitat. The origin of the new growth would be from a combination of hardwood sprouts (e.g. re-sprouting of oaks) and hardwoods from existing seedlings (scattered oaks) and seed (birches and cherries). The pre-existing huckleberries and lowbush blueberries would thrive following this cutting and there would most likely be a strong flush of blackberries and raspberries. The rapid revegetation would be a deterrent to the seeding in of bird-borne bittersweet seed. Grapes (from a possible established seed bank) would not be expected to prosper at this site. The cut would create an irregular area that would include groves of retained trees with desirable features (e.g. den cavities or the potential for these).

**Discussion of silvicultural ideas:** Given the challenging terrain, the desire to avoid impacts to riparian areas, and the low value of the trees to cut in a thinning, it is not really practical to carry out a thinning at this time. Perhaps there can be a limited amount of thinning in easy-to-access areas as an off-shoot of regenerating cutting described below.

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Stand Descriptions Page 20

Roberts Meadow Reservoir Town(s) Northampton Owner(s) City of Northampton DPW

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*STAND DESCRIPTIONS*

The creation of early successional habitat would be feasible in a number of areas (e.g. A – the areas south of Stand 30, and B - the area to the west of the short stone wall). Between these two choices, area A is probably a better choice because (1) it is easy to access from the “work area” road and (2) it is in a discreet location. Though the income from such a cut would be minimal (this would probably break even), this cut would serve DPW’s stated goals of diversifying forest structure and habitat. The “trail” that cuts through area A (on the old ROW) could be a source of interaction with the public.

Note: area A is outside the watershed system.

Conducting a regeneration cut in area B would require creating a new access point. Because it is right next to Chesterfield Road, there would probably be a lot of public attention, some of which would probably be negative. The benefits of doing this type of cut in area B probably do not outweigh the costs.

**Recommended management for the next 10 years:** (1) mark boundaries, (2) control non-native invasive plants in the ca. 2-acre area to the northwest of Stand 30, (3) conduct a regeneration harvest on ca. 5-8 acres in the area south of Stand 30 (area “A”).

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
11	SS	2.0	N/A	N/A	N/A	N/A	N/A	2	0

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into streams or flooded/saturated areas. There is no expectation that any management activity occurring here will cause sedimentation. On the east side of Sylvester Road there is an unofficial ATV-crossing of this stand. Currently, there is a small, stable, unauthorized bridge in place. The bridge may help minimize sedimentation at this crossing, but on the northern side of the bridge there is a small “mud hole” area. If the bridge were removed or fails and ATVs crossed right through the stream, this would be a more significant source of sedimentation.

**Silvicultural Status (options are “suitable” or “not suitable”):** NOT suitable.

**Overstory: Forest Type and Condition:** This is a shrub swamp fed by a seasonal west-to-east stream (see Forest Stand and Boundary Map) with areas of red maple swamp, shallow marsh, and three adjoining (possible) vernal pools (see Forest Stand and Boundary Map). About 2 acres of this stand are on the west side of Sylvester Road; approximately 12.7 acres of this stand are located on the east side of Sylvester Road. The two sections are connected hydrologically by a culvert. Scattered trees include red maple, white pine, yellow birch, elm, shadbush and muscledwood. No black gum was noted. Shrubs include witch hazel, highbush blueberry, winterberry, dogwood, spirea and viburnums. Hydrological conditions are variable, with slowly-flowing water, ponded water, saturated soil, and a microtopography of hummocks. A number of standing dead red maples reflect fluctuating water tables caused by past beaver activity.

Some parts of the main stream that runs through this stand have been ditched (perhaps as a way of draining surrounding land or perhaps simply to concentrate the flow). The tributary that defines the southern boundary of Stand 13 is also a ditch.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** N/A.

**Interfering native vegetation:** None noted. The witch hazel is not interfering with desirable processes in this stand.

**Other native understory vegetation (species and distribution):** Sensitive fern and other ferns, various grasses, sedges and cattails.

(55)

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*STAND DESCRIPTIONS*

**Non-native invasive vegetation** (species, distribution/severity) (see “Notes applying to all stands” above): Severity level is 2 overall. A small, matted area of bittersweet was noted at the eastern end of the culvert under Sylvester Road. This stand is not an area with the potential for a tall overstory, and, therefore, non-native invasive vegetation will not be an interfering factor in overstory development. However, to help with mapping and tracking of the overall invasive plant situation, the ranking system was applied here and used to indicate the level of infestation.

**Soils (type, moisture, drainage and productivity):** The soil is Ridgebury at the very western end of the stand, and Limerick at the very eastern end (near Chesterfield Road) but is primarily Saco on both sides of Sylvester Road. (See “Overview of Soils” above).

**For tree growth purposes:** Most of this soil is too wet for most tree growth over an extended period of time.

**For logging purposes:** This soil is too wet for logging activity.

**Habitat:**

**General Habitat:** Short, sparse canopy of red maple and white pine in a large area of shrub swamp and shallow marsh.

**Do wetlands occupy more than 10% of this stand?** Yes.

**Were vernal pools identified/mapped for this stand?** (if “yes”, how many): Two possible vernal pools were identified along the northern edge of this stand (see above). These were both located on the east side of Sylvester Road. One was at the very western end, just north of the culvert, and the other was at the very eastern end, south of the Stand 16 (see Forest Stand & Boundary Maps for RM-2 & RM-3. In both of these areas, on 4/8/2013, wood frogs were calling from surrounding wetland areas as well that did not have the “isolation” of a classic vernal pool. Parts of these larger wetlands may function as vernal pools.

**Are NHESP layers indicated for this stand?** (if “yes”, describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): None.

**Special risks to habitat:** Other than along the fringes, this stand is probably too wet for upland non-native invasive plants. The possibility of bittersweet and grapes becoming established along the wetland-upland interface and becoming prolific seed sources.

**Desired habitat modifications (options will vary, including “none”):** None.

**Historical/archaeological/contemporary:** None noted.

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*STAND DESCRIPTIONS*

**Management history:** N/A.

**Desired future condition:** A dynamic mix of thriving native wetland communities that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** N/A.

**Discussion of silvicultural ideas:** N/A.

**Recommended management for the next 10 years:** (1) Monitor, on an ongoing basis, this stand to detect as early as possible whether non-native invasive plants are beginning to establish. If any are detected, control these as early as possible. (2) Take steps to eliminate or minimize the ATV use of the stream crossing discussed above.

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
12	RP	3.4	10.7	212	9.5	11	60	3	1

**Special water quality concerns (for stands within a reservoir watershed):** Avoid any inputs of sediments into Roberts Meadow Brook — this should not be a problem since there does not appear to be any surface flow from this stand into the brook. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW’s ability to maintain the type of functioning forest canopy that is considered to provide the best protection for water quality.

**Silvicultural Status (options are “suitable” or “not suitable”):** NOT suitable.

**Overstory: Forest Type and Condition:** This is a plantation of red pine. The red pines are well-formed and of medium height (ca. 80’). Spacing is good due to past thinning. No exact time for the most recent thinning is known. Overall, this is some of the better red pine on DPW lands, with the exception of the northern corner (Chesterfield and Sylvester Roads) where the overstory is completely infested with large bittersweet vines that have wound their way up into the canopy and are helping kill the trees.

In some areas, there are tall, slender hardwoods that extend toward the lower canopy of the red pines. These include sugar maple, red maple, black birch and black cherry, as well as yellow birch and elm. It seems as if sugar maple is anxious to grow here.

The red pine is similar in health and appearance to most of the red pine areas at the Roberts Meadow Watershed, which is to say that the trees are not vigorous. There was only a limited display of recent or immanent mortality, and evidence of attack by Ips beetles was only noted in standing dead trees.

Throughout the red pine stand, and even more so in the central area lacking a conifer overstory, there is a fairly thick mid-story and understory of stout hardwood saplings, many of which are sugar maple. Red maple, black birch, black cherry and elm also occur. In the southern and central part of the stand, the sugar maples in the understory look vigorous and promising.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** The hardwoods described above are well established and should be able to form the basis for a new overstory that could, someday — assuming bittersweet and grapes are not allowed to overtake the hardwoods — replace the current red pine overstory.

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*STAND DESCRIPTIONS*

**Interfering native vegetation:** None noted.

**Other native understory vegetation (species and distribution):** Most of the upland ground vegetation is sparse due to overstory shade. Evergreen woodfern was common throughout. Christmas fern, hayscented fern (see below), poison ivy, and clubmosses were apparent at the time of this writing (late winter) as well. Canada mayflower and starflower are probably abundant here as well.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 3 overall, but is either 1 or 5. The southern and central areas were mostly free of invasives. However, the northern corner is heavily infested with bittersweet (see above). The abundant oriental bittersweet seed source in the northern corner could contribute to infesting the southern and central areas as well as adjacent areas of Stand 9. A minor amount of Japanese barberry and multiflora rose was also present.

**Soils (type, moisture, drainage and productivity):** This stand straddles an interface of three soils: Limerick, Hinckley and Pootatuck. (See "Overview of Soils" above).

**For tree growth purposes:** These soils (in this particular location) apparently provide a good blend of drainage and moisture availability and are well-suited to growing timber. In general, of all the soils found across the DPW-owned Roberts Meadow watershed lands, Pootatuck is the most productive soil for white pine

**For logging purposes:** The Pootatuck and Hinckley soils are well-suited to logging activity as long as water tables are low or the ground is frozen, which will be the case during much of the year. The Limerick is seasonally wet, but can be worked during dry or frozen times.

**Habitat:**

**General Habitat:** Somewhat tall, thin, partially-closed canopy of red pine with no special habitat value. Except in the area of bittersweet strangulation of overstory trees, here are a few or no snags and a number of large downed trees.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand? (if "yes", how many):** No.

**Are NHESP layers indicated for this stand? (if "yes", describe)** No.

**Other Special Habitat (elements to preserve) (e.g. tall ledge outcrops, etc.):** None.

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## STAND DESCRIPTIONS

**Special risks to habitat:** The possibility of bittersweet and grapes spreading throughout the stand, pulling it down and preventing and new tree growth if canopy gaps are created by microbursts, other storms, silviculture, or by the actions of vines themselves.

**Desired habitat modifications (options will vary, including “none”):** Treatment of invasives and grapes to reduce their potential as seed sources and to prevent vines from overtaking canopy trees and creating self-perpetuating, self-enlarging gaps in areas that are already infested with invasives or grapes.

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century.

**Management history:** no information about logging in recent decades was found.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** Harvest most of the red pine to capture the value, but do this in a way that protects the sugar maple/hardwood midstory, allowing these hardwoods to form the new overstory.

**Discussion of silvicultural ideas:** It is very likely that bittersweet, combined presumably with grapes, would aggressively take advantage of this disturbance and overrun the new hardwood overstory, causing a complete failure of the silviculture. If bittersweet and grapes are controlled and the seedbank is sufficiently diminished, over the course of time, this idea can be revisited.

**Recommended management for the next 10 years:** Next steps (1) bittersweet vines in this stand and in adjacent stands; (2) once interfering vegetation has been controlled, use the silvicultural method known as a shelterwood system to remove the red pine overstory and release the hardwood understory. Natural seeding-in of birches and black cherry would be expected to supplement the growth of the sugar maple.

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
27	BR	8.3	N/A	N/A	N/A	N/A	N/A	3	0

**Special water quality concerns (for stands within a reservoir watershed):** Avoid any inputs of sediments into the abutting stream — this should not be a problem since there does not appear to be any surface flow from this stand into the brook.

**Silvicultural Status (options are “suitable” or “not suitable”):** NOT suitable.

**Overstory: Forest Type and Condition:** There is not really an overstory in most areas. This is an old gravel pit with mostly no forest cover and an adjoining area of forest similar to the oak-hardwood mix of Stand 9 that was mostly cleared to establish a DPW work area. A pocket of uncleared forest remains near and along the road, and includes hemlock as well as white pine with the oaks and hardwoods. This patch of forest serves as a visual buffer. Poplar seedlings/root-suckers are established in some areas. Sumac is an “overstory” of sorts on the central mound of gravel in the northern section.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** None (N/A).

**Interfering native vegetation:** Grapes have climbed trees at the northern end of the stand.

**Other native understory vegetation (species and distribution):** various grasses and forbs, rubus species, sumac.

**Non-native invasive vegetation (species, distribution/severity) (see “Notes applying to all stands” above):** Severity level is 3 overall but is typically either 1 or 4. The northern half of the stand has patches of infestation of bittersweet, multiflora rose, autumn olive and Japanese knotweed. Bittersweet climbs the trees (along with grapes) at the northern end of the stand. The southern half is not infested. This stand is not an area with the potential for a tall overstory, and, therefore, non-native invasive vegetation will not be an interfering factor in overstory development. However, to help with mapping and tracking of the overall invasive plant situation, the ranking system was applied here and used to indicate the level of infestation.

**Soils (type, moisture, drainage and productivity):** Old gravel pit and adjoining gravel soil (probably Hinckley) and Charlton-rock-outcrop-Hollis. (See “Overview of Soils” above).

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**For tree growth purposes:** These soils have been heavily depleted (by gravel excavation) or compacted (by various activities related to street maintenance and street tree work) and are not expected to be very fertile for tree growth at this time.

**For logging purposes:** The soil is stable.

**Habitat:**

**General Habitat:** The northern half is an abandoned gravel pit with scruffy grasses, forbs and shrubs, and abundant grape vines in trees at the northern edge. The gravelly soil that remains may be suited for fox dens and other dug dens. The vast amount of large, coarse woody debris in piles (e.g. large trunks of old street trees, etc.) may provide other denning opportunities (e.g. porcupines, bears).

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): None.

**Special risks to habitat:** The possibility of bittersweet, other invasives, and grapes spreading throughout the stand, precluding other vegetation and serving as a prolific seed source. There is a risk that additional seeds and plants of existing pests as well as new pests (plant or insect) could be imported to this site as tree and/or road debris is brought in from other parts of the City. An example of this could be Asian longhorned beetle. Though, fortunately, this pest is thought to be not (yet) established in Hampshire County, there would be a risk, someday, of spreading it around to the surrounding forest by bringing it in on infested street trees.

**Desired habitat modifications (options will vary, including "none"):** Treatment of invasives and grapes to reduce their potential as seed sources and to prevent vines from overtaking canopy trees and creating self-perpetuating, self-enlarging edge-areas.

**Historical/archaeological/contemporary:** the northern half is an old gravel bank with a small amount of debris (waste wood, metal, concrete) in various scattered piles. The southern half is an active work area.

**Management history:** N/A.

**Desired future condition:** A native mix of grasses, forbs and possibly shrubs that is free of the influence of non-native invasive plants and other interfering factors.

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*STAND DESCRIPTIONS*

**Silvicultural ideas:** This stand is not forested. The work area needs to be kept open to help the city manage gravel, old pavement, street tree debris, etc. Options for the northern half range from establishing forest (e.g. by allowing a native forest mix to re-grow naturally or by planting a new stand of trees (e.g. Norway spruce)) to maintaining this area as non-forested habitat.

**Discussion of silvicultural ideas:** Past gravel bank usage has degraded this soil so that it is no longer well-suited for tree growth. Periodic brush mowing to maintain the current habitat mix, combined with an effort to control grapes and non-native invasive plants, might be more successful over time and would provide a habitat component that is generally lacking on other upland sites in this watershed.

**Recommended management for the next 10 years:** Next steps (1) control grapes (by cutting) along the northern edge of this stand, (2) control bittersweet and other invasives in the old gravel pit area, (3) maintain by grasses, goldenrods and other non-woody vegetation by brushmowing (where accessible) and brush-sawing as needed on steeper gravel-bank faces, (4) consider a policy for managing street tree waste that will protect the surrounding forest from possible contamination from infested street trees.

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*STAND DESCRIPTIONS*

**RM-3 Sylvester Farm East**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
10	OH	90.15	11.8	90	3.5	8	60	1	15
11	SS	12.7	N/A	N/A	N/A	N/A	N/A	1	0
13	RP	1.8	10.8	213.3	23.1	10.8	60	1	0
14	WH	3.7	12.8	185.0	19.2	9.4	60	1	1
15	WP	24.5	13.1	194	18.4	12	65	3	4
16	RP	2.0	11.5	153.3	13.1	7.3	65	3	0
		134.85							20

\*R = Invasive species rank

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*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
10	OH	90.15	11.8	90	3.5	8	60	1	15

**Special water quality concerns (for stands within a reservoir watershed):** The southern and central portions of this stand do not drain into the reservoir watershed. In the northern section, avoid any inputs of sediments into any streams. Depending on where any logging occurs in this area, there would be a need to work near, and cross, various seasonal streams. If so, any stream crossings and any work near streams will be designed to avoid sedimentation.

Otherwise, the main, and ongoing, risk to water quality is a roughly 500' stretch of old logging road that is now part of an active ATV trail (discussed above in Stand 11). This wet area is along the toe of a water-filled slope that includes two seasonal streams and various seeps. On the Forest Stand and Boundary Map, this stretch of trail is indicated by wetland symbols drawn onto the trail.

The ATV trail continues, crossing through Stand 11 where there is a second, smaller wet area next to the stream.

**Silvicultural Status (options are "suitable" or "not suitable"):** suitable.

**Overstory: Forest Type and Condition:** Stand 10 consists of tall, closed-canopy forest of large pole-sized and timber-sized red oak and other hardwoods, rarely with a strong component of tall white pine timber (mostly along the edge of Stand 11). Hemlock is limited mainly to the southern edge of Stand 11, and along the long stretch of northern property boundary. A number of streams flow down the steep, stony and ledgy middle part of this stand. At the top of the long slope there are several ledge knolls and several large boulders.

Mixed in with the red oak are minor amounts of the following hardwoods: white oak and chestnut oak (both of which are, at times, abundant), scarlet oak and black oak, red maple, shagbark hickory (and even less pignut hickory), black birch, paper birch, and white ash.

Within this large area there are a number of "zones". Most of the larger, well-formed red oaks are found on the lowest quarter to third of the steep slope, in an area bounded by Stand 11 to the north (or west). Many of these trees are vigorous, large, and well-formed. The white oaks and any black oaks tend to be less vigorous, perhaps because they occupy slightly drier sites within the stand. Most of the white pine and sugar maple occurs within this same zone, along with minor amounts of yellow birch and basswood. There is a nice

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## STAND DESCRIPTIONS

grove of white pine just off the eastern end of Stand 11, on a low knoll. Otherwise, the pine is mostly scattered along the wetland edge. These soils provide a good blend of drainage and fertility, allowing oaks and pines to grow to considerable size and exhibit good quality. This is an area of nice timber. This zone includes all of the Paxton soil (see below).

In a zone on the top 2/3 to 3/4 of the long slope, the forest becomes increasingly stunted with increasing elevation. This dwarfing tendency reaches its maximum on a number of ledgy knolls at the top of the slope, where stout, large-crowned, mature trees are sometimes less than 30' tall. Presumably, this is caused mainly by shallow soil depth, resulting in a lack of moisture and nutrients, and possibly by the drying and damaging effects of winds near the top of the slope. There is also evidence of a fire that burned up this slope long ago (many trees had the type of scars on their uphill side that indicate wildfire). In addition to red oak, there is an abundance of black, white, and chestnut oak as well as pignut hickory in this zone. Tree quality is extremely rough and not at all suited to timber.

The remainder of the stand (approximately 1/3 of the total area) occupies a sort of broad-shouldered shelf of land at the northern edge of the Sawmill Hills. The forest here is very different, and is dominated by a maturing and mature mix of paper birch, black birch, white ash, red maple with white oak, red oak, pignut hickory, and a limited amount of beech. Though oak is not nearly as dominant here as in other parts of this stand, the oaks that do occur tend to be quite large (sometimes 25"-30" or more). The pignut hickories here are also large. Though not as large as the oaks, these are the largest pignut hickories on DPW land. Both the oaks and the hickories tend to grow in sprout clumps. Most of these trees are vigorous and have large crowns. A number of white oaks – though not from sprout clumps – are also large, with large crowns. The quality of the oaks and the hickories appears to be good. Red maple and paper birch also achieves their largest size in this area, with trees of both species being large enough for timber (though quality is not very good). A general trend here seems to be that the paper birch has apparently reached its normal life expectancy (80-100 years) and is slowly dying, creating snags and coarse woody debris. Many of the black birches are heavily infested with and disfigured by nectria canker and are full of rot or dying. The white ash is declining as well and is likely to be infested with emerald ash borer at some point. As these trees weaken and die, it provides a thinning benefit to the oaks, hickories and maples. Some areas have few or no oaks or hickories though.

In a small, fourth area along the interface with Stand 11, in the northwest part of this stand, there was a widely spaced overstory of sugar maple and white ash of timber size with a thick shrubby understory of stout musclewoods. This is an area of rich soil, but, other than minor Japanese barberry, no invasives were detected. Perhaps the midstory shade of the musclewood is making it difficult for bittersweet to seed in.

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Presumably, as with Stand 9, the mature hardwoods date to approximately 1900. Although timber quality is below average in some areas, it is average or above average in others. Overall, this stand is an intact and functioning oak-hardwood forest, with, effectively, no intrusion of grapes or of bittersweet and, just a minimal presence of barberry.

### Understory:

**Desirable Tree Regeneration (species and distribution) for future overstory:** On the lower slope there are, in some places, slender white pine saplings that may survive and grow into canopy gaps. Red maple saplings, probably deriving from old sprouts, are common in many areas. Oak and hickory saplings were scattered throughout and were most common in the mid-slope area.

**Interfering native vegetation:** Wild grapes were essentially absent from this stand. In upland areas, mountain laurel was sometimes quite thick, and witch hazel was widespread and often thick throughout. Beech and striped maple occurred sporadically. Both of these were more common in the eastern third of the stand. It is not expected that these will significantly interfere with the development of the stand.

**Other native understory vegetation (species and distribution):** Beaked hazel was common on the mid-slope. Perhaps the fire that burned here was beneficial to beaked hazel. Musclewood, ironwood, shadbush, and highbush blueberry are established throughout the stand. Canada mayflower and starflower are probably fairly abundant in upland areas. On the dry knoll-tops there is sometimes thick huckleberry with lowbush blueberry and bracken fern.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 1 overall. The only non-native invasive vegetation noted was Japanese barberry, which was found at the very bottoms of the seasonal streams, especially in the immediate vicinity of stand 11. The barberry was generally clustered close to the streams.

**Soils (type, moisture, drainage and productivity):** Soils are Charlton-rock-outcrop-Hollis and Woodbridge, with a small amount of Paxton (See "Overview of Soils" above).

**For tree growth purposes:** The Woodbridge (located along the toe of the slope) is well-suited to growing a range of native trees to large, high-quality timber. The Charlton-rock-outcrop-Hollis is a mixed bag. The more fertile Charlton is well-suited to growing a range of native trees to large, high-quality timber. Presumably, as evidenced by tree size and vigor, a concentration of the more fertile Charlton component (rather than the less fertile Hollis) is found directly adjoining the Woodbridge and also in the eastern third of the stand (where it interfaces with Paxton, which is also a fertile soil. The central slope is

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*STAND DESCRIPTIONS*

presumably Hollis and "rock outcrop", which is well-suited to growing trees, though the trees will be of small size and poor quality.

**For logging purposes:** None of the soils is suited to spring logging or to logging any time of the year that is wet, but can be worked when conditions are dry or otherwise stable. The steepness of the Hollis and "rock outcrop" areas makes logging difficult.

**Habitat:**

**General Habitat:** Tall, closed-canopy oak-hardwood forest, often with a small component of tall white pine, with hard-mast-bearing trees (mixed oaks and, to a lesser extent, hickories) and scattered medium-sized downed trees that were probably killed by gypsy moths in the early 1980's as well as medium-sized paper birches that are dying. There are a number of shallow, seasonal streams coming down steep slopes. Ledge outcrops and overhangs and ledgy knolls occur throughout the stand.

As is the case across most of the DPW watershed, early successional upland habitat was completely lacking from this stand.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): protect the hard-mast seed source and the integrity of all riparian areas by keeping these in "no-cut" zones (or, if streams need to be crossed, by keeping the number of crossings to a minimum as well as locating and using these on stable ground).

**Special risks to habitat:** The longer-term possibility of bittersweet and grapes spreading from adjoining areas.

**Desired habitat modifications (options will vary, including "none"):** (2) create 5-10 acres of early successional habitat.

**Historical/archaeological/contemporary:** As with Stand 9, this stand is notable for its *lack* of old walls, fences and other indications of past agricultural use. Undoubtedly, this is a direct reflection of the very rugged and difficult terrain.

There is an ATV trail (off the Ma-Bell/Jeep Eater trail just to the south of this property). The trail does not have any official designation as a trail. This trail is further discussed above in the section on threats to water quality and in Stand 11.

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*STAND DESCRIPTIONS*

**Management history:** This stand was last thinned about 25 years ago.

**Desired future condition:** A continuation of the current forest type with the addition of areas of a younger age class (temporary early successional habitat) if possible. The forest should be free of the influence of non-native invasive plants, grapes and other interfering factors.

**Silvicultural ideas:** Silviculture is not really feasible or warranted on the central (steep) slope. In the lower section, a thinning would be helpful in maintaining vigor in well-formed or large-crowned trees. On the upper portion (the eastern third of the stand), a combination of thinning (to promote vigor in oaks, hickories, and other trees) and creating large openings (totaling 5-10 acres in size altogether) in areas where oak or hickory were sparse or lacking would help diversify forest structure and add a lacking habitat component (early successional habitat).

**Discussion of silvicultural ideas:** On the lower slope, the challenges of dealing with numerous seasonal streams, dealing with the 500' stretch of wet road, and the risk of allowing invasives and/or grapes to spread into the rich soil do not outweigh the expected benefits of the thinning. It is better to refrain from any logging here at this time. On the upper slope, this cut should be very feasible provided that an abutter grants access. This cut would not be worth doing if the access had to be off Sylvester Road (for the same reasons state above).

**Recommended management for the next 10 years:** (1) mark boundaries, (2) conduct a combination thinning on 10-12 acres and a regeneration harvest on ca. 5-8 acres in the eastern part of the stand.

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*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
11	SS	12.7	N/A	N/A	N/A	N/A	N/A	1	0

See description of Stand 11 in the section above covering RM-2.

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
13	RP	1.8	10.8	213	23.1	10.8	60	1	0

**Special water quality concerns (for stands within a reservoir watershed):** Avoid any inputs of sediments into any surface water — this should not be a problem since the terrain is flat and the soil is well-drained and does not appear to be any surface flow from this stand into the brook. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest canopy that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** suitable.

**Overstory: Forest Type and Condition:** This is a straightforward plantation of red pine of small timber size. The red pines are well-formed and of good height (ca. 90'). Spacing is tight - presumably due to the long time since the last thinning. (No exact time for the any thinning is known).

The red pine is similar in health and appearance to most of the red pine areas at the Roberts Meadow Watershed, which is to say that the trees are not vigorous. There was no indication of recent or immanent mortality.

Throughout the red pine stand, and even more so in the central area lacking a conifer overstory, there is a fairly thick understory of stout hardwood saplings, primarily red and sugar maple, black birch, and black cherry.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** The hardwoods described above are well established and should be able to form the basis for a new overstory that could, someday — assuming bittersweet and grapes are not allowed to overtake the hardwoods — replace the current red pine overstory.

**Interfering native vegetation:** Witch hazel and beech are present to a minor extent and are not expected to interfere with future management.

**Other native understory vegetation (species and distribution):** Most of the upland ground vegetation is sparse due to overstory shade. Canada mayflower and starflower are may be abundant here in the spring.

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**Non-native invasive vegetation (species, distribution/severity) (see “Notes applying to all stands” above):** Severity level is 1. No non-native invasive vegetation was noted.

**Soils (type, moisture, drainage and productivity):** Soil is Hinckley. (See “Overview of Soils” above).

**For tree growth purposes:** Hinckley is a deep, well-drained soil that is surprisingly fertile for sugar maple growth (site index for sugar maple = 57). This must attest to an availability of moisture for deeper-rooted trees.

**For logging purposes:** This is a well-drained soil that is well suited to logging at most times of year.

**Habitat:**

**General Habitat:** Somewhat tall, thin, partially-closed canopy of red pine with no special habitat value. This stand is bounded on the north and south by water features (to the north by a vernal pool and wetland, and to the south by a deep, slow-moving stream/ditch). The stand is bounded to the east by the large shrub swamp (Stand 11).

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand? (if “yes”, how many):** No.

**Are NHESP layers indicated for this stand? (if “yes”, describe)** No.

**Other Special Habitat (elements to preserve) (e.g. tall ledge outcrops, etc.):** None noted.

**Special risks to habitat:** The possibility of bittersweet and grapes becoming established.

**Desired habitat modifications (options will vary, including “none”):** None needed.

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century. The stream on the southern end of this stand seems to be a dug ditch.

**Management history:** no information about logging in recent decades was found.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

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**Silvicultural ideas:** Harvest most of the red pine to capture the value, but do this in a way that protects the sugar maple/hardwood midstory, allowing these hardwoods to form the new overstory.

**Discussion of silvicultural ideas:** The access to this stand is good, but the small size of the stand is a limitation to attracting a suitable logger. The immediate risk of spreading invasives and grapes is low. This harvest would open an interesting view out into Stand 11.

**Recommended management for the next 10 years:** (1) Conduct a regeneration harvest to convert this stand to native hardwoods; (2) monitor this stand post-harvest to detect and rapidly address any incipient establishment of invasives or grapes.

STAND DESCRIPTIONS

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
14	WH	3.7	12.8	185	19.2	9.4	60	1	1

**Special water quality concerns (for stands within a reservoir watershed):** Avoid any inputs of sediments into any surface water — the greatest risk of this is along the southern edge of the stand where there is a possible vernal pool and affiliated wetland area.

**Silvicultural Status (options are “suitable” or “not suitable”):** suitable.

**Overstory: Forest Type and Condition:** This is a tall (>100’), natural stand of white pine very crowded canopy with a minor mixture of hardwoods (red oak, black birch, red maple, black cherry). The crowding is limiting vigor. Many of the pines are poorly formed (and were counted either as rough timber or pulp), but there are enough well-formed trees to form a nice residual overstory in the event of any thinning. A few of the pines are quite large (diameters up to 30”). Hemlock is scattered through the midstory. All along Sylvester Road there are large red and white oaks. These are street trees and are not really part of the stand from a management perspective, but these oaks do contribute acorns to this stand.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** Fairly abundant saplings of mixed hardwoods, including red and sugar maple, and oaks, and areas of white pine seedling/saplings that are 5’ tall.

**Interfering native vegetation:** No grapes were noted. Some beech was present, but this is not expected to be a problem.

**Other native understory vegetation (species and distribution):** Most of the upland ground vegetation is sparse due to overstory shade. Evergreen woodfern was scattered throughout, and there were a few shadbush. Canada mayflower and starflower are probably abundant here as well.

**Non-native invasive vegetation (species, distribution/severity) (see “Notes applying to all stands” above):** Severity level is 1. No non-native invasive vegetation was noted.

**Soils (type, moisture, drainage and productivity):** Soil is Hinckley. (See “Overview of Soils” above).

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**For tree growth purposes:** Hinckley is a deep, well-drained soil that is surprisingly fertile for sugar maple growth (site index for sugar maple = 57). The must attest to an availability of moisture for deeper-rooted trees.

**For logging purposes:** This is a well-drained soil that is well suited to logging at most times of year.

**Habitat:**

**General Habitat:** Tall, closed-canopy white pine (softwood forest) with a hard-mast-bearing component (oaks and, to a minor extent, hickories) with few if any large snags or downed trees. The gravelly soil may be suited to animal burrows. There is a possible vernal pool and affiliated wetland (which drains the vernal pool toward Stand 11), as well as a strip of large stones that appear to have been deposited by human activity.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): One possible vernal pool was mapped (see Forest Stand & Boundary Map).

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): maintain the absence of bittersweet, grapes, and other undesirable plants. Avoid any disturbance to the vernal pool or affiliated wetland.

**Special risks to habitat:** The possibility of bittersweet and grapes spreading into this stand.

**Desired habitat modifications (options will vary, including "none"):** None.

**Historical/archaeological/contemporary:** Evidence of gravel excavation in the southern end of this stand. The stones appear to have been deposited.

**Management history:** No evidence of logging in recent decades.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** Thin the overstory to help improve and maintain vigor over the longer term.

**Discussion of silvicultural ideas:** Access to this stand is good and the soil is generally suitable for logging. The main limitations to attracting suitable loggers to this project are

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the small size of the job and the high proportion of poor quality white pine to be cut. It might help to do this work in conjunction with work in Stands 9 (in RM-2) and 13 (in RM-3).

**Recommended management for the next 10 years:** (1) conduct a thinning to improve overstory vigor; (2) monitor this stand post-harvest to detect and rapidly address any incipient establishment of invasives or grapes.

STAND DESCRIPTIONS

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
15	WP	24.5	13.1	194	18.4	12	65	3	4

**Special water quality concerns (for stands within a reservoir watershed):** Avoid any inputs of sediments into any surface water — this should not be a problem since the terrain is flat and there does not appear to be any surface flow from this stand into the adjoining brook or wetland. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest canopy that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable.

**Overstory: Forest Type and Condition:** This is a pure plantation of white pine, one of two in the Roberts Meadow watershed (the other is Stand 19 in RM-10). The white pines are quite tall (ca. 95-100'), but vigor is suppressed by overcrowding. Live crowns are short and narrow relative to tree height. So far, though, there does not appear to be much mortality due to crowding. This stand is classified as "not suitable" due to the pockets of bittersweet along Chesterfield Road and the abundant bittersweet seed sources on the north side of Chesterfield Road and in the northeast corner of Stand 12. Seed from these sources could "seed in" to this stand.

Scattered throughout the stand are tall, usually stringy black cherries.

Throughout this stand there is a well-established understory of mixed hardwood saplings, sugar maple, red maple, yellow & black birch, ash, elm, and beech.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** The hardwoods described above are well established and should be able to form the basis for a new overstory that could, someday — assuming bittersweet and grapes are not allowed to overtake the hardwoods — replace the current white pine overstory.

**Interfering native vegetation:** None noted.

**Other native understory vegetation (species and distribution):** Evergreen woodfern was heavy in many areas. Christmas fern, hayscented fern (see below), abundant poison ivy, and clubmosses were apparent at the time of this writing (late winter) as well. Canada mayflower and starflower are probably abundant here as well.

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**Non-native invasive vegetation** (species, distribution/severity) (see “Notes applying to all stands” above): Severity level is 3 overall. Many areas of the stand seemed free of bittersweet plants. However, as mentioned above, there are large bittersweet vines along Chesterfield Road and abundant bittersweet seed sources on the north side of Chesterfield Road and in the northeast corner of Stand 12. There are large bittersweet vines in scattered locations throughout the stand. It may be possible to reduce severity level to a 2 or 1 if the established vines are controlled within this stand and in nearby areas AND several years are allowed to lapse to deplete the seed bank.

**Soils** (type, moisture, drainage and productivity): Soil is Limerick. (See “Overview of Soils” above).

**For tree growth purposes:** This soil is well-suited to white pine, and may be well-suited to sugar maple and other hardwoods.

**For logging purposes:** This soil tends to be wet and soft for much of the year, with a water table within 9 inches of the surface typically from December to May, and is only suitable for logging when dry, frozen, or otherwise stable.

**Habitat:**

**General Habitat:** Tall, closed canopy of white pine with the potential for good cone (seed) production. Scattered black cherries are a source of soft mast.

**Do wetlands occupy more than 10% of this stand?** No. The NRCS Soil Survey refers to this soil as hydric, but the vegetation occupying the soil is upland vegetation, so this may be a gray zone.

**Were vernal pools identified/mapped for this stand?** (if “yes”, how many): No, but there are a number of water features that may be vernal pools. These appear as gouged “fingers” the gravelly soil – perhaps due to the rushing action of water when – if – Roberts Meadow Brook flowed through here or was re-directed. The depth of the gouging went deeper than the seasonally high water table so that these areas are flooded seasonally (see Forest Stand & Boundary Map).

**Are NHESP layers indicated for this stand?** (if “yes”, describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): None.

**Special risks to habitat:** The possibility of bittersweet (and grapes) spreading into and throughout the stand.

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*STAND DESCRIPTIONS*

**Desired habitat modifications (options will vary, including “none”):** Treatment of bittersweet so that this threat is greatly reduced.

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century.

**Management history:** this stand has been pruned, but no information about thinning in recent decades was found, and there is no indication on the ground that this stand was thinned.

**Desired future condition:** For the foreseeable future, a stand of tall, vigorous white pine that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** This stand is in need of a series of thinnings to improve vigor in a stepwise manner without destabilizing the stand (by overcutting at any one time).

**Discussion of silvicultural ideas:** It is extremely probable that bittersweet would aggressively take advantage of this disturbance and completely overrun the understory and perhaps continue to climb into the overstory. The best best policy here would be to control the bittersweet, allow some time to elapse to extinguish the bittersweet seed bank, then re-evaluate. Go forward with the thinning if, ever, the bittersweet is controlled.

**Recommended management for the next 10 years:** Next steps (1) control bittersweet vines in this stand and in any adjacent stands; (2) re-evaluate conditions several years after completion of bittersweet control to see if conditions are more favorable for carrying out a thinning.

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
16	RP	2.0	11.5	153	13.1	7.3	65	3	0

**Special water quality concerns (for stands within a reservoir watershed):** Avoid any inputs of sediments into any surface water — this should not be a problem since the terrain is flat and there does not appear to be any surface flow from this stand into the adjoining brook or wetland. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW’s ability to maintain the type of functioning forest canopy that is considered to provide the best protection for water quality.

**Silvicultural Status (options are “suitable” or “not suitable”):** NOT suitable.

**Overstory: Forest Type and Condition:** This is a plantation of red pine. The red pines are well-formed and of medium height (ca. 80’), but are in very poor health. Live crowns seemed to be, at best, at about 10% of what would be desirable. There were a number of standing dead red pines and a number of dead trees that had snapped. Most of the trees are dead in the southern section of the stand (this may have to do with past beaver activity). By and large, this overstory is falling apart.

Throughout this stand there is a fairly thick mid-story and understory of stout hardwood saplings, many of which are sugar maple and black birch, with ash, elm, and musclewood.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** The hardwoods described above are well established and should be able to form the basis for a new overstory that could, someday — assuming bittersweet and grapes are not allowed to overtake the hardwoods — replace the current red pine overstory.

**Interfering native vegetation:** None noted.

**Other native understory vegetation (species and distribution):** Evergreen woodfern was common throughout. Christmas fern, hayscented fern (see below), poison ivy, and clubmosses were apparent at the time of this writing (late winter) as well. Canada mayflower and starflower are probably abundant here as well. Poison ivy vines were especially numerous and large along Chesterfield Road.

**Non-native invasive vegetation (species, distribution/severity) (see “Notes applying to all stands” above):** Severity level is 3 overall. Though the interior area was mostly free

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*STAND DESCRIPTIONS*

of invasives, the fringe along Chesterfield Road and the southern interface with Stand 11 is infested with bittersweet. Japanese barberry was scattered along the southwestern edge of the stand.

**Soils** (type, moisture, drainage and productivity): Soil is Limerick. (See "Overview of Soils" above).

**For tree growth purposes:** This soil may be too wet for red pine. It is well-suited to growing white pine, and may be well-suited to sugar maple and black cherry.

**For logging purposes:** This soil tends to be wet and soft for much of the year, with a water table within 9 inches of the surface typically from December to May, and is only suitable for logging when dry, frozen, or otherwise stable.

**Habitat:**

**General Habitat:** Somewhat tall, thin, partially-closed canopy of red pine with no special habitat value.

**Do wetlands occupy more than 10% of this stand?** No. The NRCS Soil Survey refers to this soil as hydric, but the vegetation occupying the soil is upland vegetation, so this may be a gray zone.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): None.

**Special risks to habitat:** The possibility of bittersweet (and grapes) spreading into and throughout the stand.

**Desired habitat modifications (options will vary, including "none"):** Treatment of bittersweet around the perimeter and on a spot basis in the interior.

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century.

**Management history:** This stand has been thinned, but no information about logging in recent decades was found.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

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**Silvicultural ideas:** Harvest most of the red pine to capture the value, but do this in a way that protects the sugar maple/hardwood midstory, allowing these hardwoods to form the new overstory.

**Discussion of silvicultural ideas:** It is very likely that bittersweet, combined possibly with grapes triggered from the soil seed bank, would aggressively take advantage of this disturbance and overrun the new hardwood overstory, causing a complete failure of the silviculture. The best silviculture and best policy here may be to simply let the overstory fade away and, assisted by control of bittersweet, allow the hardwoods to take over. The loss of timber value would not be significant. The sugar maple is well established and enough should survive so that it becomes a part of the future stand (probably with a strong component of birches).

**Recommended management for the next 10 years:** Next steps (1) control bittersweet vines in this stand and in any adjacent stands.

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*STAND DESCRIPTIONS*

**RM-4 Upper Reservoir**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
5	WH	71.70	14.7	119	10.1	9	70	3	12
6	RP	5.0	9.6	236	7.8	7.3	65	3	1
7	RP	7.4	11.3	196	10.7	7.6	70	3	1
8	RP	1.0	10.1	153	10.7	9.6	60	2	0
		85.05							14

\*R = Invasive species rank

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Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
5	WH	71.70	14.7	119	10.1	9	70	3	12

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into streams or flooded/saturated areas. There is no expectation that any management activity occurring here will cause sedimentation. Currently, ATV activity is a source of sedimentation into Marble Brook (above the Upper Reservoir) and into a tributary of Roberts Meadow Brook (below the Upper Reservoir) (see Forest Stand & Boundary Map). This can be addressed by closing the ATV trail and establishing functioning drainage on the affected slopes. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable

**Overstory: Forest Type and Condition:** Stand 5 is intended to encompass all the native forest areas. These areas are a mix of red oak and other oaks and hardwoods (red maple, black birch, white ash), white pine, hemlock, and occur in the following configurations:

(1) WH: impressively large, vigorous, mature white pine with or without large red oaks (and including parts of this section that were logged ca, 20 years ago and are now overrun with grapes and bittersweet). Most areas have been logged, and the understory is filled with a combination of hardwood saplings (black birch, sugar maple, red maple, as well as beech), small trees or shrubs (sassafras, witch hazel, alternate-leaved dogwood, maple-leaved viburnum, striped maple) ferns (Christmas fern, hayscented fern and evergreen woodfern) as well as partridgeberry. In many cases, grapes and/or bittersweet are present within this mix as a minor component, yet as a threat nonetheless in the event of future disturbance. In other cases, however, where the last round of cutting attempted to create larger openings that would regenerate to a new age class, the young hardwoods in these openings quickly were overrun by grapes and bittersweet. At present, these areas are effectively "mats" of grapes and bittersweet draped on bent-over hardwood saplings, with a "canopy height" of 5'-8'.

(2) OH: red oaks (with a small component of black oak, white oak and pignut hickory) with paper birch, black birch and other hardwoods, scattered overstory white pine, and scattered midstory hemlock. This area features a thick understory of mountain laurel, witch hazel, ironwood in some areas, with striped maple and beech. No bittersweet (or other non-native invasive plants) or grapes were noted in this section.

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(3) WK: mature white pine and/or mature hemlock, sometimes with a considerable component of red oak with white oak and/or white ash, and often a well-established midstory of hemlock. In many areas — wherever the hemlock overstory or midstory is thick — the understory is sparsely vegetated and consists primarily of oak leaves and conifer needles. Where past logging has created openings in the overstory, the understory consists primarily of mountain laurel, witch hazel and black birch saplings 10'-15' tall. No bittersweet (or other non-native invasive plants) or grapes were noted in this section. On the south side of Roberts Meadow Brook, in areas that were thinned about 25 years ago, the understory is thick with the "classic" mix of mountain laurel, witch hazel, hemlock saplings, and scattered black birch.

### Understory:

#### **Desirable Tree Regeneration (species and distribution) for future overstory:**

Variable, but, generally lacking. See discussion of areas 1, 2 & 3 above.

**Interfering native vegetation:** Grapes are a serious problem in one area, but absent in others. Given the overall risk of bittersweet and grapes, the presence of mountain laurel and witch hazel in the oak areas can be thought of as beneficial. See discussion of areas 1, 2 & 3 above.

**Other native understory vegetation (species and distribution):** See discussion of areas 1, 2 & 3 above.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 3 overall. The severity level is = 1 or 2 in most areas of the stand (see description of general habitat below) but is 3 or 4 in some areas and there are a few small pockets of 5. Bittersweet is by far the most prevalent (generally together with grapes in thick mats covering understory trees), with minor levels of Japanese barberry and multiflora rose.

**Soils (type, moisture, drainage and productivity):** About 2/3 of the area is comprised of Charlton. The remaining third of the area includes areas of Woodbridge, Gloucester, and Charlton-Hollis (See "Overview of Soils" above).

**For tree growth purposes:** Charlton is a deep, well-drained, moderately fertile soil that is well suited to growing white pine, red oak, and other native trees. Fertility is elevated in swales and on lower slope positions. Woodbridge is not as deep as Charlton, but is also well-suited to native tree growth. Gloucester is a deep, excessively drained soil, but in the riparian zone of Marble Brook there are numerous seasonal streams and seeps that apparently make this soil more fertile than expected. The area of Charlton-Hollis appears to be a deep, moderately fertile soil that is comparable to the Charlton.

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**For logging purposes:** No areas of this stand are suitable for spring logging, and many will have prolonged periods of being too wet to support logging equipment. An old skid trail across the top of this stand is rutted. However, during dry times or during frozen winter conditions, this soil is suitable for logging.

**Habitat:**

**General Habitat:** Tall, very large (up to 30" diameter and more) white pines, with tall, old hemlocks (near Marble and Roberts Meadow Brooks) with abundant red oaks (medium- and large sized) with scattered white oaks, black oaks, hickories, white ash, and birches. Many areas have a thick shrub layer (comprised mainly of witch hazel and/or mountain laurel). Marble and Roberts Meadow Brooks are significant streams with extensive, tall bedrock outcrops. There are a number of seasonal streams that flow into Marble and Roberts Meadow Brooks. There is a good level of diversity within this stand. The main feature lacking is early successional habitat. Unfortunately, in many areas disturbed by logging about 25 years ago, bittersweet and grapes have proliferated. This is mainly true in areas dominated by mature white pine. In areas dominated by oaks and white pine together, with the thick shrub layer described above, there were few if any invasives or grapes. Areas still under the influence of deep hemlock shade were free of invasives and grapes.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) Yes, the western portion of this stand falls within a wood turtle polygon.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): Preserve large pines and oak seed source; prevent additional areas from becoming overrun with invasives and grapes.

**Special risks to habitat:** The possibility of bittersweet and grapes continuing to spread throughout the stand, continuing to pull down and prevent and new tree growth whenever (inevitably) canopy gaps are created by microbursts, other storms, silviculture, or by the actions of vines themselves. Some of the midslope areas are already perfect examples of what would be desirable to avoid (i.e. trees completely overrun with vines).

**Desired habitat modifications (options will vary, including "none"):** Treatment of heavy infestation of invasives and grapes within this stand.

**Historical/archaeological/contemporary:** Evidence of minor quarrying of a boulder (see "Q" on Forest Stan & Boundary Map) as well as along Roberts Meadow Brook. There is an ATV trail (see above section of Special Water Quality Concerns).

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**Management history:** this stand was thinned about 25 years ago.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors. If the current infestation of invasives and grapes were “magically” removed, this stand would be in an ideal condition and would be ready for a new round of silvicultural work to establish areas of younger growth.

**Silvicultural ideas:** This stand has an ideal structure for water quality protection and is ready for the next step in an ongoing uneven-aged system. Accordingly, the selection system would be used to create new openings and to conduct vigor-improving thinning around well-formed trees.

**Discussion of silvicultural ideas:** Some areas are already overrun with bittersweet and grapes and would certainly fail to regenerate. It is very likely that bittersweet, combined possibly with grapes triggered from the soil seed bank, would aggressively take advantage of any disturbance and overrun any areas dominated by white pine. In the oak-hardwood areas, which are not currently infested, it is possible that seed sources nearby will allow bittersweet or grapes to become established. Most of the hemlock is concentrated along the streams or on the north side of the reservoir—these areas should remain undisturbed. The best overall silviculture and best policy here would be to hold off on any cutting until such time as bittersweet vines and grapes are no longer a serious threat.

**Recommended management for the next 10 years:** Next steps (1) control bittersweet vines and grapes in this stand and in any adjacent stands; (2) stabilize and close the ATV trail (consider blocking the ford of Marble Brook with large, old logs).

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
6	RP	5.0	9.6	236	7.8	7.3	65	3	1

**Special water quality concerns (for stands within a reservoir watershed):** This stand does not directly interface with any seasonal streams or wetlands. There is no expectation that any management activity occurring here will cause sedimentation. Currently, there is no indication of any activity (ATV or otherwise) that could directly cause sedimentation. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable.

**Overstory: Forest Type and Condition:** Stand 6 is a red pine plantation. The red pines are well-formed and of medium height (ca. 80'), but are in a condition poor health and vigor. As in many of the other red pine stands, the overstory trees are barely growing.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** There is (and/or was — see below) a well-developed understory of stout hardwood saplings (red maple, sugar maple, black birch and beech) that formed after the last cutting about 25 years ago. Bittersweet and grapes have completely overrun some areas of saplings. Had bittersweet and grapes not become a problem, these saplings would have been ready for release by overstory removal at this time.

**Interfering native vegetation:** Grapes are a serious problem in the southern half of the stand. It should be assumed that the grapes have a well-stocked seedbank that would be triggered by any harvesting or other disturbance of the overstory. Hayscented fern occurs throughout.

**Other native understory vegetation (species and distribution):** Scattered evergreen woodfern, Christmas fern and Rubus spp. (e.g. prickly dewberry). Canada mayflower and starflower are may be abundant here in the spring.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 3 overall. The severity level is 1 or 2 in the northern half of the stand but is 3 or 4 in the southern half (approximately) and there are a few small pockets of 5. As in Stand 5, bittersweet is by far the most prevalent (generally

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*STAND DESCRIPTIONS*

together with grapes in thick mats covering understory trees), with minor levels of Japanese barberry and multiflora rose.

**Soils** (type, moisture, drainage and productivity): The soil is Charlton. (See "Overview of Soils" above).

**For tree growth purposes:** Charlton is a deep, well-drained, moderately fertile soil that is well suited to growing white pine, red oak, and other native trees. Positioned at the top of the land, this soil may have less available moisture during the growing season and is somewhat less fertile than mid- and lower-slope positions of this same soil in Stands 5 & 7.

**For logging purposes:** This stand is not suitable for spring logging, and may have extended periods of being too wet to support logging equipment. However, during dry times or during frozen winter conditions, this soil is suitable for logging.

**Habitat:**

**General Habitat:** Somewhat tall, thin, partially-closed canopy of red pine with no special habitat value. Large hardwoods (red oak, white oak, hickory, etc.) in the wall and fence line along the northern boundary provide rough, mature tree habitat and a good mix of hard mast.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): Preserve large boundary trees discussed above.

**Special risks to habitat:** The possibility of bittersweet and grapes continuing to spread throughout the stand, continuing to pull down existing trees and prevent new tree growth whenever (inevitably) canopy gaps are created by microbursts, other storms, silviculture, or by the actions of vines themselves. The areas at the top of the slope are already perfect examples of what would be desirable to avoid (i.e. trees completely overrun with vines).

**Desired habitat modifications (options will vary, including "none"):** Treatment of heavy infestation of invasives and grapes within this stand.

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century. There are stone walls, and the northern boundary features the old hardwoods discussed above.

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**Management history:** this stand was thinned, but no information about logging in recent decades was found.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** Harvest most of the red pine to capture the value, but do this in a way that protects the sugar maple/hardwood midstory, allowing these hardwoods to form the new overstory.

**Discussion of silvicultural ideas:** Some areas are already overrun with bittersweet and grapes and would certainly fail to regenerate to hardwoods. It is very likely that bittersweet, combined possibly with grapes triggered from the soil seed bank, would aggressively take advantage of this disturbance and overrun most of the remaining areas, causing a complete failure of the silviculture. The best silviculture and best policy here would be to hold off on any cutting until such time as bittersweet vines and grapes are no longer a serious threat.

**Recommended management for the next 10 years:** Next steps (1) control bittersweet vines and grapes in this stand and in any adjacent stands.

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Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
7	RP	7.4	11.3	196	10.7	7.6	70	3	1

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into streams or flooded/saturated areas. There is no expectation that any management activity occurring here will cause sedimentation. Currently, there is no indication of any activity (ATV or otherwise) that could directly cause sedimentation. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable.

**Overstory: Forest Type and Condition:** Stand 7 is a red pine plantation. The red pines are well-formed and of medium height (ca. 80'), but are in a condition of weak health and vigor. As in many of the other red pine stands, the overstory trees are barely growing.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** There is (and/or was — see below) a well-developed understory of stout hardwood saplings (red maple, sugar maple, black birch and beech) that formed after the last cutting about 25 years ago. Sugar maple is especially abundant on the lower slope. Bittersweet and grapes have completely overrun some areas of saplings (on the upper slope).

**Interfering native vegetation:** Grapes are a serious problem in the upper portion of the stand and are scattered in other areas. Striped maple is present but is not a problem.

**Other native understory vegetation (species and distribution):** Scattered evergreen woodfern, cinnamon fern, Christmas fern, viburnum, alternate-leaved dogwood, spicebush, elm, and poison ivy. Canada mayflower and starflower may be abundant here in the spring. Trout lilies, a spring ephemeral, were observed at the toe of the slope (4/9/2013).

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 3 overall. The severity level is 1 or 2 on the mid and lower slope, but is 3, 4 or 5 on the upper slope. As in Stand 5, bittersweet is by far the most prevalent (generally together with grapes in thick mats covering understory trees), with minor levels of Japanese barberry and multiflora rose. Right along Kennedy Road

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there is an infestation of bush honeysuckle mixed with bittersweet and a minor amount of multiflora rose. Bush honeysuckle occurs on a scattered basis in other parts of the stand.

**Soils (type, moisture, drainage and productivity):** The soil is Charlton. (See "Overview of Soils" above).

**For tree growth purposes:** Charlton is a deep, well-drained, moderately fertile soil that is well suited to growing white pine, red oak, and other native trees. With its mid- and lower-slope position, the fertility of this soil is somewhat elevated. The presence of a tapped sugarbush at the toe of the slope is a good indicator of this.

**For logging purposes:** This stand is not suitable for spring logging, and may have extended periods of being too wet to support logging equipment. However, during dry times of during frozen winter conditions, this soil is suitable for logging.

**Habitat:**

**General Habitat:** Somewhat tall, thin, partially-closed canopy of red pine with no special habitat value. A small, wet area at the foot of the slope, right next to Kennedy Road, did not seem to be a vernal pool (there was no visible or audible breeding activity of vernal pool species on 4/9/2013).

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand? (if "yes", how many):** No.

**Are NHESP layers indicated for this stand? (if "yes", describe)** No.

**Other Special Habitat (elements to preserve) (e.g. tall ledge outcrops, etc.):** None.

**Special risks to habitat:** The possibility of bittersweet and grapes continuing to spread throughout the stand, continuing to pull down existing trees and prevent new tree growth whenever (inevitably) canopy gaps are created by microbursts, other storms, silviculture, or by the actions of vines themselves. The areas at the top of the slope are already perfect examples of what would be desirable to avoid (i.e. trees completely overrun with vines).

**Desired habitat modifications (options will vary, including "none"):** Treatment of heavy infestation of invasives and grapes within this stand.

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century. There is a nice, old, sidehill-cut road that climbs into this stand from the northeast corner, passing through a stone wall that seems to be designed to separate the flatter upper slope from the mid- and lower-slope. There is an established sugarbush within the red pine. This bush is actively

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tapped. DPW contacted the operator of this sugarbush in spring, 2013, to talk about possible continuing use of this. The very northwestern corner of this stand is "maintained" as lawn by the abutter. This thin strip of lawn delineates the curve in the stone wall (see Forest Stand & Boundary Map) that is on DPW property.

**Management history:** this stand was thinned, but no information about logging in recent decades was found.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** Harvest most of the red pine to capture the value, but do this in a way that protects the sugar maple/hardwood midstory, allowing these hardwoods to form the new overstory.

**Discussion of silvicultural ideas:** Some areas are already overrun with bittersweet and grapes and would certainly fail to regenerate to hardwoods. It is very likely that bittersweet, combined possibly with grapes triggered from the soil seed bank, would aggressively take advantage of this disturbance and overrun most of the remaining areas, causing a complete failure of the silviculture. The best silviculture and best policy here would be to hold off on any cutting until such time as bittersweet vines and grapes are no longer a serious threat.

**Recommended management for the next 10 years:** Next steps (1) control bittersweet vines and grapes in this stand and in any adjacent stands; (2) bring usage of the sugar bush into compliance with DPW policy; (3) address the small area of encroachment described above.

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
8	RP	1.0	10.1	153	10.7	9.6	60	2	0

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into seasonal streams or flooded/saturated areas that feed into Roberts Meadow Brook. There is no expectation that any management activity occurring here will cause sedimentation. Depending on whether/where any logging occurs in this stand, there would be a need to work near some of these areas. If so, any work near streams will be designed to avoid sedimentation. Currently, there is no indication of any activity (ATV or otherwise) that could directly cause sedimentation. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** suitable.

**Overstory: Forest Type and Condition:** Stand 8 is a red pine plantation. The red pines are well-formed and of medium height (ca. 80'), but are in a condition of weak health and vigor. As in many of the other red pine stands, the overstory trees are barely growing.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** There is (and/or was — see below) a well-developed understory of small hardwood saplings (red maple, sugar maple, black birch and beech) that formed after the last cutting about 25 years ago.

**Interfering native vegetation:** Grapes are a serious problem in the upper portion of the stand and are scattered in other areas. Striped maple is present but is not a problem.

**Other native understory vegetation (species and distribution):** Scattered evergreen woodfern, cinnamon fern, Christmas fern, viburnum, alternate-leaved dogwood, and large poison ivy vines. Canada mayflower and starflower may be abundant here in the spring. Trout lilies, a spring ephemeral, were observed at the toe of the slope (4/9/2013).

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 2 overall. The severity level would have been = 1 if it were not for a few individual plants of Japanese barberry, as well as an abundant seed source of bittersweet on parts of the property abutting to the south.

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**Soils (type, moisture, drainage and productivity):** Soil is Charlton-Hollis (See "Overview of Soils" above).

**For tree growth purposes:** This soil is somewhat shallow at the top of the small knoll, but becomes increasingly deep along the gradient from the knoll-top down into the swale that is just to the northwest of this stand. Moisture availability during the growing season is quite variable. Overall fertility for red pine and native trees ranges from below- to above-average.

**For logging purposes:** Like the other soils in RM-4, this soil is not suitable for spring logging, and may have extended periods of being too wet to support logging equipment. However, during dry times or during frozen winter conditions, this soil is suitable for logging.

**Habitat:**

**General Habitat:** Somewhat tall, thin, partially-closed canopy of red pine with no special habitat value. The understory is thick with hardwoods, including red maple, sugar maple and striped maple.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand? (if "yes", how many):** No.

**Are NHESP layers indicated for this stand? (if "yes", describe)** No.

**Other Special Habitat (elements to preserve) (e.g. tall ledge outcrops, etc.):** None.

**Special risks to habitat:** The possibility of bittersweet and grapes spreading throughout the stand, pulling it down and preventing and new tree growth if canopy gaps are created by microbursts, other storms, silviculture, or by the actions of vines themselves. There is a grape seed source right across the street, and a nearby bittersweet infestation (on non-DPW parcels to the south).

**Desired habitat modifications (options will vary, including "none"):** Treatment of limited invasives and grapes within this stand.

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century.

**Management history:** this stand was thinned, but no information about logging in recent decades was found.

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**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** As with other red pine stands, there is no reason to expect this red pine stand to improve in vigor and thrive in the future. The most sensible overall approach seems to be an orderly retreat (by harvesting) from red pine plantations where feasible, in order to capture what value is there. This harvesting would also help reduce the unsightliness and danger of a large number of tall, dead trees that will result if the red pines continue to decline. The harvesting would also help diversify forest structure. Removing the red pine overstory all at once would allow hardwoods to regenerate from established seedlings and saplings, sprouts and seed to form a new stand.

**Discussion of silvicultural ideas:** This is somewhat complicated, by tight access (amidst fast-moving traffic on a busy road), and moist soils on the slope. A limiting factor is the VERY small size of this job. Presumably, this cut would be linked with other nearby red pine harvesting. In order to minimize the possibility of promoting Ips beetles, a system that removes most of the tree tops and debris (e.g. whole-tree biomass harvesting) would be best.

**Recommended management for the next 10 years:** Next steps (1) regenerate the eastern half of this stand by removing the red pine overstory; (2) monitor for the presence of bittersweet and other non-native invasive plants, and/or grapes, and control these before they interfere with stand development.

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**RM-5 Kennedy Road East**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
17	RP	19.53	11.0	166	8.7	12	65	3	0

\*R = Invasive species rank

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into the Roberts Meadow Brook and wetland areas in the northwest part of the stand. The soil and slope of the terrain is not prone to erosion. Furthermore, much of Roberts Meadow Brook is contained within an elevated levee. There is no expectation that any management activity occurring here will cause sedimentation. Currently, ATV activity crosses a wet area (see Forest Stand & Boundary Map) and is causing minor sedimentation into a hydrologically isolated wet area. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable. However, with the advanced process of mortality occurring, it may be necessary to conduct salvage harvesting.

Note: see "Possibility of temporary sedimentation basins in RM-5" in the Overview section of this Forest Stewardship Plan.

**Overstory: Forest Type and Condition:** Stand 17 is a red pine plantation. The red pines are well-formed and of medium height (ca. 80'), but are in a condition of poor health and vigor. There are two significant areas of mortality totaling several acres in size when combined. This is the most serious area of mortality among the red pine stands. At a late winter site visit with Ken Gooch, the Forest Health Program Supervisor for DCR's statewide program, it was concluded that the immediate cause of mortality is an infestation of IPS beetles. It is likely that beetle-caused mortality will spread to the remaining areas of the stand over the next few years. The overall state of red pine health is discussed in greater detail in the Overview Section.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** There is a well-developed understory and midstory hardwood saplings (mostly red maple and sugar maple in the western part and black birch in the central and eastern part) that

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formed after the last cutting about 25 years ago and have apparently thrived under the slowly weakening overstory.

**Interfering native vegetation:** Grapes are a serious problem in scattered concentrations (large vines) and presumably have a well-stocked seedbank. In some cases, bittersweet is using grapes to “shortcut” its way to the canopy (instead of climbing tree trunks).

**Other native understory vegetation (species and distribution):** Scattered evergreen woodfern, cinnamon fern in wetter areas; large poison ivy vines along Roberts meadow Brook and scattered elsewhere.

**Non-native invasive vegetation (species, distribution/severity) (see “Notes applying to all stands” above):** Severity level is 3 overall. Many areas are actually free of invasives (1 or 2). However, there is an infestation of bittersweet (large vines) along Roberts Meadow Brook (especially between the brook and the town roads) and an infestation of smaller vines along the northern boundary (with agricultural land). There are also spot areas inside the stand with large bittersweet vines, usually in conjunction with grapes. At the western end of the stand, along Reservoir Road, there is a thick “edge” of honeysuckle. Vinca, a ground cover that is sometimes found around the site of former cellar holes/homesteads, is established in a good-sized patch visible next to Chesterfield Road. The vinca is not really a threat, it is mainly a curiosity.

**Soils (type, moisture, drainage and productivity):** The main soil components are Rippowam and Limerick, with a small area of Pootatuck. Minor soils are Hinckley and Charlton. (See “Overview of Soils” above). The Rippowam, Limerick, and Pootatuck soils are on flat, stone-less terraces that were formed by ancient flooding, and consist of sand or loam over sandy-gravelly deposits. Though deep, these soils have seasonally high water tables. Both the Rippowam and Limerick are considered “hydric”.

**For tree growth purposes:** These soils are well-suited to white pine. Sugar maple, black birch and black cherry are well-established in understory (sugar maple), mid-story (black birch) and in some cases overstory (black cherry) positions, which indicates potential for these species, and perhaps for other hardwoods.

**For logging purposes:** The Rippowam and Limerick tend to be wet and soft for much of the year, with a water table within 9 inches of the surface typically from December to May, and is only suitable for logging when dry, frozen, or otherwise stable. The Pootatuck is stable during most times of the year.

### Habitat:

**General Habitat:** Somewhat tall, thin, partially-closed canopy of red pine with no special habitat value, with several notable inclusions: (1) a vernal pool and affiliated shrub-swamp/wet-meadow (see Forest Stand and Boundary Map); (2) various tall black

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cherries; (3) a face of exposed sand & gravel left over after gravel removal long ago; (4) a large number of standing dead red pines in several mortality zones; and (5) a long riparian zone along Roberts Meadow Brook. The riparian zone is heavily altered in the eastern part of the stand, where it is contained within a tall gravel berm.

**Do wetlands occupy more than 10% of this stand?** No. However, the majority of the area is occupied by soils that are considered hydric. This would make this a wetland. However, other than in the swamp mentioned above, the forest is dominated by vegetation typically found in upland situations.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): Yes, one. A possible vernal pool in the eastern part of the stand as examined, but this area was completely dry (4/9/2013). If there is a vernal pool there, it would be irregular, restricted to wet springs.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): Preserve the black cherry (if the red pine is cut off).

**Special risks to habitat:** The possibility of bittersweet, other invasives, and grapes becoming established. The ATV trail crossing part of the wetland (see Forest Stand & Boundary Map) stirs up sediment and creates an attractive seed-bed for invasives.

**Desired habitat modifications (options will vary, including "none"):** Control scattered vines (grapes and bittersweet). These are concentrated along Roberts Meadow Brook and the northern boundary (with agricultural land).

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century. Gravel/sand was excavated from a knoll along the northern boundary. To the northwest of the vernal pool, there appears to be an old foundation – probably a barn foundation that took advantage of the sharp drop-off in the land to have access to a lower level. There is old barbed wire fence along the northern boundary.

**Management history:** this stand was last thinned about 25 years ago.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** Harvest most of the red pine to capture the value, but do this in a way that protects the sugar maple/hardwood understory, midstory, and overstory, allowing these hardwoods to form a new stand. The urgency of doing this is increased by the infestation of Ips beetles that are already causing significant mortality.

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**Discussion of silvicultural ideas:** This is very complicated. First of all, it is very likely that bittersweet, combined with grapes triggered from the soil seed bank, would aggressively take advantage of this disturbance and overrun the new hardwood stand. Secondly, much of this stand is right along Roberts Meadow Brook in a thin, 2000-foot strip between the brook and Chesterfield and Reservoir Roads. This has a few implications. First, under CH 132, 50% of the overstory (basal area) would have to be retained within 50' of the brook. Secondly, this type of cut would change the familiar appearance of this area and attract a lot of attention. These are busy roads, very much in the public view. There may be a lot of public response and this project would probably require a strong public educational effort by DPW. Finally, the northwestern area is too wet at the surface to allow (under CH 132) the full removal of the red pine overstory.

One option would be to simply let the overstory fade away and, assisted by control of bittersweet (if chemical control is allowed), allow the hardwoods to take over. The loss of timber value would not be significant. The sugar maple is well established and enough should survive so that it becomes a part of the future stand (probably with a strong component of birches).

Another option is to at least partially accomplish the objective of regenerating this stand and avoiding the build up of mortality. If so, bittersweet should be cut (and, ideally, chemically treated) to prevent fruit formation in the year going into the cut (if not sooner).

**Recommended management for the next 10 years:** Next steps (1) control bittersweet vines, honeysuckle, and grapes in this stand and in any adjacent stands; (2) consider a partial attempt to regenerate this stand and reduce the amount of standing deadwood; (3) close the ATV trail; (4) mark and post the northern boundary.

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**RM-6 Reservoir Road West**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
25	WH	3.71	9.0	60	0.5	8	65	3	1

\*R = Invasive species rank

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into Roberts Meadow Brook and avoid a situation where a mat of vines takes the place of an overstory of tall trees and native shrubs. There is no expectation that any management activity occurring here will cause sedimentation. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable.

**Overstory: Forest Type and Condition:** Stand 25 is a long strip of land on either side of a stone-lined channel that serves as Roberts Meadow Brook. The entire stand is a riparian zone comprised of scattered clumps of red maple and white pine and a few red pine. The red maple tend to be multi-stemmed, suggesting that these have been cut back in the past. The white pines tend to be quite branchy, even low on the tree, and have multiple stems and large crowns. The red maples are in the 30'-50' height range, while the pines tend to be 60'-80'. There is a thick shrub layer throughout the stand. The shrubs benefit from the side-light (from Reservoir Road to the east and from the open agricultural land to the west) and from gaps in the overstory. Non-native bush honeysuckle is the most prominent shrub, but there are a number of native shrubs as well, including dogwood, winterberry, spirea, blackberries & raspberries, sumac, and northern arrowwood.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** The red maple sprout clumps are vigorous and, though not well-suited for timber production, are very well-suited to riparian zone protection. Seedlings of black cherry and white ash were abundant, with scattered oaks and a few white pine seedlings.

**Interfering native vegetation:** Wild grapes are well-established and are certainly overtopping a number of trees and can be expected to continue to do so unless controlled.

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**Other native understory vegetation (species and distribution):** poison ivy is abundant. See shrubs noted above.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 3 overall. Stout honeysuckle bushes form a nearly continuous, thick component of the shrub layer. Small bittersweet vines were noted throughout. Over time, given the availability of moisture, light, and climbing structure, bittersweet can be expected to increase aggressively over time.

**Soils (type, moisture, drainage and productivity):** Soil is Limerick, with minor components of Hinckley. (See "Overview of Soils" above).

**For tree growth purposes:** The Limerick is well-suited to white pine, and may be well-suited to sugar maple and other hardwoods. This riparian setting appears to be favorable to red maple, white ash and elm as well.

**For logging purposes:** Limerick tends to be wet and soft for much of the year, with a water table within 9 inches of the surface typically from December to May, and is only suitable for logging when dry, frozen, or otherwise stable. The small areas of deep, excessively-drained Hinckley along Chesterfield road would make the best location for a landing in the case of any logging (though none is expected for this stand).

**Habitat:**

**General Habitat:** Mixed-height canopy of white pine (tall) and red maple (medium) with numerous gaps filled with shrubs (including abundant honeysuckle). The center of this stand is the deep, slow-moving brook.

**Do wetlands occupy more than 10% of this stand?** Yes. Much of this stand is bordering vegetated wetland directly adjacent to the stream.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve) (e.g. tall ledge outcrops, etc.):** None.

**Special risks to habitat:** The possibility of bittersweet and grapes spreading throughout the stand, pulling it down edge trees and enlarging the upland-wetland interface area that can be overrun with vines. The continued spread of honeysuckle and tendency to crowd out native seedlings.

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**Desired habitat modifications (options will vary, including “none”):** Treatment of invasives and grapes to reduce their potential as seed sources and to prevent vines from overtaking canopy trees and creating self-perpetuating, self-enlarging gaps in areas that are already infested with invasives or grapes.

**Historical/archaeological/contemporary:** The brook is effectively a man-made, stone-lined channel.

**Management history:** Apparently, red maples have been “cut back” in the past (at least 15 years ago) as part of brush management.

**Desired future condition:** A dynamic mix of thriving riparian forest that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** None needed at this time.

**Discussion of silvicultural ideas:** N/A.

**Recommended management for the next 10 years:** Take steps to control non-native invasive vegetation and grapes.

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**RM-7, 8 & 9 Middle & Lower Reservoirs**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
22	WH	17.51	14.3	123	10.0	5	65	1	3
23	RP	4.50	9.4	138	6.8	13	65	3	1
24	WH	3.48	14.0	165	11.6	10	65	2	1
		25.49							4

\*R = Invasive species rank

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Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
22	WH	17.51	14.3	123	10.0	5	65	1	3

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into streams or flooded/saturated areas. There is no expectation that any management activity occurring here will cause sedimentation. Currently, there is ATV activity that is causing sedimentation directly into Clark Brook and into the unnamed brook that feed the Middle Reservoir. For the time being, at least, it does not appear that oriental bittersweet vines and other non-native invasive plants, or wild grapes, will be a problem.

**Silvicultural Status (options are "suitable" or "not suitable"):** suitable.

**Overstory: Forest Type and Condition:** Stand 22 features a mix of white pine, hemlock with red and black oak, and a minor amount of white oak, red maple, sugar maple, black birch, yellow birch and paper birch as well as pignut hickory. Many of the white pine and hemlock are large, tall, mature trees. Some of the oaks are as well, though most are from a younger age class than the pine and hemlock and are best described as maturing timber. Spacing between overstory trees is often good, reflecting a thinning about 25 years ago, though some areas are overcrowded and are ready for additional thinning. The land includes dry, gravelly knoll-tops and dry gravelly ridges as well as lower slopes and swales with abundant moisture. The tallest trees (pines well over 100' tall) tend to be in these lower positions, whereas some of the pines at the top of knolls have been struck by lightning. One knoll in particular was littered with tall pines that had been knocked down or were left dead and standing. Where openings created by the last thinning were large enough, there is a thick understory of hardwood saplings. In other places, thick hemlock shade from the overstory and midstory has prevented any seedlings from becoming established. Many of the hemlocks have snapped off or died — probably due to stem rot that can occur with increasing age in hemlock — a process that has created excellent snags and downed logs. In the very northern area of the stand there is a concentration of large red and white oaks.

Overall, this stand comes closer to the ideal watershed forest condition than most other stands. Unfortunately, elongate hemlock scale was noted (hemlock woolly adelgid was not noted but may be present as well), and the expectation is that hemlock will lose vigor over time and eventually enter a prolonged period of mortality. This will greatly increase the number of snags and the amount of coarse woody debris, and will result in black birch becoming prevalent in the understory. With its extreme shade tolerance, the nice midstory component that hemlock can uniquely provide (and does provide here) will someday be lacking from this stand and other stands.

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### Understory:

**Desirable Tree Regeneration (species and distribution) for future overstory:** Highly variable. Stout saplings of red maple, black birch with oaks, sugar maple and hickory were common in areas with a pine overstory and no hemlock. In areas with hemlock, midstory hemlock was the regeneration, and hardwood regeneration other than black birch was generally lacking. White pine seedlings occurred in scattered clumps.

**Interfering native vegetation:** Though witch hazel and mountain laurel were prevalent in some places, these did not appear to be a limitation to regeneration. Hay-scented fern was abundant in areas with better moisture, but lacking in drier areas.

**Other native understory vegetation (species and distribution):** Wintergreen and partridgeberry were abundant, and maple-leaved viburnum was scattered throughout.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 1 overall. Other than a couple barberry and multiflora rose plants, no non-native invasive plants were noted, and grapes were also not a problem.

**Soils (type, moisture, drainage and productivity):** Soils are a patchwork of Hinckley, Paxton and Woodbridge. (See "Overview of Soils" above).

**For tree growth purposes:** This might be an ideal mix of soils, combining good fertility with good accessibility (see below). Moister sections in swales are better-suited to growing high-quality red oak and other hardwoods, while the drier areas (typically at the top of the land but also in general on the Hinckley soil) are well-suited to growing white pine.

**For logging purposes:** The Charlton is well-drained and stable. The Paxton, which occupies the northern half of the stand, is seasonally quite wet; any logging would have to be limited to dry or frozen times of year.

### Habitat:

**General Habitat:** Tall white pine, hemlock and oak-hardwood overstory with midstory hemlocks and well-established brushy understory in places, with two streams. This stand forms an edge with the Middle Reservoir, a large water body with various duck species and other birds using opening water (kingfisher, etc.). Much of the edge area is a speckled-alder swamp and shallow marsh. There are scattered tall snags of pine and hemlock and large downed pines, and there is a concentration of these (pine only) on one of the knoll tops.

**Do wetlands occupy more than 10% of this stand?** No.

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Roberts Meadow Reservoir Town(s) Northampton Owner(s) City of Northampton DPW

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**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No. However, there is a vernal pool just south of this stand (see Forest Stand & Boundary Map) (egg masses observed 4/16/2013).

**Are NHESP layers indicated for this stand?** (if "yes", describe) No, not on current NHESP mapping made available to DPW. However, NHESP did mention that American bittern may occur on Roberts Meadow parcels. Presumably, NHESP was referring to one or more of the three reservoirs.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): Preserve small grove of black cherry on the north side of the reservoir; preserve the large white and red oaks in the northern tip of the stand.

**Special risks to habitat:** There is an expectation that hemlock will lose vigor over time and eventually enter a prolonged period of mortality.

**Desired habitat modifications (options will vary, including "none"):** Treatment of minor invasives and grapes to reduce their potential as seed sources.

**Historical/archaeological/contemporary:** There is barbed wire fence along much of the boundary as well as short stretches of stone wall. There is an ATV trail (described above).

**Management history:** Last thinned about 25 years ago.

**Desired future condition:** A continuation of this type with a strong presence of oaks and black cherry, with tall, old white pines, abundant coarse woody debris, and with the absence of non-native invasive plants.

**Silvicultural ideas:** This stand is ready for a follow up to the last thinning. The objective would be to improve spacing around some of the overstory trees, especially around the oaks, and to establish small areas of regeneration.

**Discussion of silvicultural ideas:** There are many limitations to managing this stand. There is no readily useable road frontage for access. Two streams right next to the reservoir would need to be crossed. And the total acreage that could be managed is small. Perhaps the best approach would be to approach an abutter about access to the southern part of the stand. Only areas south of the streams would be harvested, thereby avoiding the crossing of the streams. By cutting in this area, some of the hemlock could be taken out, and the thinning around most of the oaks could be achieved (most of the oaks are found south of the streams).

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**Recommended management for the next 10 years:** (1) blaze, paint and post the boundaries; (2) take steps to close down the ATV trail; (3) Take steps to control non-native invasive vegetation (near the southern stream); (4) conduct a thinning in a limited area (about 8 acres).

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Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
23	RP	4.50	9.4	138	6.8	13	65	3	1

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into streams or flooded/saturated areas. There is a risk of surface flow (erosion) into the Lower Reservoir from the steep hillside. The action of wild grape vines, and to a lesser extent oriental bittersweet vines, are compromising DPW's ability to maintain the type of functioning forest structure here that would minimize overland flow and would provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable.

**Overstory: Forest Type and Condition:** Stand 23 is a red pine plantation with two components. In the northern half there is no longer a red pine overstory, but, instead, there is an "overstory" of bent-over hardwood saplings (mostly red maple) with sumac and blackberries that grew in after the red pine was cut. Formerly, an overhead-wire ROW ran through this area, but it has since been removed. The young growth has been strongly influenced by subsequent weather events (heavy snow or ice) and by the aggressive growth of grapes and, to a lesser extent, bittersweet, creating a patchwork of bent-over hardwood saplings (mostly red maple) with sumac and blackberries. This section of the stand is steep and also seepy.

The southern half remains a tall, dense red pine overstory. The extreme steepness of the land, which comes right down to the Lower Reservoir, has been a limitation on past thinning. The red pines in the portion of this stand that occupies the steep bank down toward the reservoirs appear more vigorous than red pine in general across the watershed, but the red pine at the top of the knoll appears to be struggling due, presumably, to limited moisture availability.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** Where red pine was cut, vigorous regeneration of red maple, birches, and other hardwoods became established, but grape vines (possibly in conjunction with heavy snow on at least one occasion) have bent these over. Regeneration in the other area is red maple and black birch, which is spread through the stand.

**Interfering native vegetation:** The scattered mountain laurel does not appear to be a limitation to regeneration.

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**Other native understory vegetation (species and distribution):** Prickly dewberry and evergreen woodfern were scattered throughout. Sassafras was found in the grape pull-down area.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 3 overall. Though non-native invasive plants were lacking throughout the intact portion of the stand, bittersweet was established within the grape pull-down area. Given the difficulty of accessing this area, it is hard to determine the extent of the bittersweet. However, given the elevated moisture on this steep, somewhat seepy soil, and given the disturbance of past logging and the action of grapes and snow, it is very likely that bittersweet is well established and will only increase over time.

**Soils (type, moisture, drainage and productivity):** Soil is Paxton. (See "Overview of Soils" above).

**For tree growth purposes:** This soil is well-suited to white pine, red oak, and other hardwoods. Though somewhat droughty at the top of the land, the mid- and lower-slope positions have elevated moisture and are more fertile. Unfortunately, this elevated fertility applies to grapes as well.

**For logging purposes:** The Charlton is well-drained and stable. The Paxton, which occupies the northern half of the stand, is seasonally quite wet; any logging would have to be limited to dry or frozen times of year.

**Habitat:**

**General Habitat:** Somewhat tall, thin, closed canopy of red pine with no special habitat value in the southern half, and a dense tangle of bent-over hardwood saplings and vines in the northern half.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand? (if "yes", how many):** No.

**Are NHESP layers indicated for this stand? (if "yes", describe)** No.

**Other Special Habitat (elements to preserve) (e.g. tall ledge outcrops, etc.):** None.

**Special risks to habitat:** The possibility of bittersweet and grapes spreading throughout the rest of the stand in the event of any disturbance to the remaining red pine, preventing any new tree growth if canopy gaps are created by microbursts, other storms, silviculture, or by the actions of vines themselves.

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**Desired habitat modifications (options will vary, including “none”):** Treatment of invasives and grapes to reduce their potential as seed sources and to prevent vines from overtaking canopy trees and creating self-perpetuating, self-enlarging gaps in areas that are already infested with invasives or grapes.

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century.

**Management history:** the northern part of the stand was cut about 25 years ago, but it is not clear whether this was a silvicultural operation or whether this was driven by storm salvage or by removal of the overhead wires.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** Harvest most of the red pine to capture the value, but do this in a way that prevents erosion down the steep bank and does not allow grapes and bittersweet to spread.

**Discussion of silvicultural ideas:** Not only is the site difficult to access (no road frontage), difficult to operate (with the steep slope), and at risk of the spread of grapes and bittersweet, it is very prominent in its location next to the water’s edge. The stand is in plain view from Musante Beach. It is doubtful that there is a good and publicly appealing way to conduct any harvesting here.

**Recommended management for the next 10 years:** (1) consider cutting access paths through the pull-down so that grapes and invasives can be monitored and controlled; (2) control grapes and bittersweet.



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Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
24	WH	3.48	14.0	165	11.6	10	65	2	1

**Special water quality concerns (for stands within a reservoir watershed):** None. There is no surface flow from this stand into the drinking water system, and therefore.

**Silvicultural Status (options are "suitable" or "not suitable"):** suitable.

**Overstory: Forest Type and Condition:** Stand 24 consists primarily of tall, natural white pine with limited red oak and other hardwoods, combined with a small area of large oaks and an uncommon concentration of large, tall poplars and also an area of dense white pine and hemlock in the northern end. This stand is on the east side of Reservoir Road. An area on the west side of Reservoir Road that has the look of a picnic area with white pines arranged in natural groups with open spaces in between, is not part of this stand, but is counted as part of the reservoir and surrounding infrastructure.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:**

Generally lacking due to dense overstory shade. In a small section near the northwest corner, the tall overstory was cut off in the past, and the current overstory is a mix of hemlock, hardwoods and white pine ca. 15'-25' tall.

**Interfering native vegetation:** Witch hazel, mountain laurel and striped maple were scattered throughout but were thicker in the moister oak-poplar understory and would probably be a limitation to successful regeneration in this moister area.

**Other native understory vegetation (species and distribution):** evergreen woodfern and prickly dewberry were scattered throughout.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 2 overall. Though non-native invasive plants were completely lacking in most areas of this stand, the area of 15'-25' tall hemlock, hardwoods and white pine (see above) did have at least one well-established bittersweet vine. Given that this area is somewhat seepy, which benefits bittersweet, it is reasonable to expect this vine and possibly others to thrive in this area, quickly reach the canopy, and begin to produce seeds if they have not already done so.

**Soils (type, moisture, drainage and productivity):** Soils is a blend of Charlton and Paxton. (See "Overview of Soils" above).

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**For tree growth purposes:** Both soils are well-suited to white pine, red oak, and other hardwoods. The wetter Paxton is able to grow hardwoods to a large size.

**For logging purposes:** The Charlton is well-drained and stable. The Paxton, which occupies the northern half of the stand, is seasonally quite wet; any logging would have to be limited to dry or frozen times of year.

**Habitat:**

**General Habitat:** Tall white pine, and oak-hardwood overstory with a concentration of poplar and an inclusion hemlocks.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): Preserve large oaks (white, red and black/scarlet) and poplar concentration in the northern end of the stand.

**Special risks to habitat:** None.

**Desired habitat modifications (options will vary, including "none"):** Treatment of bittersweet to reduce potential seed source.

**Historical/archaeological/contemporary:** There is barbed wire fence along much of the boundary as well as short stretches of stone wall. There is an ATV trail (described above).

**Management history:** Limited thinning about 25 years ago in the southernmost section.

**Desired future condition:** A continuation of this type with a strong presence of oaks and poplar, and with tall, vigorous white pines and an absence of non-native invasive plants.

**Silvicultural ideas:** This stand is ready for a follow up to the last thinning in the thin, southern strip of white pine. The objective would be to improve spacing around some of well-established pines, thereby improving their long-term vigor.

**Discussion of silvicultural ideas:** This is a very difficult situation. The land is very narrow and becomes somewhat steep in the northern half of the thin strip. This cut is

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probably only do-able in a scenario in which the eastern abutter allows DPW to set up an access on their land, and DPW is able to find a logger who is willing to cut a very small amount of pulp-grade white pine with a fixed-head harvesting machine. This could be the same logger who cuts any of the red pine stands.

**Recommended management for the next 10 years:** (1) blaze, paint and post the boundaries; (2) take steps to clarify use of the access road to the abutting property and possibly obtain permission to set up a landing on their land; (3) Take steps to control non-native invasive vegetation (in the northwest area); (4) conduct a thinning in a limited area (about 1.5 acres).

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**RM-10 Reservoir Road East**

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
18	OH	12.00	12.4	105	5.5	9	70	2	2
19	WP	22.91	12.6	173	8.9	13.6	65	3	4
20	RP	10.42	13.1	173	14.7	11.2	66	2	2
21	RP	1.98	10.4	158	12.5	12.1	65	2	1
26	SS	19.05	N/A	N/A	N/A	N/A	N/A	3	0
		66.36							8

\*R = Invasive species rank

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Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
18	OH	12.00	12.4	105	5.5	9	70	2	2

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into streams or flooded/saturated areas. There is no expectation that any management activity occurring here will cause sedimentation. Depending on whether/where any logging occurs in this stand, there would be a need to work near, and cross, at least one seasonal stream. If so, any stream crossings and any work near streams will be designed to avoid sedimentation. Currently, there is no indication of any activity (ATV or otherwise) that could directly cause sedimentation. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable.

**Overstory: Forest Type and Condition:** Stand 18 is timber-sized red oak and hardwood mix with scattered large white pine and a well-developed shrub layer (esp. witch hazel and musclewood). Hemlock occurs as a scattered midstory tree.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** Scattered black birch and red maple saplings became established after logging about 25 years ago. Regeneration is mostly lacking due to overstory and shrub-layer shade.

**Interfering native vegetation:** Scattered large wild grapes; mountain laurel was thick in some places, and witch hazel was widespread and often thick throughout. Beech and striped maple occurred sporadically.

**Other native understory vegetation (species and distribution):** Shrubs are well-developed in some places, especially musclewood on the lower slope. Ironwood, shadbush, and highbush blueberry are scattered throughout the stand. Ferns include Christmas fern, evergreen woodfern and cinnamon fern.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 2 overall, due to scattered Japanese barberries, and the threat of bittersweet becoming established from nearby seed sources.

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**Soils (type, moisture, drainage and productivity):** Soils are Charlton and Woodbridge. (See "Overview of Soils" above).

**For tree growth purposes:** Both soils offer good fertility for white pine, red oak, and other native trees, with elevated fertility in lower-slope positions.

**For logging purposes:** Many areas of this soil tend to be wet and soft for much of the year, a situation that is compounded by mild and steep slopes. Logging should be restricted to dry or frozen times.

**Habitat:**

**General Habitat:** Tall, mixed-species canopy of native trees, including red oak, other hardwoods, and white pine, with a thick hardwood shrub layer in places (esp. witch hazel and muscledwood). A central seasonal stream.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): Large-crowned red oaks.

**Special risks to habitat:** The possibility of bittersweet and grapes spreading throughout the stand, pulling it down and preventing any new tree growth if canopy gaps are created by microbursts, other storms, silviculture, or by the actions of vines themselves.

**Desired habitat modifications (options will vary, including "none"):** Treatment of invasives and grapes to reduce their potential as seed sources and to prevent vines from overtaking canopy trees and creating self-perpetuating, self-enlarging gaps in areas that are already infested with invasives or grapes.

**Historical/archaeological/contemporary:** Old fence lines (barbed wire) along the boundary.

**Management history:** this stand was thinned about 25 years ago.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** A selection system (creating small openings and thinning around well-established trees) would enhance forest structure and keep the forest vigorous.

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**Discussion of silvicultural ideas:** There is a risk that bittersweet and other non-native invasives, combined with grapes triggered from the soil seed bank, would aggressively take advantage of this disturbance and overrun new openings. The need to do a round of selection system cutting is not urgent. The best silviculture and best policy here may be to wait and allow the benefits of invasives control and control of grapes in this and nearby stands to accumulate in the hopes that, at a future time, the idea of going forward with a selection system will not be hampered by the threat of undesirable vegetation.

**Recommended management for the next 10 years:** Next steps control bittersweet vines, other non-native invasives, and grapes in this stand and in any adjacent stands.

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
19	WP	22.91	12.6	173	8.9	13.6	65	3	4

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into the stream and adjacent flooded/saturated areas. There is no expectation that any management activity occurring here will cause sedimentation. Currently, there is no indication of any activity (ATV or otherwise) that could directly cause sedimentation. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable.

**Overstory: Forest Type and Condition:** Stand 19 is a white pine plantation. This stand is quite similar to Stand 15 in RM-2 (Sylvester Farm East), though, in general, the quality of the timber was even poorer. Many areas of this stand have a dense understory of white pine saplings and black birch 5'-12' tall.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:**

Scattered cherry seedlings in the southern part (with a good black cherry seed source scattered through the overstory); in the central and northern part, white pine and black birch are thick in places (described above).

**Interfering native vegetation:** Wild grapes have overrun a number of small openings, climbing and bending over hardwood saplings that had gotten off to a good start. Presumably, the grape seed bank is well stocked. There are many large poison ivy vines – it is unknown at this time whether these interfere appreciably with tree growth.

**Other native understory vegetation (species and distribution):** Evergreen woodfern was heavy in many areas. Christmas fern, hayscented fern (see below), abundant poison ivy, and clubmosses were apparent at the time of this writing (late winter) as well. Canada mayflower and starflower are probably abundant here as well.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 3 overall. Many areas of the stand seemed free of bittersweet plants. However, there are large bittersweet vines in scattered locations throughout the stand, as well as younger vines that have climbed into understory trees. It

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may be possible to reduce severity level to a 2 or 1 if the established vines are controlled within this stand and in nearby areas AND several years are allowed to lapse to deplete the seed bank.

**Soils (type, moisture, drainage and productivity):** Soil is Limerick, with minor components of Hinckley. (See "Overview of Soils" above).

**For tree growth purposes:** The Limerick is well-suited to white pine, and may be well-suited to sugar maple and other hardwoods.

**For logging purposes:** This soil tends to be wet and soft for much of the year, with a water table within 9 inches of the surface typically from December to May, and is only suitable for logging when dry, frozen, or otherwise stable. The small areas of deep, excessively-drained Hickley along Chesterfield road would make the best location for a landing in the case of any logging.

**Habitat:**

**General Habitat:** Tall, closed canopy of white pine with the potential for good cone (seed) production. Scattered black cherries are a source of soft mast. Poison ivy is abundant, with large vines in some areas. The northern part of the stand has a thick understory of white pine and black birch. There are various tall snags.

**Do wetlands occupy more than 10% of this stand?** No. The NRCS Soil Survey refers to this soil as hydric, but the vegetation occupying the soil is upland vegetation, so this may be a gray zone.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): None.

**Special risks to habitat:** The possibility of bittersweet (and grapes) spreading into and throughout the stand.

**Desired habitat modifications (options will vary, including "none"):** Treatment of bittersweet (and grapes) so that this threat is greatly reduced. Concurrently treat scattered other invasives (barberry, etc.)

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century.

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**Management history:** this stand has been pruned, but no information about thinning in recent decades was found, and there is no indication on the ground that this stand was thinned in recent decades.

**Desired future condition:** For the foreseeable future, a stand of tall, vigorous white pine that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** This stand is in need of a series of thinnings to improve vigor in a stepwise manner without destabilizing the stand (by overcutting at any one time).

**Discussion of silvicultural ideas:** It is extremely probable that bittersweet and/or grapes would aggressively take advantage of this disturbance and completely overrun the understory and perhaps continue to climb into the overstory. The best best policy here would be to control the bittersweet and grapes, allow some time to elapse to extinguish the bittersweet and grape seed bank, then re-evaluate. Go forward with the thinning only if the bittersweet is controlled.

**Recommended management for the next 10 years:** Next steps (1) control bittersweet and grapes vines in this stand and in any adjacent stands; (2) re-evaluate conditions several years after completion of bittersweet control to see if conditions are more favorable for carrying out a thinning.

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
20	RP	10.42	13.1	173	14.7	11.2	66	2	2

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into seasonal streams. Depending on where any logging occurs in this area, there would be a need to work near, and cross, various seasonal streams. If so, any stream crossings and any work near streams will be designed to avoid sedimentation. Currently, there is no indication of any activity (ATV or otherwise) that could directly cause sedimentation. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** suitable.

**Overstory: Forest Type and Condition:** Stand 20 is a red pine plantation. The red pines are well-formed and of medium height (ca. 80'), but are in a condition of weak health and vigor. As in many of the other red pine stands, the overstory trees are barely growing. Other than a few roadside trees, however, there is no indication of accelerated mortality (as there is in Stand 17). This red pine stand has the significant inclusions described below under "General Habitat". Much of the white ash in the red maple swamp inclusion are very weak or are already dead. This type of dieback of ash is not unusual in our wider region, and there is no good explanation.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** Black birch, red maple and in some cases sugar maple saplings are common throughout, except where witch hazel is thick or under white pine or hemlock inclusions, or in the red maple swamp.

**Interfering native vegetation:** Witch hazel is abundant; beech and striped maple are present to a minor extent and is not expected to interfere with future management. In fact, these plants would be totally acceptable to the extent that their shade helps keep bittersweet and grapes at bay.

**Other native understory vegetation (species and distribution):** Musclewood, spicebush, elm are scattered throughout. Poison ivy is thick in the swamp.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 2 overall. The severity level would have been 1 if it

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were not for a few individual plants of bittersweet, especially along Chesterfield Road, and scattered Japanese barberry.

**Soils (type, moisture, drainage and productivity):** This plantation is sited across three soils: Charlton-Hollis, Paxton, and Woodbridge. (See "Overview of Soils" above). The terrain ranges from top-slope to mid-slope to lower-slope, creating a variety of moisture regimes and conditions. Some top-slope areas are poorly-drained and are wetlands. Other top-slope positions are thin-soiled and droughty. Fertility increases in mid-slope and lower-slope positions.

**For tree growth purposes:** Average overall, but see discussion of variability above.

**For logging purposes:** Many areas of this soil tend to be wet and soft for much of the year, a situation that is compounded by mild and steep slopes. Logging should be restricted to dry or frozen times.

**Habitat:**

**General Habitat:** Somewhat tall, thin, partially-closed canopy of red pine with no special habitat value, with several notable inclusions: (1) a grove of tall, large white pines; (2) a tall red maple swamp with ash and elm; (3) a small pocket of tall, large hemlock just below a ledge outcrop next to Chesterfield Road; and (3) three seasonal streams.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): Preserve the native forest elements (if the red pine is cut off).

**Special risks to habitat:** The possibility of bittersweet and grapes becoming established. The possibility of alteration to stream banks if there are any logging operations.

**Desired habitat modifications (options will vary, including "none"):** Control scattered vines (grapes and bittersweet).

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century.

**Management history:** this stand has been thinned, but no information about logging in recent decades was found.

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**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** As with other red pine stands, there is no reason to expect this red pine stand to improve in vigor and thrive in the future. The most sensible overall approach seems to be an orderly retreat from red pine plantations where feasible, in order to capture what value is there, to avoid the possibility of being responsible for the unsightliness and danger of a large number of tall, dead trees, and to help diversify forest structure. Removing the red pine overstory all at once would allow hardwoods to regenerate from established seedlings and saplings, sprouts and seed to form a new stand. The central grove of large white pine would be retained.

**Discussion of silvicultural ideas:** This is somewhat complicated, by tight access (amidst fast-moving traffic on a busy road), and moist soils and slopes to operate on. A limiting factor is the small size of this job. Presumably, this cut would be linked with other nearby red pine harvesting. Additionally, there is a scattered presence of bittersweet that should be controlled prior to cutting. In order to minimize the possibility of promoting Ips beetles, a system that removes most of the tree tops and debris (e.g. whole-tree biomass harvesting) would be best.

**Recommended management for the next 10 years:** Next steps (1) pre-emptively control bittersweet and grapes; (2) regenerate the eastern half of this stand by removing the red pine overstory; (3) monitor for the presence of bittersweet and other non-native invasive plants, and/or grapes, and control these before they interfere with stand development.

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
21	RP	1.98	10.4	158	12.5	12.1	65	2	1

**Special water quality concerns (for stands within a reservoir watershed):** This stand does not directly interface with any surface water. There is no expectation that any management activity occurring here will cause sedimentation. Currently, there is no indication of any activity (ATV or otherwise) that could directly cause sedimentation. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** suitable.

**Overstory: Forest Type and Condition:** Stand 20 is a red pine plantation. The red pines are well-formed and of medium height (ca. 80'), but are in a condition of weak health and vigor. As in many of the other red pine stands, the overstory trees are barely growing.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** Black birch, red maple and in some cases sugar maple saplings and a few hemlock saplings are scattered throughout.

**Interfering native vegetation:** None noted.

**Other native understory vegetation (species and distribution):** scattered evergreen woodfern.

**Non-native invasive vegetation (species, distribution/severity) (see "Notes applying to all stands" above):** Severity level is 2 overall. Although no non-native invasive plants were found, the designation of 2 is a precaution to reflect that this is a small stand with nearby sources of bittersweet seed. Before and after any harvesting, this stand should be carefully checked for bittersweet and other non-native invasive plants, and/or grapes.

**Soils (type, moisture, drainage and productivity):** The soil is listed as "Charlton". (See "Overview of Soils" above).

**For tree growth purposes:** Charlton is a deep, well-drained, moderately fertile soil that is well suited to growing white pine, red oak, and other native trees. This site actually

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seems like it is a deep, gravelly soil with restricted water availability during the growing season, which might make it more like a Hinckley. Fertility is average.

**For logging purposes:** This stand should be suitable for logging at most times of the year.

**Habitat:**

**General Habitat:** Somewhat tall, thin, partially-closed canopy of red pine with no special habitat value.

**Do wetlands occupy more than 10% of this stand?** No.

**Were vernal pools identified/mapped for this stand?** (if "yes", how many): No.

**Are NHESP layers indicated for this stand?** (if "yes", describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): None noted.

**Special risks to habitat:** The possibility of bittersweet and grapes becoming established.

**Desired habitat modifications (options will vary, including "none"):** None needed.

**Historical/archaeological/contemporary:** As a plantation, this stand is a result of actions taken in the early decades of the 20<sup>th</sup> century.

**Management history:** this stand has been thinned, but no information about logging in recent decades was found.

**Desired future condition:** A multi-aged, mixed-species forest of vigorous trees that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** As with other red pine stands, there is no reason to expect this red pine stand to improve in vigor and thrive in the future. The most sensible overall approach seems to be an orderly retreat from red pine plantations where feasible, in order to capture what value is there, to avoid the possibility of being responsible for the unsightliness and danger of a large number of tall, dead trees, and to help diversify forest structure. Removing the red pine overstory all at once would allow hardwoods to regenerate from established seedlings and saplings, sprouts and seed to form a new stand.

**Discussion of silvicultural ideas:** This is fairly straightforward, with good access and good ground to operate on. Some trees in the surrounding white pine stand may need to be cut in order to create a more natural and stable edge. A limiting factor is the small size

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of this job. Presumably, this cut would be linked with other nearby red pine harvesting. In order to minimize the possibility of promoting Ips beetles, a system that removes most of the tree tops and debris (e.g. whole-tree biomass harvesting) would be best.

**Recommended management for the next 10 years:** Next steps (1) regenerate this stand by removing the red pine overstory; (2) monitor for the presence of bittersweet and other non-native invasive plants, and/or grapes, and control these before they interfere with stand development.

*STAND DESCRIPTIONS*

Stand	Type	Acres	MSD	BA	Mbf per acre	Cords per acre	Site Index WP	R*	Growth Rate (Mbf/yr)
26	SS	19.05	N/A	N/A	N/A	N/A	N/A	3	0

**Special water quality concerns (for stands within a reservoir watershed):** avoid any inputs of sediments into streams or flooded/saturated areas. There is no expectation that any management activity occurring here will cause sedimentation. Currently, there is no indication of any activity (ATV or otherwise) that could directly cause sedimentation. Over the longer-term, the threat of oriental bittersweet vines and other non-native invasive plants, as well as wild grapes, may compromise DPW's ability to maintain the type of functioning forest structure that is considered to provide the best protection for water quality.

**Silvicultural Status (options are "suitable" or "not suitable"):** NOT suitable.

**Overstory: Forest Type and Condition:** Stand 26 is a wide, deep, slow-moving stream with affiliated riparian areas of shrub swamp, wet meadow and red maple swamp with periodic beaver activity. Ecologically, this stand is a continuation of Stand 11 (Sylvester Road East and West). There are also oak-hardwood and white pine upland areas in the northwestern part of the stand, along the boundary with Roberts Hill Conservation Area. These upland areas are included because they are small in size and because there is no practical way to access them without coming in from abutting land (these areas are marked with a "u." on the Forest Stand & Boundary Map). Apparently, this stand is the original stream course of Roberts Meadow Brook (before it was re-directed into the present-day "canal" on the west side of Chesterfield Road. The water in the stream moves slowly enough so that spring peepers and woodfrogs were calling (on 4/9/2013) and may, therefore, be using the stream as a vernal-pool-like breeding habitat.

Scattered trees include red maple, white pine, yellow birch, elm, shadbush and muscledwood. No black gum was noted. Shrubs include witch hazel, highbush blueberry, winterberry, dogwood, spirea and viburnums. Hydrological conditions are variable, with slowly-flowing water, ponded water, saturated soil, and a microtopography of hummocks. A number of standing dead red maples reflect fluctuating water tables caused by past beaver activity.

**Understory:**

**Desirable Tree Regeneration (species and distribution) for future overstory:** N/A.

**Interfering native vegetation:** Wild grapes tend to form undesirable mats and thickets along the wetland-upland interface. The witch hazel is not interfering with desirable processes in this stand.

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*STAND DESCRIPTIONS*

**Other native understory vegetation (species and distribution):** Sensitive fern and other ferns, various grasses, sedges and cattails.

**Non-native invasive vegetation (species, distribution/severity) (see “Notes applying to all stands” above):** Severity level is 3 overall. Various, matted areas of bittersweet (and grapes) were noted throughout the stand. Multiflora rose and Japanese barberry were also scattered throughout. It seemed that these areas are likely to increase over time, with the possibility of flooding providing, perhaps, the best hope of a natural inhibitor to their spread.

This stand is not an area with the potential for a tall overstory, and, therefore, non-native invasive vegetation will not be an interfering factor in overstory development. However, to help with mapping and tracking of the overall invasive plant situation, the ranking system was applied here and used to indicate the level of infestation.

**Soils (type, moisture, drainage and productivity):** The northwest part of this stand is classified as Ridgebury. The remaining areas constitute and interface between a variety of upland soil types (Charlton-Hollis, Paxton, Woodbridge and Charlton) with the wet Limerick. (See “Overview of Soils” above).

**For tree growth purposes:** Much of this soil is too wet for tree growth or is effectively so, given the possibility of beaver feeding and flooding at some point during the long potential lifetime of a tree.

**For logging purposes:** This soil is too wet for logging activity.

**Habitat:**

**General Habitat:** Tall, upland forest edge (white pine, red pine and oak-hardwoods) along a deep, slow-moving stream with affiliated shrub swamp, wet-meadow, shallow marsh. There are scattered tall snags and large downed trees.

**Do wetlands occupy more than 10% of this stand?** Yes.

**Were vernal pools identified/mapped for this stand?** (if “yes”, how many): No. However, wood frog and spring peeper choruses were heard throughout the stand (4/9/2013). This may indicated use of this stream as a “vernal pool”.

**Are NHESP layers indicated for this stand?** (if “yes”, describe) No.

**Other Special Habitat (elements to preserve)** (e.g. tall ledge outcrops, etc.): None.

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*STAND DESCRIPTIONS*

**Special risks to habitat:** The possibility of bittersweet and grapes spreading throughout the stand, pulling down edge trees and enlarging the upland-wetland interface area that can be overrun with vines.

**Desired habitat modifications (options will vary, including “none”):** Treatment of invasives and grapes to reduce their potential as seed sources and to prevent vines from overtaking canopy trees and creating self-perpetuating, self-enlarging gaps in areas that are already infested with invasives or grapes.

**Historical/archaeological/contemporary:** This may be the original stream bed of Roberts Meadow Brook (which currently flows through a “canal” on the west side of Chesterfield Road..

**Management history:** In 1987, this was not mapped as a separate stand, but was included with the surrounding upland stands. In the meantime, it appears that the “extent” of the non-forested riparian habitat has increased (perhaps due to the action of beavers, vines, storms, decline of red pine, etc.).

**Desired future condition:** A dynamic mix of thriving native wetland communities that is free of the influence of non-native invasive plants and other interfering factors.

**Silvicultural ideas:** N/A.

**Discussion of silvicultural ideas:** N/A.

**Recommended management for the next 10 years:** Take steps to control non-native invasive vegetation and grapes.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Explanation of Silvicultural Methods**

“Silviculture” is the body of ideas and practices used by foresters to shape the forest. Ideally, the forester will mark the silviculture (by painting trees to be cut). A crucial aspect of success is to find a logger who is willing and able to carry out the marked cutting as the forester intends.

To the landowner: recommended silvicultural methods for your particular forest stands are referred to in Stand-level management practices on subsequent pages and are drawn from the following list, which is based on (**proposed**) Chapter 132 (Forest Cutting Practices Act) regulations. Silvicultural methods are broadly divided into two groups, **intermediate cuts** and **regeneration cuts**. Intermediate cuts focus on improving growth in existing overstory trees. Regeneration cuts focus on establishing and promoting new stands of trees. Please note that in considering or implementing any of the methods described below there are numerous factors that must be contemplated and addressed, such as competing vegetation, browse, optimal logging systems, woodlot access (roads, landings, etc.), time of year and ground conditions, and measures to protect state-listed species, watercourses and wetlands, etc.

**Intermediate Cuts**

**Thinnings & Improvement Cuts:** These reduce the density of trees to enhance the vigor of residual trees. An improvement cut is usually an initial treatment that removes trees of low quality or undesirable species. Thinnings are subsequent adjustments to continue focusing growth on selected trees. Intermediate cuts that are overly “heavy” (i.e. cuts that let in a lot of light) are classified as regeneration cuts: *proposed* (pending as of this writing) basal area thresholds are as follows: BA = 100 for conifer stands, BA = 60 for hardwood stands, BA = 80 for conifer-hardwood stands.

**Regeneration Cuts**

Regeneration cuts use existing stands of trees to create future stands of trees. The future stands of trees can be of a single age (known as “even-aged”), two ages (two-aged) or of three or more ages (uneven-aged). In regeneration cuts, particular attention is paid to seed sources and/or existing seedlings/saplings for the future stand, light conditions in the understory, and interfering factors (e.g. native or non-native competitor plants in the understory, browsing by deer or moose, etc.). A regeneration cut can be sudden and decisive (clearcutting, seed-tree, coppice, single-cut shelterwood), or a regeneration cut can be staggered (multiple cut shelterwood), or ongoing (uneven-aged, i.e. “selection system” or “irregular shelterwood”).

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

Even-aged Regeneration Methods

**Clearcut:** All established trees are removed to allow new trees to grow from seed in full sun. Clearcutting is especially appropriate for early-successional species (e.g. paper birch, poplar and black cherry plus gray birch and pin cherry) and may grow with mixes of hemlock, red maple and other birches. Seeding is assumed to occur from edge trees or from seed stored in the soil (cherry). Clearcuts may be up to 5 acres, or, if artificial seeding or planting is used, up to 10 acres. Larger clearcuts require special permission. Clearcuts separated by more than 100 feet are considered separate. Clearcutting is sometimes confused with the final cut ("overstory removal cut") in a shelterwood system (see below), but the difference is that clearcutting is done to grow new trees from seed, whereas the overstory removal cut in a shelterwood system is done to release existing seedlings or saplings. Clearcutting is also sometimes confused with patch selection (see below); in fact, the distinction between two practices falls into a gray area.

**Seed-Tree Cut:** Similar to a clearcut except that (1) seed trees are retained to provide seed (and either cut later or leave) and (2) any species may be grown (i.e. desired regeneration does not have to be from light-seeded species or cherry). There is no acreage limitation. At least 4 seed trees (20-inch diameter or greater (BA = 10)) or 12 seed trees (14-20 inches diameter) (BA 20) must be retained per acre.

**Shelterwood/ Shelterwood System:** usually a multi-step approach to establish desirable trees in the understory in medium-light conditions before the overstory is eventually removed to release the seedlings. The final step in the shelterwood system is the overstory removal, which is done to release the established young trees. Used especially for oak, sugar maple (giving these species years to establish well-developed root systems) white pine and hemlock (giving these species years to establish competitive height). Black birch typically becomes abundant as well. Regeneration that is adequate for release must typically be 2 feet tall, well-distributed and abundant. Interfering vegetation must be identified and (ideally) controlled.

**Coppice:** a complete "cutting off" of small or medium-sized hardwoods, especially oaks, hickory, red maple) to cause these to re-sprout and form a new stand from the same root systems. This is an old system that sometimes occurs inadvertently, and is useful for reliably producing firewood or whips (i.e. saplings used for any number of purposes).

Two-aged Regeneration Methods

**Clearcut, Seed-tree, Shelterwood with "reserves":** Same as methods described above but with retention of trees (12 inches diameter or larger) (possibly for timber, seed source, habitat or aesthetic reasons, but not for the purpose of managing understory light conditions).

Uneven-aged Regeneration Methods (Selection/Irregular Shelterwood)

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

In an uneven-aged stand there will always be trees in a range of size and age classes that are *free to grow*. Often current conditions will be an approximation of this, but over time a true multi-aged stand can be created and maintained. A selection cut is a mix of thinning and creating or enlarging openings. Openings are defined either as groups or patches; new openings generally do not cover more than 50% of the stand area.

**Group Selection:** openings may range from single-tree-size up to 1/4 acre (e.g. equivalent to a circle about 120 feet in diameter in size, which is about 1.5 times the mature height of many trees (80'-100')). No special provisions are needed to prepare the understory for this more conservative opening size, though, to achieve the ideal outcome, it may be necessary to control competing vegetation (native vegetation such as beech or striped maple, or non-native invasive vegetation such as bittersweet, buckthorn, etc.).

**Patch Selection:** openings may range up to 2 acres (e.g. equivalent to a circle about 333 feet in diameter). Interfering vegetation (if present) should be identified and ideally controlled so that seedlings can be established/released. Please note: in Massachusetts, patch cuts will appear identical (to the public) as clearcutting.

**Continuous-Cover Irregular Shelterwood:** (see "The Irregular Shelterwood System", *Journal of Forestry*, December, 2009) is used to "create and maintain an unbalanced, multi-aged stand for a long and indefinite period of time by successive regeneration fellings." This system is perhaps the most complex, but is the most versatile for creating or maintaining complex forest conditions. In this system, elements of thinning, shelterwood, and group selection are combined and applied in ways that reflect the current conditions and ultimate potential of specific woodlot areas, and strongly reflect the judgement and vision of the forester. A forest managed in this way will not have an "industrial" feel and should be rewarding for people with a wide range of interests ranging from on-going timber production to contemplative enjoyment of nature. This system is not used when the landowner wants to maximize short-term income or dramatically alter the landscape (for this see "Even-Age Regeneration Methods" above).

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Treatment Recommendations for Non-Native Invasive Plants Based on Stand**

**Ranking:** treatments of interfering vegetation will be designed according to the degree of infestation. For each stand and situation, a specific prescription would be developed. The general approach to treatments is discussed below.

In Stands ranked 1, there is typically no need to treat interfering vegetation.

In Stands ranked 2 and scheduled for silvicultural activity, control of interfering vegetation is typically recommended as a condition of the harvest (i.e. recommended to occur, as a separate step to be done by separate contractors before, during, or right after the harvesting.) Without treatment of interfering vegetation, these harvests should not be pursued (because it would merely spur new growth in the interfering vegetation). A typical treatment for stands ranked 2 would be as follows:

- Winter, Year 1 (dormant season): cut-stump herbicide application to invasive plants and interfering vegetation using Garlon 4 Ultra in basal oil. Various saws and clippers used as needed.
- Summer, Year 1: as needed, foliar herbicide application of triclopyr-based herbicide on low and resurgent vegetation (e.g. horizontal vines, resprouts, etc.). Use backpack sprayer.
- Summer, Year 2: as needed, follow-up foliar spray application.

For some Stands ranked 3 (none of these are slated for silvicultural treatment), especially where there is significant timber, treatments are recommended that would seek to reduce the Stand ranking to 2 so that harvesting could occur in the future (though probably beyond the 10-year time frame of this plan). A typical treatment for stands ranked 3 would be as follows:

- Winter, Year 1 (dormant season): cut-stump herbicide application to invasive plants and interfering vegetation. Various saws and clippers used as needed.
- Summer, Year 1: as needed, foliar herbicide application of triclopyr-based herbicide on low vegetation (e.g. horizontal vines). Mistblower and/or backpack sprayer would be used.
- Late Summer, Year 1: as needed, foliar herbicide application of glyphosate-based herbicide and imazapyr-based herbicide on low vegetation (e.g. horizontal vines) on low-growing vegetation.
- Summer, Year 2: as needed, follow-up foliar spray application.
- Summer, Year 3: as needed, follow-up foliar spray application.

For some Stands ranked 4 or 5, no active treatment is recommended at this time, unless the DPW wishes to be very ambitious and regain the ability to manage all DPW lands with normal silvicultural methods. **The exceptions would be for included areas ranked 4 or 5 (i.e. at Kingsley Farm and Roberts Meadow Stands 5, 6 & 7).** Control may be

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

recommended in these focused areas in order to prevent these areas from enlarging over time and from serving as a seed source to surrounding areas. A typical treatment for stands ranked 4 or 5 would be as follows:

- Winter, Year 1 (dormant season): cut-stump herbicide application to invasive plants and interfering vegetation. Various saws and clippers used as needed.
- Winter, Year 1 (6 weeks after previous treatment): if needed, using equipment as needed, create walkable access routes into the treatment area
- Summer, Year 1: foliar herbicide application of triclopyr-based herbicide on low vegetation (e.g. horizontal vines). Mistblower and/or backpack sprayer would be used.
- Late Summer, Year 1: foliar herbicide application of glyphosate-based herbicide and imazapyr-based herbicide on low vegetation (e.g. horizontal vines) on low-growing vegetation.
- Fall, Year 1 or early spring, Year 2: in Stands ranked 5, possible planting of new vegetation (e.g. Norway spruce to cast dense shade) to grow in combination with native vegetation.
- Summer, Year 2: as needed, follow-up foliar spray application.
- Summer, Year 3 as needed, follow-up foliar spray application.

**MANAGEMENT PRACTICES**  
to be done within next 10 years

**Roberts Meadow Watershed: Management Practices Overview**  
**for Management Units RM-2 – RM-10**

**RM-2 Sylvester Farm West**

Stand	Type	Mark boundary?	Harvesting?	Invasives Control?	Control grapes?	Address Encroachment. ATV, etc.?
9	OH	Y	Y		Y	Y
11	SS					
12	RP			Y	Y	
27	BR			Y	Y	

**RM-3 Sylvester Farm East**

Stand	Type	Mark boundary?	Harvesting?	Invasives Control?	Control grapes?	Address Encroachment. ATV, etc.?
10	OH	Y	Y			Y
11	SS					Y
13	RP		Y			
14	WH		Y			
15	WP			Y		Y
16	RP			Y		

**RM-4 Upper Reservoir**

Stand	Type	Mark boundary?	Harvesting?	Invasives Control?	Control grapes?	Address Encroachment. ATV, etc.?
5	WH	Y		Y	Y	Y
6	RP	Y		Y	Y	
7	RP	Y		Y	Y	Y
8	RP		Y	Y	Y	

**MANAGEMENT PRACTICES**  
to be done within next 10 years

**RM-5 Kennedy Road East**

Stand	Type	Mark boundary?	Harvesting?	Invasives Control?	Control grapes?	Address Encroachment. ATV, etc.?
17	RP	Y	Y	Y	Y	Y

**RM-6 Reservoir Road West**

Stand	Type	Mark boundary?	Harvesting?	Invasives Control?	Control grapes?	Address Encroachment. ATV, etc.?
25	WH			Y	Y	

**RM-7, 8 & 9 Middle & Lower Reservoirs**

Stand	Type	Mark boundary?	Harvesting?	Invasives Control?	Control grapes?	Address Encroachment. ATV, etc.?
22	WH	Y	Y	Y		Y
23	RP					
24	WH	Y	Y	Y		Y

**RM-10 Reservoir Road East**

Stand	Type	Mark boundary?	Harvesting?	Invasives Control?	Control grapes?	Address Encroachment. ATV, etc.?
18	OH	Y			Y	Y
19	WP			Y	Y	
20	RP	Y	Y	Y	Y	
21	RP		Y			
26	SS	Y		Y	Y	

**MANAGEMENT PRACTICES**  
to be done within next 10 years

**Roberts Meadow Watershed: Timber Harvesting Overview**  
**for Management Units RM-2 – RM-10**

**RM-2 Sylvester Farm West**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
9	OH	SH	7.5	47	13	43	2013 /15
11	SS	N/A	0.0	0	0.0	0.0	N/A
12	RP	N/A	0.0	0	0.0	0.0	N/A
27	BR	N/A	0.0	0	0.0	0.0	N/A
			7.5		13	43	

**RM-3 Sylvester Farm East**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
10	OH	selection	18.0	35	31	52	2013 /15
11	SS	N/A	0.0	0	0.0	0.0	N/A
13	RP	shelterwood	1.7	154	35	7	2013 /15
14	WH	Selection	2.8	57	11	15	2013 /15
15	WP	N/A	0.0	0	0.0	0.0	N/A
16	RP	N/A	0.0	0	0.0	0.0	N/A
			22.5		77	75	

**RM-4 Upper Reservoir**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
5	WH	N/A	0.0	0	0.0	0.0	N/A
6	RP	N/A	0.0	0	0.0	0.0	N/A
7	RP	N/A	0.0	0	0.0	0.0	N/A
8	RP	shelterwood	1.0	153	11	9	2013 /15
			1.0		11	9	

**RM-5 Kennedy Road East**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
17	RP	shelterwood	9.8	131	84	85	2013 /15
			9.8		84	85	

**MANAGEMENT PRACTICES**  
to be done within next 10 years

**RM-6 Reservoir Road West**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
25	WH	N/A	0.0	0	0.0	0.0	N/A

**RM-7, 8 & 9 Middle & Lower Reservoirs**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
22	WH	thinning	8.0	30	15.0	15.0	2013 /15
23	RP	N/A	0.0	0	0.0	0.0	N/A
24	WH	thinning	1.5	70	4	15	2013 /15
			9.5		19	30	

**RM-10 Reservoir Road East**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
18	OH	N/A	0.0	0	0.0	0.0	N/A
19	WP	N/A	0.0	0	0.0	0.0	N/A
20	RP	shelterwood	5.2	130	77	58	2013 /15
21	RP	shelterwood	2.0	158	25	24	2013 /15
26	SS	N/A	0.0	0	0.0	0.0	N/A
			7.2		102	82	

**Timber Harvesting Roberts Meadow (only) Totals**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
			48		286	295	2013 /15

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*MANAGEMENT PRACTICES*  
*to be done within next 10 years*

**Roberts Meadow Watershed:**  
**Management Prescriptions for Individual Stands**  
**In Management Units RM-2 – RM-10**

The remainder of this section is devoted to stand-specific management prescriptions. The stands are grouped by management unit (RM-2 through RM-10). Each stand is shown on the relevant Forest Stand & Boundary Map (one map for each management unit (RM-2 through RM-10)). The maps can be found at the end of this section of this Forest Stewardship Plan.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Recommended Management 2013-2023**

**RM-2 Sylvester Farm West:**

**Trails/Roads/Drainage**

There are no official trails on this property. The trail that follows the old utility ROW is not authorized. Going forward, the status/usage of this trail should be clarified and/or altered as needed. The only established road goes into Stand 27. The road is blocked by a cable. There are no drainage or other issues with this road.

**Boundaries & Encroachment**

Locate, blaze and paint the southern and western boundaries, including the area around the "Thibault Corner" (former) encroachment.

No unresolved encroachment issues were discovered in the course of this work.

**Future Pest Prevention**

Consider a policy for managing street tree waste that will protect the surrounding forest from possible contamination from infested street trees (or soil) that might be brought into the work area of Stand 27.

**Control of Interfering Vegetation**

**Control of grape vines (mechanical treatment): (northern edge area of Stand 27 and surrounding edge areas of Stands 9 & 12):** Control of grapes: This is a one-time treatment involving cutting grapes (grape vines) close to the ground and, typically, also at chest or shoulder height. There will be some re-sprouting, but deer browse and shade will probably be sufficient to prevent the sprouts from surviving. The work will probably be done by chainsaw, but because this is a wetland area, it would be good to use canola oil in place of traditional mineral-based bar oil. Canola oil works fine, and using it avoids the problem of spraying mineral-based bar oil all over the wetland.

**Control of oriental bittersweet, autumn olive, Japanese barberry, multiflora rose, Japanese knotweed, and other non-native invasive plants (northern edge area of Stand 30 and surrounding edge areas of Stands 9 & 12).**

**Control of oriental bittersweet in northern section of Stand 12.**

First, maintain maximum shade by not cutting overstory trees. Second, follow the initial practice indicated below. Third, if feasible and if needed, follow the complete regimen listed above for stands ranked 3. Continue to monitor the response of bittersweet and other non-native vegetation.

**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

•Winter, Year 1 (dormant season): cut-stump herbicide application to invasive plants and interfering vegetation using Garlon 4 Ultra in basal oil. Various saws and clippers used as needed.

**Note on abutting DPW lands:** The cluster of DPW parcels (RM 2, RM-3, RM-4 and RM-5) centered around the intersection of Kennedy, Chesterfield and Sylvester Roads has numerous areas that are infested with seed-bearing oriental bittersweet. Any effort to control bittersweet in any one of these areas will be much more effective if this entire area is regarded as, and treated as, a single infestation. Otherwise, the bittersweet in untreated areas can continue to seed in to treated areas.

**Overview of harvesting: RM-2 Sylvester Farm West:**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
9	OH	SH	7.5	47	13	43	2013 /15
11	SS	N/A	0.0	0.0	0.0	0.0	N/A
12	RP	N/A	0.0	0.0	0.0	0.0	N/A
30	BR	N/A	0.0	0.0	0.0	0.0	N/A
			7.5		13	43	

**MANAGEMENT PRACTICES**  
to be done within next 10 years

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
9	OH	SH	7.5	47	13	43	2013 /15

**Practice purpose (how it helps create desired future condition)**

This practice will improve forest structure by creating a new age class and providing early successional habitat. Most of the overstory will be removed, and the regeneration will come from a combination of resprouting of oaks and red maples and from established seedlings and small trees.

**Trees to be removed & retained (types, conditions, sizes):** Most overstory would be removed. Trees to retain would be small groups of well-formed and/or vigorous trees of any species and any size, primarily oaks and/or tall white pine. Also, any of the well-formed midstory white pine that can be saved, should be saved.

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** Try to protect established midstory white pine.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 2. The Stand is ranked 2, but this area is ranked 1. Because of the bittersweet seed source at the northern end of Stand 30, this area should be monitored post-harvest to detect and control any possible establishment of bittersweet as early as possible. The same applies to grapes.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided.

**Special access considerations (erosion, access, timing, cultural, etc.):** Access is by the road into Stand 27. This is a good (well-drained and stable) woods road for purposes of logging. There should be no difficulty.

**Special equipment/logging-system considerations:** Any system that can adequately protect the ground/soil and residual stand is acceptable.

**Special boundary considerations:** The cutting area is not near any boundary (other than Sylvester Road).

**Special habitat improvements (anything particular to accomplish):** Retain large coarse woody debris and snags to the extent possible.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Special habitat protection considerations (anything particular to protect):** leave a 100'-no-cut-buffer around the roadside vernal pool.

**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** Even though the trail through this area has no official status, try to keep the trail unobstructed by logging debris. The trail should be posted no trespassing for the duration of the logging.

**Special cultural resource considerations:** None.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Recommended Management 2013-2023**  
**RM-3 Sylvester Farm East:**

**Trails/Roads/Drainage**

There are no official trails on this property. The ATV trail that comes onto the property from the MA-BELL Jeep Eater trail, which is located just south of RM-3, is not authorized. This trail has an unauthorized stream crossing and crosses through about 500' of wetland. This trail is discussed further in the Description for Stand 10. Going forward, the status/usage of this trail should be clarified and/or altered as needed. This may involve removing the bridge (or improving it?) and stabilizing the 500' section of road.

The only established road goes into Stand 10 from Sylvester Road. This is an old truck road at first, but quickly becomes a skidder-only road. The ATV trail discussed above enters onto the skid road and continues through the 500' wet stretch. The continuous all-season wear and tear on the skid road by the ATV's makes this road less usable for any future DPW logging. The road is not blocked by a cable, but DPW may want to do this.

**Boundaries & Encroachment**

Locate, blaze and paint the southern, eastern and northern boundaries. Post the boundary.

No encroachment issues were discovered in the course of this work.

**Control of Interfering Vegetation**

**Control of grape vines (mechanical treatment):** None needed.

Grapes were not noted to be a problem at RM-3.

**Control of oriental bittersweet, and other, incidental, non-native invasive plants in Stands 15 & 16, at the very western end of Stand 11 (near the culvert) and on a spot basis around the northeastern part of Stand 11).**

First, maintain maximum shade by not cutting overstory trees. Second, follow the initial practice indicated below. Third, if feasible and if needed, follow the complete regimen listed above for stands ranked 3. Continue to monitor the response of bittersweet and other non-native vegetation.

•**Winter, Year 1 (dormant season):** cut-stump herbicide application to invasive plants and interfering vegetation using Garlon 4 Ultra in basal oil. Various saws and clippers used as needed.

**Note on abutting DPW lands:** The cluster of DPW parcels (RM 2, RM-3, RM-4 and RM-5) centered around the intersection of Kennedy, Chesterfield and Sylvester Roads has numerous areas that are infested with seed-bearing oriental bittersweet. Any effort to

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

control bittersweet in any one of these areas will be much more effective if this entire area is regarded as, and treated as, a single infestation. Otherwise, the bittersweet in untreated areas can continue to seed in to treated areas.

The bittersweet infestation in the southern part of RM-10 is close enough to Stand 16 and parts of Stand 15 to serve as a potential seed source. The effectiveness of bittersweet control efforts in these areas will be improved if bittersweet is also controlled.

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**MANAGEMENT PRACTICES**  
to be done within next 10 years

**Overview of harvesting: RM-3 Sylvester Farm East**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
10	OH	selection	18.0	35	31	52	2013 /15
11	SS	N/A	0.0	0.0	0.0	0.0	N/A
13	RP	shelterwood	1.7	154	35	7	2013 /15
14	WH	Selection	2.8	57	11	15	2013 /15
15	WP	N/A	0.0	0.0	0.0	0.0	N/A
16	RP	N/A	0.0	0.0	0.0	0.0	N/A
			22.5		77	75	

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**MANAGEMENT PRACTICES**  
to be done within next 10 years

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
10	OH	selection	18.0	35	31	52	2013 /15

**Practice purpose (how it helps create desired future condition)**

This practice will improve forest structure by creating a new age class and providing early successional habitat. At the same time, this practice will improve the growth and vigor of selected trees.

**Trees to be removed & retained (types, conditions, sizes):** In openings (totaling roughly 5 – 8 acres), most overstory trees would be removed. In thinning areas, competitors of well-formed trees would be removed — trees to cut would tend to be birches, ash, and red maple, trees to keep would tend to be oaks and hickories.

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** None.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 2. The Stand is ranked 2, but this area is ranked 1. As a general precaution against bittersweet and grapes, this area should be monitored post-harvest to detect and control any possible establishment of bittersweet and/or grapes as early as possible.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided.

**Special access considerations (erosion, access, timing, cultural, etc.):** Access to this area from DPW road frontage on Sylvester or Chesterfield Roads is very difficult (long, steep, wet). This harvest is probably only feasible if an abutter gives permission for access. The abutter directly to the east might be the best place to start.

**Special equipment/logging-system considerations:** Any system that can adequately protect the ground/soil and residual stand is acceptable.

**Special boundary considerations:** The boundaries should be blazed and painted.

**Special habitat improvements (anything particular to accomplish):** Retain large coarse woody debris and snags in any openings to the extent possible.

**Special habitat protection considerations (anything particular to protect):** None.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** None.

**Special cultural resource considerations:** None.

**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
13	RP	shelterwood	1.7	154	35	7	2013 /15

**Practice purpose (how it helps create desired future condition)**

This practice will improve forest structure by replacing a declining red pine stand with a new age class of native hardwoods while providing early successional habitat.

**Trees to be removed & retained (types, conditions, sizes):** Most red pines and scattered other overstory trees would be removed.

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** None.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 1. As a general precaution against bittersweet and grapes, this area should be monitored post-harvest to detect and control any possible establishment of bittersweet and/or grapes as early as possible.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided.

**Special access considerations (erosion, access, timing, cultural, etc.):** Access to this area from DPW road frontage on Sylvester Road is easy, but the landing area is directly in the public view and it will be important to make the landing area look as neat as possible.

**Special equipment/logging-system considerations:** Any system that can adequately protect the ground/soil and residual stand is acceptable. In order to minimize the amount of red pine slash, a whole-tree chipping system, or some other system that can remove tops, is preferable.

**Special boundary considerations:** The cutting area is not near any boundary (other than Sylvester Road).

**Special habitat improvements (anything particular to accomplish):** Retain large coarse woody debris and snags to the extent possible, but not of red pine.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Special habitat protection considerations (anything particular to protect):** leave a 100'-no-cut-buffer around the roadside vernal pools (in Stand 13 & 14).

**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** None.

**Special cultural resource considerations:** None.

**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
14	WH	Selection	2.8	57	11	15	2013 /15

**Practice purpose (how it helps create desired future condition)**

This practice will improve the vigor of the native white pine overstory by reducing competition among trees.

**Trees to be removed & retained (types, conditions, sizes):** Most trees to be removed are poorly-formed white pines (pulp & timber). Conversely, Most trees to be retained are well-formed white pines or, alternatively, very vigorous albeit poorly-formed white pines, as well as most hardwoods.

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** None.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 1. As a general precaution against bittersweet and grapes, this area should be monitored post-harvest to detect and control any possible establishment of bittersweet and/or grapes as early as possible.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided.

**Special access considerations (erosion, access, timing, cultural, etc.):** Access to this area from DPW road frontage on Sylvester Road is easy, but the landing area is directly in the public view and it will be important to make the landing area look as neat as possible.

**Special equipment/logging-system considerations:** Any system that can adequately protect the ground/soil and residual stand is acceptable.

**Special boundary considerations:** The cutting area is not near any boundary (other than Sylvester Road).

**Special habitat improvements (anything particular to accomplish):** Retain large coarse woody debris and snags to the extent possible.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Special habitat protection considerations (anything particular to protect):** leave a 100'-no-cut-buffer around the roadside vernal pools (in Stand 13 & 14).

**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** None.

**Special cultural resource considerations:** None.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Recommended Management 2013-2023**

**RM-4 Upper Reservoir:**

**Trails/Roads/Drainage**

The unauthorized ATV trail through this stand (see Forest Stand & Boundary Map and also Stand Descriptions) should be closed and posted, including blocking access points off Marble Road and Kennedy Road. The ford through Marble Brook should be blocked. Durable drainage (sturdy waterbars) should be installed at various points on the trail (this trail should be kept usable for future DPW purposes).

Ensure that DPW has a key to any lock used to close off Marble Road (DPW ownership of this road appears to be to the centerline).

**Boundaries & Encroachment**

Locate, (re-)blaze and (re-)paint the northern boundary. Post the boundary.

Continue to address the usage of the sugarbush in the northeast corner of RM-4 (Stand 7)

Also, address the area of mowed grass in the northeast corner (also Stand 7 – see Stand Descriptions).

**Control of Interfering Vegetation**

**Control of grape vines (mechanical treatment):**

These are distributed irregularly throughout RM-4. See Stand Descriptions

**Control of oriental bittersweet, and other, incidental, non-native invasive plants in Stands 5, 6 & 7, and on a spot basis in Stand 8).**

First, maintain maximum shade by not cutting overstory trees in Stands 5, 6 & 7. Second, follow the initial practice indicated below. Third, if feasible and if needed, follow the complete regimen listed above for stands ranked 3. Continue to monitor the response of bittersweet and other non-native vegetation.

•Winter, Year 1 (dormant season): cut-stump herbicide application to invasive plants and interfering vegetation using Garlon 4 Ultra in basal oil. Various saws and clippers used as needed.

**Note on abutting DPW lands:** The cluster of DPW parcels (RM 2, RM-3, RM-4 and RM-5) centered around the intersection of Kennedy, Chesterfield and Sylvester Roads has numerous areas that are infested with seed-bearing oriental bittersweet. Any effort to control bittersweet in any one of these areas will be much more effective if this entire

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***MANAGEMENT PRACTICES***  
*to be done within next 10 years*

area is regarded as, and treated as, a single infestation. Otherwise, the bittersweet in untreated areas can continue to seed in to treated areas.

**MANAGEMENT PRACTICES**  
to be done within next 10 years

**Overview of harvesting: RM-4 Upper Reservoir**

**RM-4 Upper Reservoir**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
5	WH	N/A	0.0	0.0	0.0	0.0	N/A
6	RP	N/A	0.0	0.0	0.0	0.0	N/A
7	RP	N/A	0.0	0.0	0.0	0.0	N/A
8	RP	shelterwood	1.0	153	11	9	2013 /15
			1.0		11	9	

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
8	RP	shelterwood	1.0	153	11	9	2013 /15

**Practice purpose (how it helps create desired future condition)**

This practice will improve forest structure by replacing a declining red pine stand with a new age class of native hardwoods while providing early successional habitat.

**Trees to be removed & retained (types, conditions, sizes):** All red pines and scattered other overstory trees would be removed.

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** None.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 2. As a general precaution against bittersweet and grapes, this area should be monitored prior to any harvest, and post-harvest to detect and control any possible establishment of bittersweet and/or grapes as early as possible.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided.

**Special access considerations (erosion, access, timing, cultural, etc.):** Access to this area from DPW road frontage on Chesterfield Road is tight and awkward, and the landing area is directly in the public view, so it will be important to make the landing area look as neat as possible.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Special equipment/logging-system considerations:** Any system that can adequately protect the ground/soil and residual stand is acceptable. In order to minimize the amount of red pine slash, a whole-tree chipping system, or some other system that can remove tops, is preferable. Because many trees are close to the road, a mechanical harvesting system that can grip trees is preferred.

**Special boundary considerations:** The cutting area is not near any boundary (other than Chesterfield Road).

**Special habitat improvements (anything particular to accomplish):** None.

**Special habitat protection considerations (anything particular to protect):** None.

**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** None.

**Special cultural resource considerations:** None.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Recommended Management 2013-2023**  
**RM-5 Kennedy Road East:**

**Trails/Roads/Drainage**

The unauthorized ATV trail through this stand (see Forest Stand & Boundary Map and also Stand Descriptions) should be closed and posted, including blocking access points off Kennedy Road and at the northern boundary.

**Boundaries & Encroachment**

Locate, (re-)blaze and (re-)paint the northern boundary. Post the boundary.

**Control of Interfering Vegetation**

**Control of grape vines: All stands (mechanical treatment):**

These are distributed irregularly throughout RM-5. See Stand Descriptions

**Control of oriental bittersweet, honeysuckle, and other, incidental, non-native invasive plants in Stand 17:**

The situation here is difficult because the first principle of maintaining maximum shade by not cutting overstory trees is being rapidly undermined by mortality processes in the overstory. To a certain extent, the ongoing mortality fuels more mortality (as beetle population use dying and dead trees to feed and breed). For this reason, salvage harvesting is being recommended (below). In conjunction with this, follow the initial practice indicated below. Third, if feasible and if needed, follow the complete regimen listed above for stands ranked 3. Further treatment will most likely be needed as bittersweet (and grapes) respond to the disturbance of logging. Continue to monitor the response of bittersweet and other non-native vegetation.

•Winter, Year 1 (dormant season): cut-stump herbicide application to invasive plants and interfering vegetation using Garlon 4 Ultra in basal oil. Various saws and clippers used as needed.

**Note on abutting DPW lands:** The cluster of DPW parcels (RM 2, RM-3, RM-4 and RM-5) centered around the intersection of Kennedy, Chesterfield and Sylvester Roads has numerous areas that are infested with seed-bearing oriental bittersweet. Any effort to control bittersweet in any one of these areas will be much more effective if this entire area is regarded as, and treated as, a single infestation. Otherwise, the bittersweet in untreated areas can continue to seed in to treated areas.

**MANAGEMENT PRACTICES**  
to be done within next 10 years

**Overview of harvesting: RM-5 Kennedy Road East:**

**RM-5 Kennedy Road East**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
17	RP	shelterwood	9.8	131	84	85	2013 /15
			9.8		84	85	

**Practice purpose (how it helps create desired future condition)**

The practice is an irregular shelterwood that will improve forest conditions by salvaging living, dying and dead red pine in suitable areas (on ca. 50% of the acreage) and will improve forest structure by replacing declining red pine with a new age class of native hardwoods while providing early successional habitat. In the event that the City creates a temporary sediment basin (see Overview section of this Forest Stewardship Plan) in part of this stand (which will destroy existing regeneration), the site will be re-planted following removal of the basin. Species to plant have not been determined, but will not include red pine.

**Trees to be removed & retained (types, conditions, sizes):** All red pines (whether living, dead, timber, or pulp) in harvest areas would be removed; to the extent feasible, all hardwoods (saplings, poles and overstory trees) would be retained.

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** None.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 3. Normally, areas ranked 3 are not suitable for silviculture. This is an exception (see discussion in Stand Descriptions). Bittersweet, honeysuckle and grapes should be treated prior to harvest and post-harvest. See description of treatment above.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided. Ideally, snow cover will prevent equipment from scarifying leaf litter.

**Special access considerations (erosion, access, timing, cultural, etc.):** Access to this area from DPW road frontage on Kennedy Road straightforward, but access off Chesterfield Road is tight and awkward. All activity is directly in the public view, so it will be important to make the job and landing areas look as neat as possible.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Special equipment/logging-system considerations:** Any system that can adequately protect the ground/soil and residual stand is acceptable. In order to minimize the amount of red pine slash, a whole-tree chipping system, or some other system that can remove tops, is preferable. Because many trees are close to the road, a mechanical harvesting system that can grip trees is preferred.

**Special boundary considerations:** The cutting area is not near any boundary (other than town roads).

**Special habitat improvements (anything particular to accomplish):** None.

**Special habitat protection considerations (anything particular to protect):** Protect overstory black cherry seed source.

**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** None.

**Special cultural resource considerations:** None.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Recommended Management 2013-2023**  
**RM-6 Reservoir Road West:**

**Trails/Roads/Drainage**

No issues were noted during the preparation of this plan.

**Boundaries & Encroachment**

The boundary is not presently marked but it does not seem practical or necessary to do so for any forestry purpose. However, the City may want to inspect the boundary from time to time to ensure that the agricultural activity to the west of this stand does not encroach.

**Control of Interfering Vegetation**

**Control of grape vines: Stand 25 (mechanical treatment):**

Cut any large grape vines.

**Control of bush honeysuckle, oriental bittersweet, and other, incidental, non-native invasive plants in Stand 25:**

First, maintain maximum potential shade by not cutting any overstory trees. Second, follow the initial practice indicated below. This may be difficult due to restrictions on use of herbicides. If chemical control is not feasible, mechanical control (cutting) may be better than no control. Third, if feasible and if needed, follow the complete regimen listed above for stands ranked 3. Continue to monitor the response of bittersweet and other non-native vegetation.

•Winter, Year 1 (dormant season): cut-stump herbicide application to invasive plants and interfering vegetation using Garlon 4 Ultra in basal oil. Various saws and clippers used as needed.

**Overview of harvesting: RM-6 Reservoir Road West:** None.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Recommended Management 2013-2023**  
**RM-7, 8 & 9 Middle & Lower Reservoirs:**

**Trails/Roads/Drainage**

An ATV trail that crosses two streams (see Forest Stand & Boundary Map) should be closed. Ideally, the stream crossings should be barricaded with woody debris. There was evidence of horseback riding. This did not seem to be causing any problems. Marking and posting the boundaries (see below) may be sufficient to discourage ongoing trail use. There is an established woods road through Stand 24. The status and use of this road should be clarified. If DPW obtains permission from the abutter (to Stand 24) for logging access (see below), this is the road that would lead to the landing.

**Boundaries & Encroachment**

Locate, blaze and paint the northern, western and southern boundaries. Post the boundary. Address ATV trail (see above).

**Control of Interfering Vegetation**

**Control of grape vines:** None.

There does not seem to be a realistic way to control grape vines in the problem-area of Stand 23. Other areas did not have a problem.

**Control of oriental bittersweet, and other, incidental, non-native invasive plants in Stand 22 & 24:**

In Stand 22, adequate control may be obtained by hand-pulling. Barberry and multiflora rose from the lower part of the southern stream.

In Stand 24, the beginnings of a bittersweet infestation should be curtailed with control control. This treatment would involve a few vines within a limited area using the following method:

•Winter, Year 1 (dormant season): cut-stump herbicide application to invasive plants and interfering vegetation using Garlon 4 Ultra in basal oil. Various saws and clippers used as needed.

The area should be monitored following treatment to detect any need for further control.

**MANAGEMENT PRACTICES**  
to be done within next 10 years

**Overview of harvesting: RM-7, 8 & 9**  
**Middle & Lower Reservoirs:**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
22	WH	thinning	8.0	30	15.0	15.0	2013 /15
23	RP	N/A	0.0	0	0.0	0.0	N/A
24	WH	thinning	1.5	70	4	15	2013 /15
			9.5		19	30	

In the interest of promoting forest vigor, two very limited harvests are proposed below. However, these may be too small and difficult to accomplish. One way to partially overcome the size limitation might be to lump all the Roberts Meadow red pine harvests together into a larger harvest.

**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
22	WH	thinning	8.0	30	15.0	15.0	2013 /15

**Practice purpose (how it helps create desired future condition)**

This practice will improve vigor in selected trees (mainly white pine and red oak).

**Trees to be removed & retained (types, conditions, sizes):** In the immediate vicinity of selected trees, competitors would be removed (typically white pine or hemlock of lower quality or oak of firewood or low-grade timber quality. Well-formed pines, hemlocks and oaks would be retained.

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** None.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 1. Several barberry and multiflora rose bushes at the end of the southern stream could be pulled. Even if they are not, this will not effect this harvest, which will not go near the stream.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided.

**Special access considerations (erosion, access, timing, cultural, etc.):** There is no realistic access to this stand from DPW-owned road frontage. One possibility would be to ask permission from an abutter on Kennedy Road.

**Special equipment/logging-system considerations:** Any system that can adequately protect the ground/soil and residual stand is acceptable. A hand-felling, cable-skidder operator could do this job.

**Special boundary considerations:** The boundaries should be blazed and painted.

**Special habitat improvements (anything particular to accomplish):** None.

**Special habitat protection considerations (anything particular to protect):** Retain current coarse woody debris.

**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** None.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Special cultural resource considerations:** None.

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**MANAGEMENT PRACTICES**  
to be done within next 10 years

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
24	WH	thinning	1.5	70	4	15	2013 /15

**Practice purpose (how it helps create desired future condition)**

This practice will improve vigor in selected trees (mainly white pine).

**Trees to be removed & retained (types, conditions, sizes):** In the immediate vicinity of selected trees, competitors would be removed (typically white pine). Well-formed pines would be retained.

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** None.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 2. The bittersweet mentioned above is not in the immediate vicinity of the area to be thinned. Even if it is not controlled as recommended, this will not effect this harvest, which will not go near the stream.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided.

**Special access considerations (erosion, access, timing, cultural, etc.):** Because the strip of land to be thinned is so narrow, it may be necessary to get permission to have the landing on abutting land to the east.

**Special equipment/logging-system considerations:** Presumably, a harvester with a fixed felling head will be necessary to safely fell the tall trees in this narrow strip with long road frontage.

**Special boundary considerations:** The boundaries should be blazed and painted.

**Special habitat improvements (anything particular to accomplish):** None.

**Special habitat protection considerations (anything particular to protect):** None.

**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** None.

**Special cultural resource considerations:** None.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

**Recommended Management 2013-2023**  
**RM-10 Reservoir Road East:**

**Trails/Roads/Drainage**

No issues were noted during the preparation of this plan other than the presence of a hiking trail from the abutting Roberts Hill Conservation Area through parts of Stand 18. This did not seem to be an ATV trail. It would be good to coordinate with the City Office of Planning and Development about this trail.

**Boundaries & Encroachment**

Locate, (re-)blaze and (re-)paint the eastern boundary. Post the boundary.

**Control of Interfering Vegetation**

**Control of grape vines: Stands 18, 19, 20 & 26 (mechanical treatment):**

These are distributed irregularly throughout RM-10. See Stand Descriptions.

**Control of oriental bittersweet, and other, incidental, non-native invasive plants in Stand 19, 20 & 26:**

First, maintain maximum shade by not cutting overstory trees in Stands 19 & 26. Second, follow the initial practice indicated below. This includes parts of Stand 20 that would be included in the harvesting described below. This may be difficult in Stand 26 and in nearby areas of other stands due to restrictions on use of herbicides. Third, if feasible and if needed, follow the complete regimen listed above for stands ranked 3. Continue to monitor the response of bittersweet and other non-native vegetation.

•**Winter, Year 1 (dormant season):** cut-stump herbicide application to invasive plants and interfering vegetation using Garlon 4 Ultra in basal oil. Various saws and clippers used as needed.

**Note on abutting DPW lands:** The cluster of DPW parcels (RM 2, RM-3, RM-4 and RM-5) centered around the intersection of Kennedy, Chesterfield and Sylvester Roads has numerous areas that are infested with seed-bearing oriental bittersweet. Any effort to control bittersweet in any one of these areas will be much more effective if this entire area is regarded as, and treated as, a single infestation. Otherwise, the bittersweet in untreated areas can continue to seed in to treated areas.

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**MANAGEMENT PRACTICES**  
to be done within next 10 years

**Overview of harvesting: RM-10 Reservoir Road East:**

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
18	OH	N/A	0.0	0.0	0.0	0.0	N/A
19	WP	N/A	0.0	0.0	0.0	0.0	N/A
20	RP	shelterwood	5.2	130	77	58	2013 /15
21	RP	shelterwood	2.0	158	25	24	2013 /15
26	SS	N/A	0.0	0.0	0.0	0.0	N/A
			7.2		102	82	

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
20	RP	shelterwood	5.2	130	77	58	2013 /15

**Practice purpose (how it helps create desired future condition)**

This practice will improve forest structure by replacing operable portions of a declining red pine stand with a new age class of native hardwoods while providing early successional habitat.

**Trees to be removed & retained (types, conditions, sizes):** All red pines would be removed. To the extent possible, any other overstory or midstory trees would be retained (e.g. white pine, rd oak, hemlock).

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** None.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 2. This stand will need a minor degree of pre-harvest treatment of scattered bittersweet and minor barberry and other invasives. This area should be monitored prior following the harvest to detect and control any possible establishment of bittersweet and/or grapes as early as possible. There will probably be a need for some follow up bittersweet control.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided.

**Special access considerations (erosion, access, timing, cultural, etc.):** Access to this area from DPW road frontage on Chesterfield Road is tight and awkward, and the landing

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

area is directly in the public view, so it will be important to make the landing area look as neat as possible. One possibility would be to ask permission from the eastern abutter (Melnik) to have the landing on their land (re-using an existing landing) instead of opening a new landing on DPW land.

**Special equipment/logging-system considerations:** Any system that can adequately protect the ground/soil and residual stand is acceptable. In order to minimize the amount of red pine slash, a whole-tree chipping system, or some other system that can remove tops, is preferable. Because many trees are close to the road, a mechanical harvesting system that can grip trees is preferred.

**Special boundary considerations:** The eastern boundary (with Melnik) has been recently marked.

**Special habitat improvements (anything particular to accomplish):** None.

**Special habitat protection considerations (anything particular to protect):** Retain non-red-pine overstory trees as much as possible. If the seasonal stream has to be crossed, locate the crossing below the red maple swamp area where the drainage is well-defined.

**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** None.

**Special cultural resource considerations:** None.

**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

Stand	Type	Silviculture (harvesting)	Acres to Cut	BA to Cut	Mbf to Cut	Cords to Cut	Timing
21	RP	shelterwood	2.0	158	25	24	2013 /15

**Practice purpose (how it helps create desired future condition)**

This practice will improve forest structure by replacing a declining red pine stand with a new age class of native hardwoods while providing early successional habitat.

**Trees to be removed & retained (types, conditions, sizes):** All red pines and a few of the surrounding white pines would be removed.

**Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.):** None.

**Special invasive species considerations:** Please re-confirm severity ranking for this stand (cf. Stand Descriptions section). Stand must be ranked 1 or 2. If ranked 1, no treatment required. If ranked 2, treatment must fall within the same 12-month period as any harvesting. Stands ranked 3 or 4 are not eligible for harvesting.

Current level = 2. As a general precaution against bittersweet and grapes, this area should be monitored prior to any harvest, and post-harvest to detect and control any possible establishment of bittersweet and/or grapes as early as possible.

**Special soil considerations (erosion, seasonal timing, cultural, etc.):** Ground must be adequately dry or frozen so that rutting/compaction are avoided.

**Special access considerations (erosion, access, timing, cultural, etc.):** Access to this area from DPW road frontage on Reservoir Road is refreshingly straightforward. The landing area is directly in the public view, so it will be important to make the landing area look as neat as possible.

**Special equipment/logging-system considerations:** Any system that can adequately protect the ground/soil and residual stand is acceptable. In order to minimize the amount of red pine slash, a whole-tree chipping system, or some other system that can remove tops, is preferable. Because some trees are close to the road, a mechanical harvesting system that can grip trees is preferred.

**Special boundary considerations:** The cutting area is not near any boundary.

**Special habitat improvements (anything particular to accomplish):** None.

**Special habitat protection considerations (anything particular to protect):** None.

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**MANAGEMENT PRACTICES**  
*to be done within next 10 years*

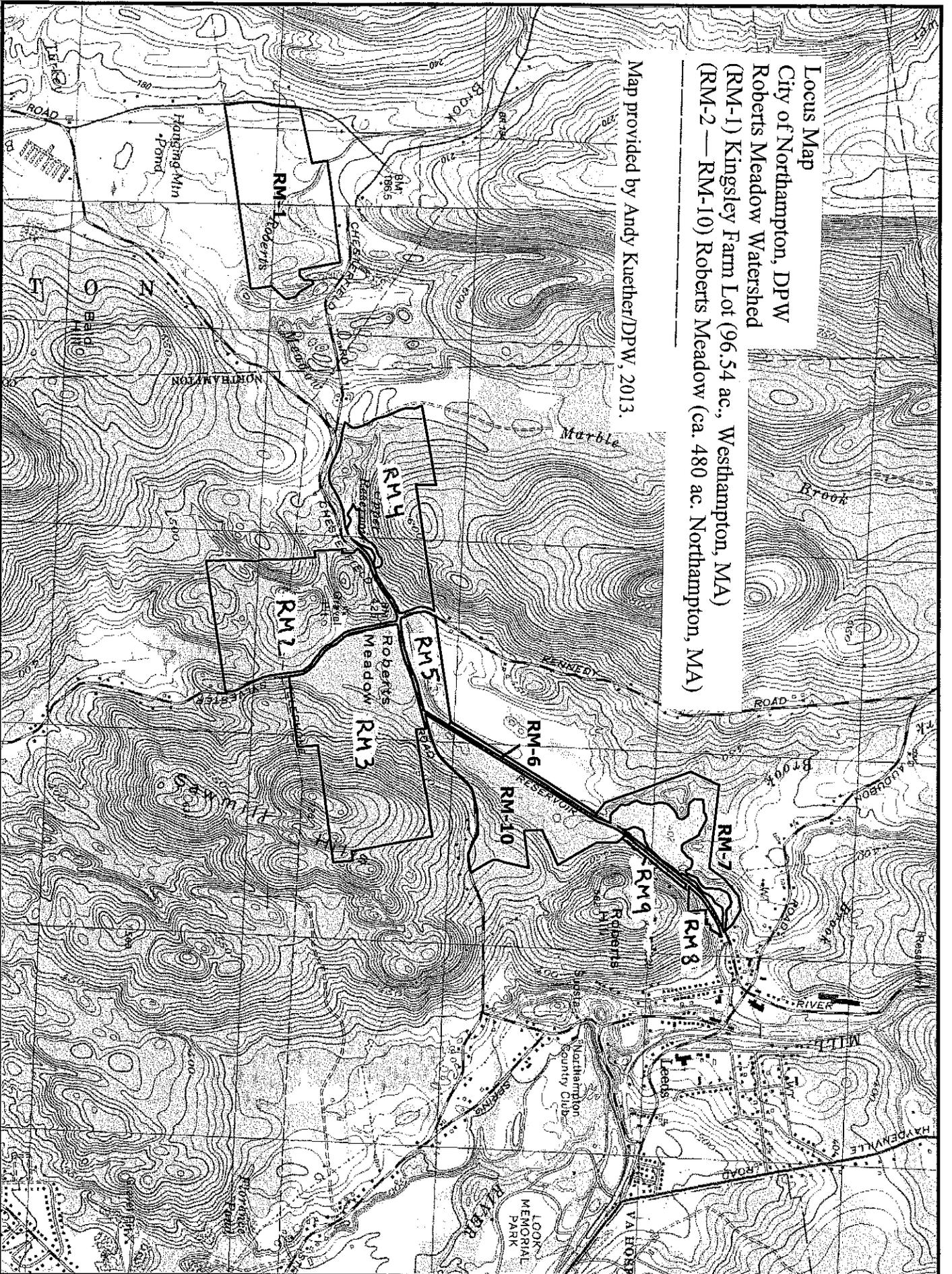
**Special trail/recreational considerations (anything particular to accomplish or avoid/protect):** None.

**Special cultural resource considerations:** None.

Locus Map

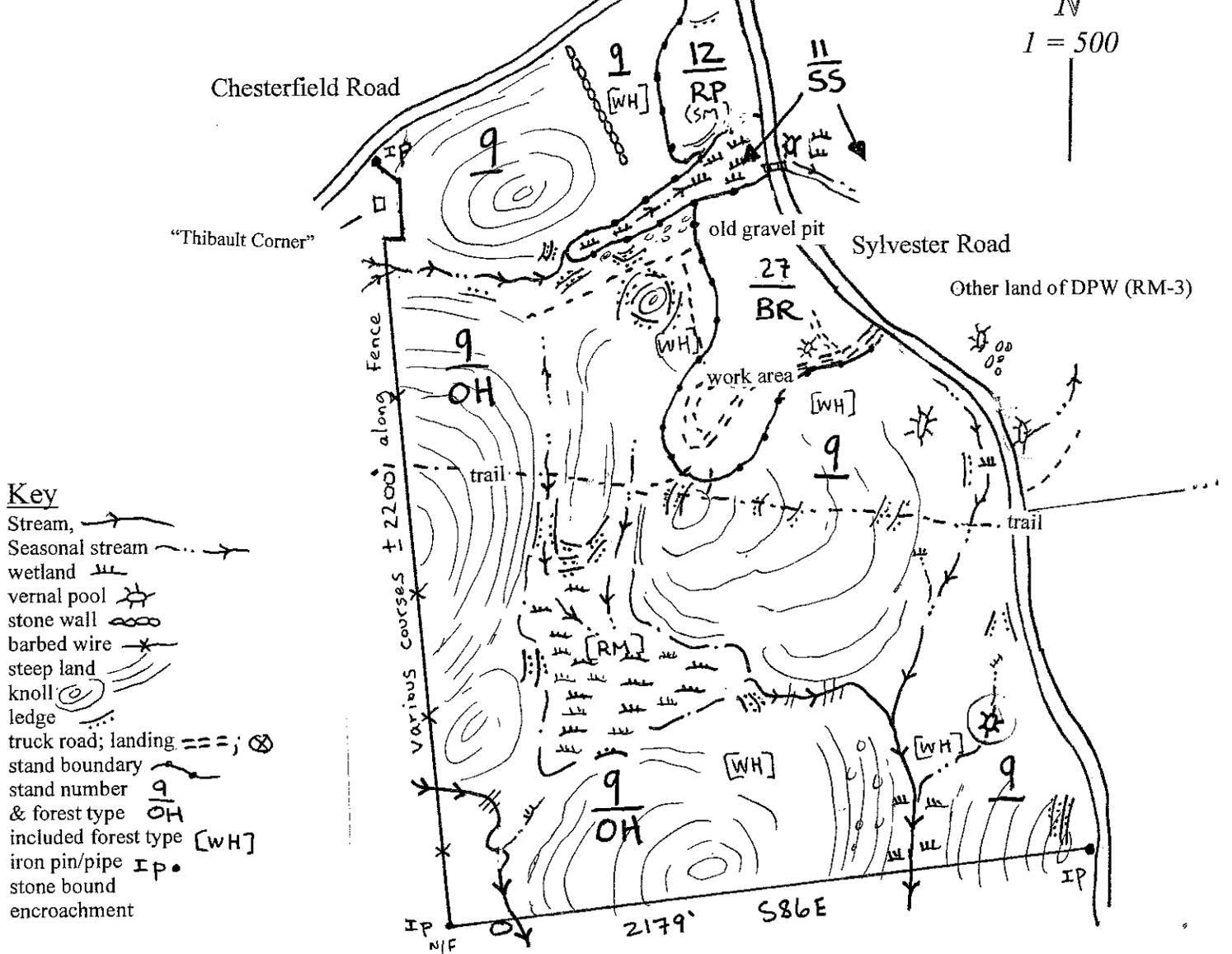
City of Northampton, DPW  
Roberts Meadow Watershed  
(RM-1) Kingsley Farm Lot (96.54 ac., Westhampton, MA)  
(RM-2 — RM-10) Roberts Meadow (ca. 480 ac. Northampton, MA)

Map provided by Andy Kueher/DPW, 2013.



Forest Stand and Boundary Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 105.98 acres (Assessors')  
 Northampton, MA

"Sylvester Farm West" (RM-2)



Main Type Key

- OH – oak & hardwoods
- RP (SM) – planted red pine with sugar maple understory
- BR – brush
- SS – Shrub swamp

Included Types

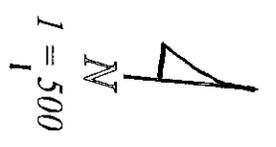
- WH – white pine & hardwoods
- RM – red maple /shrub swamp

Map by Michael Mauri, L.F. 4/2013  
 20 West St. S. Dfld., MA 01373  
 (413) 665-6829 based on tax map,  
 various GIS views provided by Andy Kuether/DPW,  
 previous map by Karl Davies (1987),  
 surveys (Pin BK 175 Pg 50,  
 Pin BK 183 Pg 161,  
 Pin BK 179 Pg 69 and fieldwork, winter, 2013.  
 Metes & bounds from above sources.

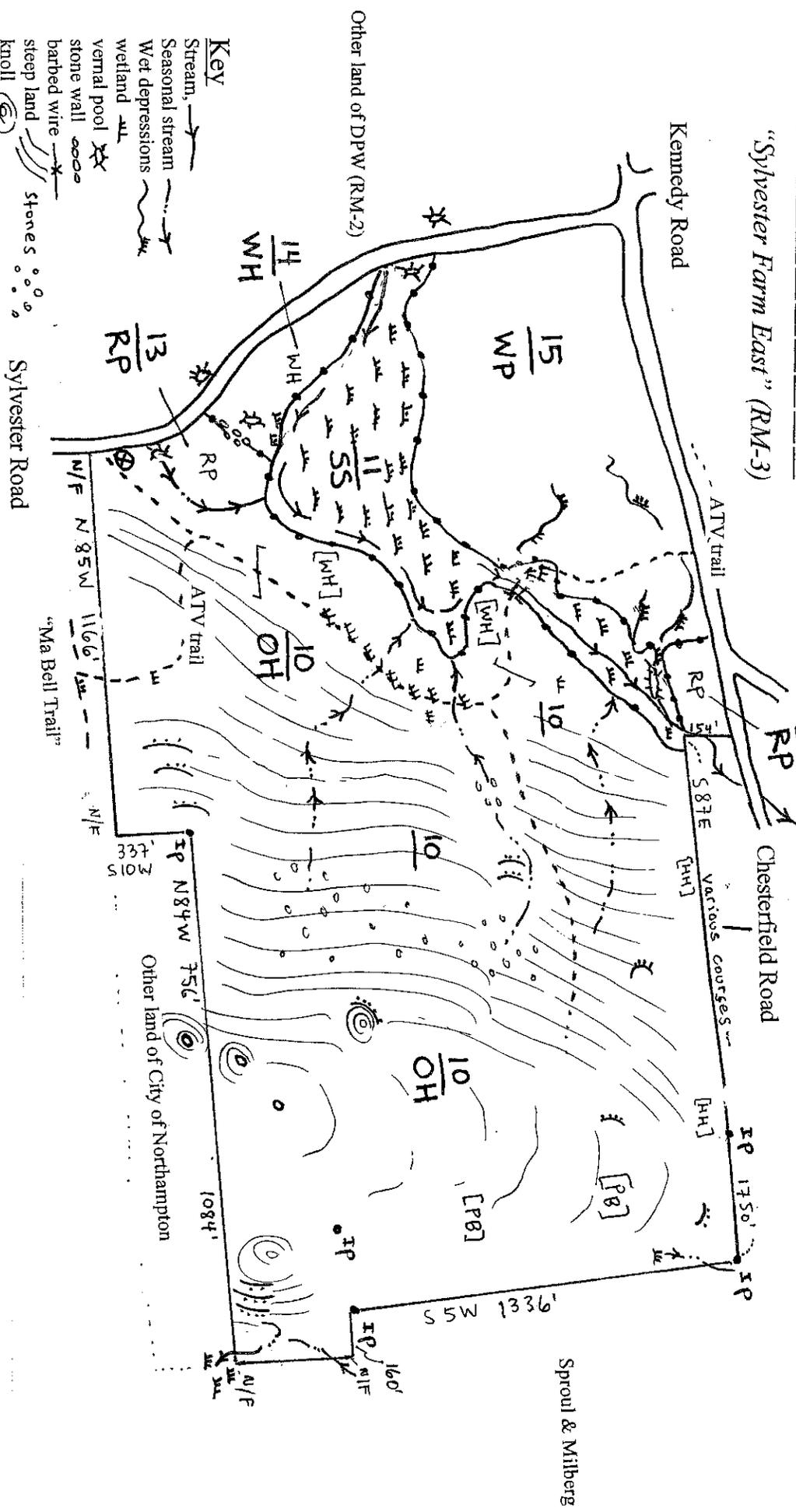
Forest Stand and Boundary Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 134.85 acres (Assessors')  
 Northampton, MA

"Sylvester Farm East" (RM-3)

Reservoir Road



Map by Michael Mauri, L.F. 4/2013  
 20 West St. S. DfId., MA 01373  
 (413) 665-6829 based on tax map,  
 various GIS views provided by Andy Kuehner/DPW,  
 an old survey of "Sylvester Farm" on file with DPW  
 (pg. 22), a previous map by Karl Davies (1987),  
 and fieldwork, winter, 2013.  
 Metes & bounds from above sources.



Sproul & Milberg

- Key**
- Stream, →
  - Seasonal stream →
  - Wet depressions →
  - wetland →
  - vernal pool →
  - stone wall →
  - barbed wire →
  - steep land →
  - knoll →
  - truck road; landing →
  - stand boundary →
  - stand number 10
  - & forest type OH
  - included forest type [PB]
  - iron pin/pipe IP
  - Not Found N/F

- Main Type Key**
- OH - oak & hardwoods
  - WH - white pine & hardwoods
  - WP - white pine plantation
  - RP - red pine plantation
  - SS - Shrub swamp/shallow marsh/red maple

- Included Types**
- WH - white pine & hardwoods
  - PB - paper birch, red maple, oak & hardwoods

175

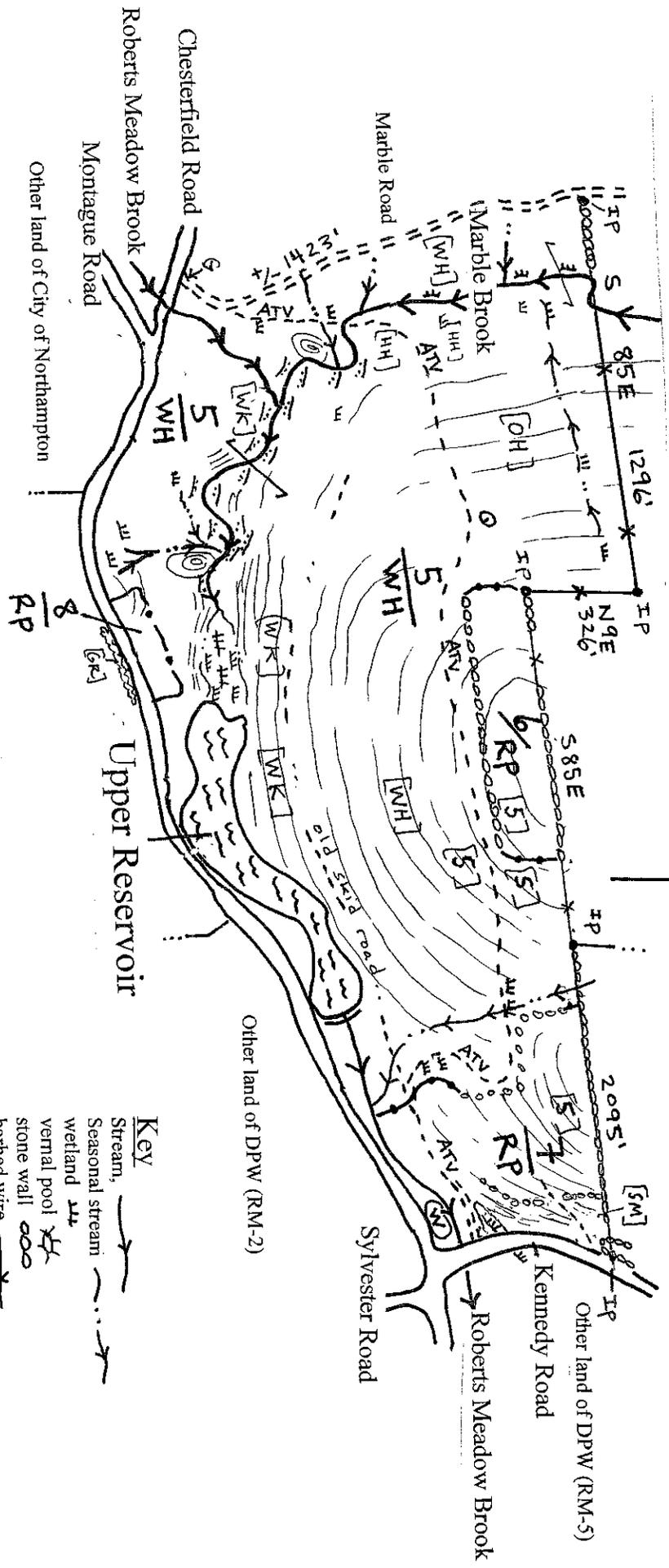
Forest Stand and Boundary Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 85.05 acres (Assessors')  
 Northampton, MA

"Upper Reservoir" (RM-4)

Marble Brook CR

1 = 500

Map by Michael Mauri, L.F. 4/2013  
 20 West St. S. Dhd., MA 01373  
 (413) 665-6829 based on tax map,  
 various GIS views provided by Andy Kuether/DPW,  
 an old survey on file with DPW (pg. 27),  
 surveys recorded at PLN BK 187 P 16 and  
 PLN BK 144 P 39 (both showing Marble Road)  
 a previous map by Karl Davies (1987),  
 and fieldwork, winter-spring, 2013.  
 Metes & bounds from above sources



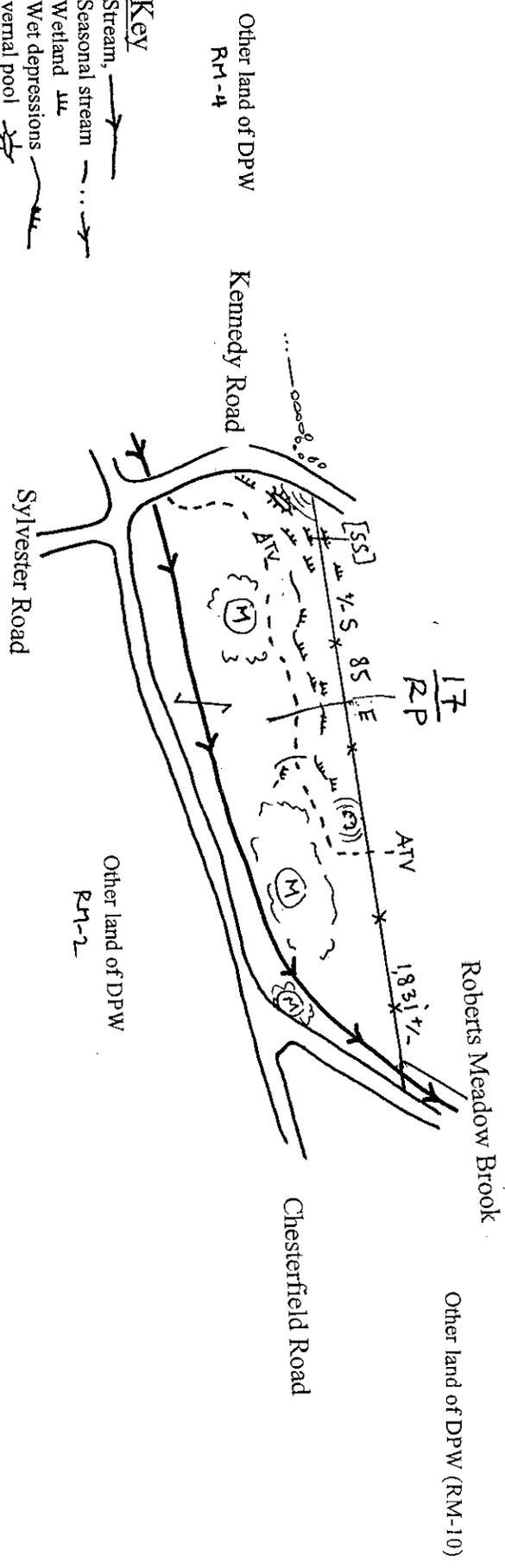
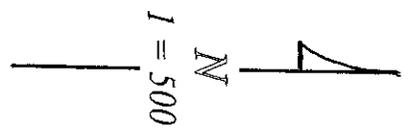
- Main Type Key**
- W/H – white pine & hardwoods
  - RP – red pine plantation
  - SS – Shrub swamp/shallow marsh/red maple

- Included Types**
- OH – oak & hardwoods
  - SM – sugar maple w/ red pine
  - WK – white pine & hemlock
  - HH – hemlock, hardwoods & white pine
  - [5] – area with invasives ranking = 5

- Key**
- Stream, →
  - Seasonal stream →
  - wetland
  - vernal pool
  - stone wall
  - barbed wire
  - steep land
  - knoll
  - ledge
  - truck road, landing
  - stand boundary
  - stand number
  - & forest type
  - included forest type
  - iron pin/pipe
  - gate or cable
  - construction trailers

Forest Stand and Boundary Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 19.53 acres (DPW GIS)  
 Northampton, MA

"Kennedy Road East" (RM-5)



- Key**
- Stream, ———→
  - Seasonal stream - - - - -→
  - Wetland uu
  - Wet depressions ~
  - vernal pool ⊕
  - stone wall ooo
  - barbed wire x
  - steep land ⤴
  - knoll ⊖
  - old gravel excavation ⊖
  - truck road, landing ⊖
  - stand boundary —
  - stand number 17
  - & forest type RP
  - included forest type [SS]
  - iron pin/pipe ±p.
  - ATV trail ATV
  - concentration of red pine mortality (M)

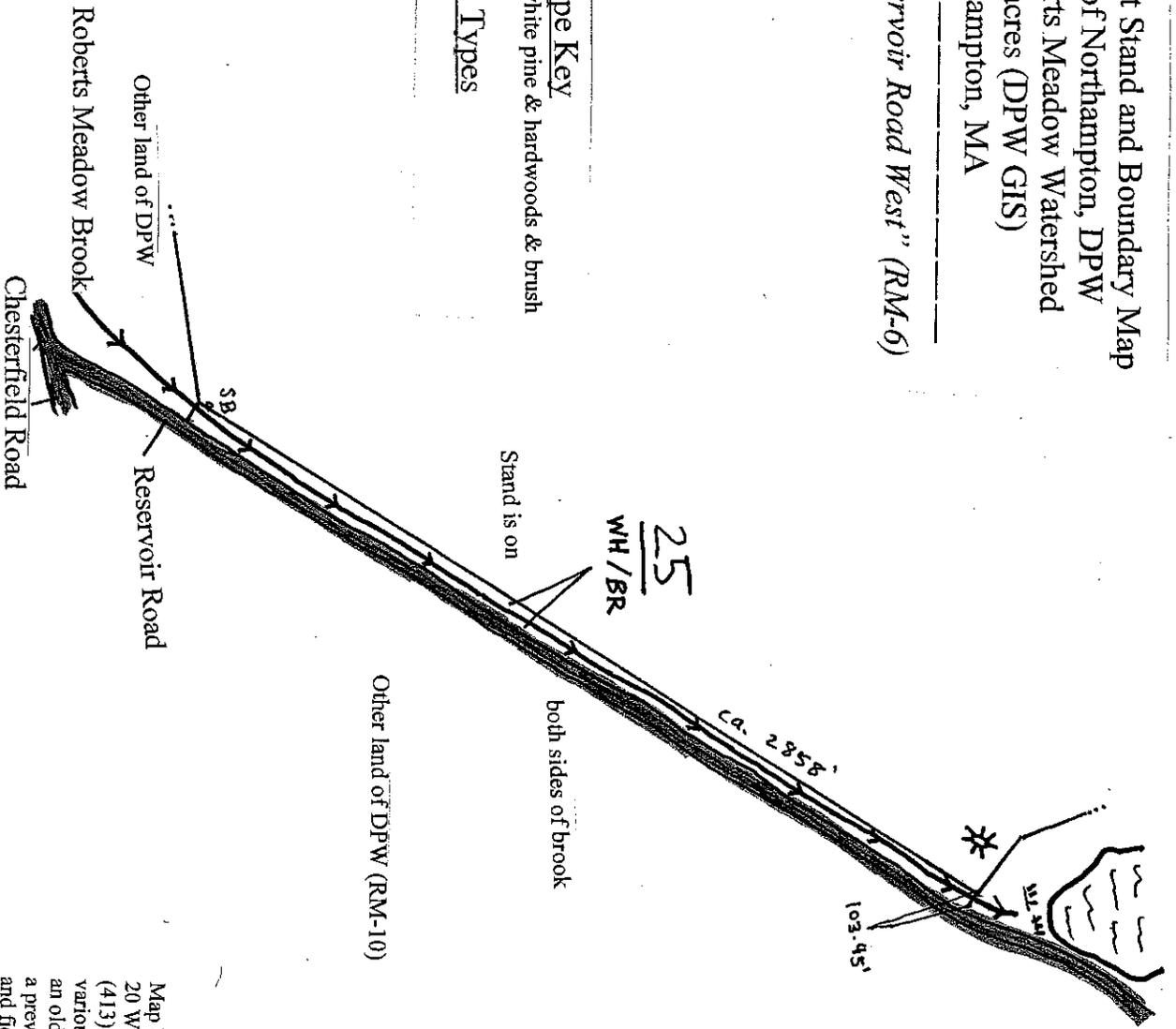
- Main Type Key**
- RP – red pine plantation
- Included Types**
- SS – Shrub swamp/shallow marsh

Map by Michael Mauri, L.F. 4/2013  
 20 West St. S. Dfhd., MA 01373  
 (413) 665-6829 based on tax map,  
 various GIS views provided by Andy Kuether/DPW,  
 an old survey on file with DPW (pg. 22),  
 a previous map by Karl Davies (1987),  
 and fieldwork, winter-spring, 2013.  
 Metes & bounds from above sources

# Middle Reservoir

Forest Stand and Boundary Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 3.71 acres (DPW GIS)  
 Northampton, MA

"Reservoir Road West" (RM-6)



**Main Type Key**  
 WH/BR - white pine & hardwoods & brush

**Included Types**  
 None

**Key**

- Stream,
- Seasonal stream
- wetland
- vernal pool
- stone wall
- barbed wire
- steep land
- knoll
- stones
- stand boundary
- stand number
- & forest type
- included forest type [5M]
- iron pin/pipe I.P.

Map by Michael Mauri, L.F. 4/2013  
 20 West St. S. DfId., MA 01373  
 (413) 665-6829 based on tax map,  
 various GIS views provided by Andy Kueher/DPW,  
 an old survey on file with DPW (pg. 22),  
 a previous map by Karl Davies (1987),  
 and fieldwork, winter-spring, 2013.  
 Metes & bounds from above sources  
 or estimated

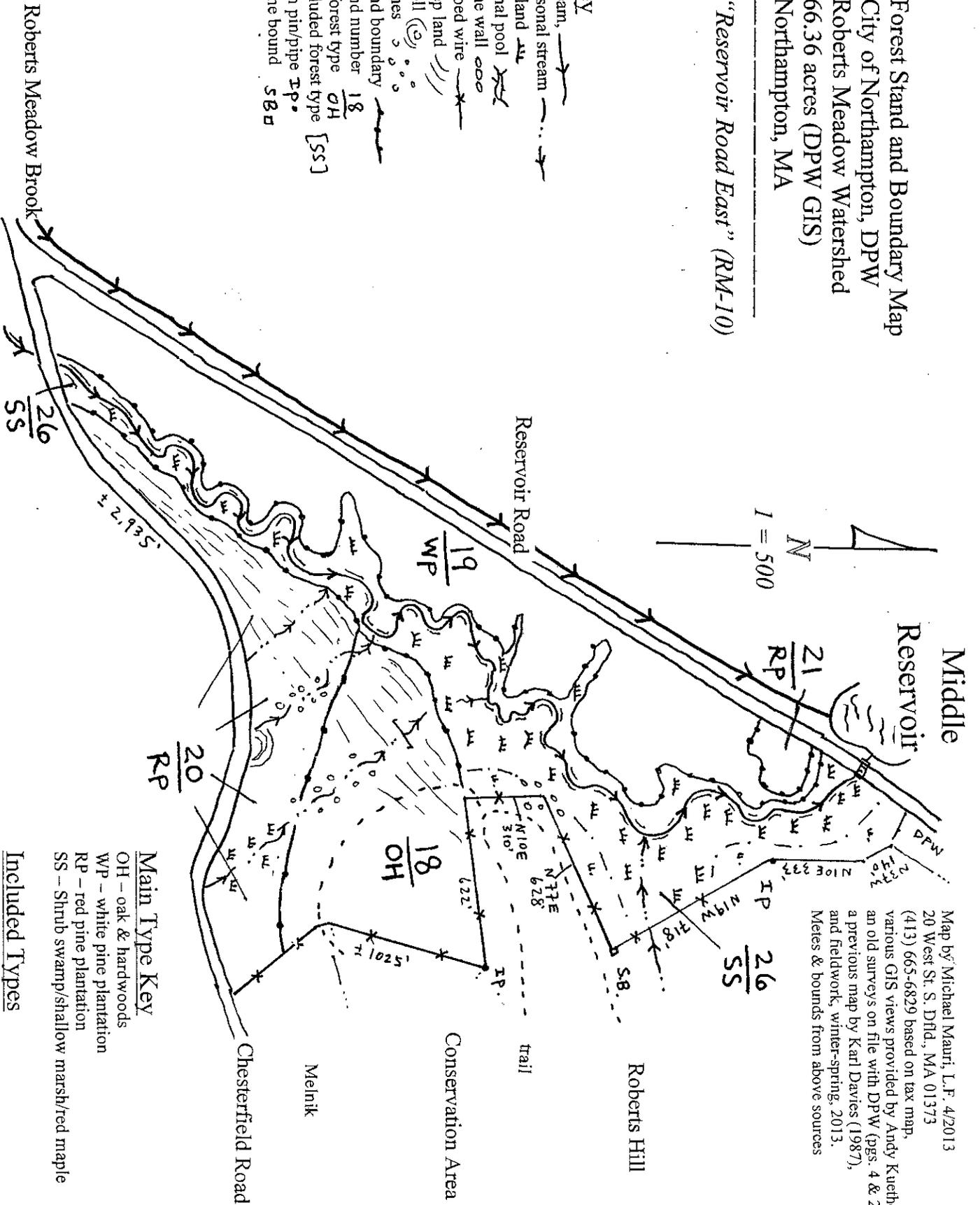


Forest Stand and Boundary Map  
 City of Northampton, DPW  
 Roberts Meadow Watershed  
 66.36 acres (DPW GIS)  
 Northampton, MA

"Reservoir Road East" (RM-10)

Key

- Stream, 
- Seasonal stream 
- wetland 
- vernal pool 
- stone wall 
- barbed wire 
- steep land 
- knoll 
- stones 
- stand boundary 
- stand number 18 
- & forest type OH 
- included forest type [SS] 
- iron pin/pipe IP 
- stone bound SB 



Map by Michael Mauri, L.F. 4/2013  
 20 West St. S. DHD, MA 01373  
 (413) 665-6829 based on tax map,  
 various GIS views provided by Andy Kuehler/DPW,  
 an old survey on file with DPW (pgs. 4 & 22),  
 a previous map by Karl Davies (1987),  
 and fieldwork, winter-spring, 2013.  
 Metes & bounds from above sources

Main Type Key

- OH - oak & hardwoods
- WP - white pine plantation
- RP - red pine plantation
- SS - Shrub swamp/shallow marsh/red maple

Included Types

none

**Signature Page** Please check each box that applies.

**CH. 61/61A Management Plan** I attest that I am familiar with and will be bound by all applicable Federal, State, and Local environmental laws and /or rules and regulations of the Department of Conservation and Recreation. I further understand that in the event that I convey all or any portion of this land during the period of classification, I am under obligation to notify the grantee(s) of all obligations of this plan which become his/hers to perform and will notify the Department of Conservation and Recreation of said change of ownership.

**Forest Stewardship Plan.** When undertaking management activities, I pledge to abide by the management provisions of this Stewardship Management Plan during the ten year period following approval. I understand that in the event that I convey all or a portion of the land described in this plan during the period of the plan, I will notify the Department of Conservation and Recreation of this change in ownership.

**Green Certification.** I pledge to abide by the FSC Northeast Regional Standards and MA private lands group certification for a period of five years. To be eligible for Green Certification you must also check the box below.

**Tax considerations.** I attest that I am the registered owner of this property and have paid any and all applicable taxes, including outstanding balances, on this property.

Signed under the pains of perjury:

Owner(s) *Edward S. Kutz* Date 4/30/13

Owner(s) \_\_\_\_\_ Date \_\_\_\_\_

I attest that I have prepared this plan in good faith to reflect the landowner's interest.

Plan Preparer *[Signature]* Date 4-29-13

I attest that the plan satisfactorily meets the requirements of CH61/61A and/or the Forest Stewardship Program.

Approved, Service Forester *Sam Aybey* Date 5/29/13

Approved, Regional Supervisor \_\_\_\_\_ Date \_\_\_\_\_

In the event of a change of ownership of all or part of the property, the new owner must file an amended Ch. 61/61A plan within 90 days from the transfer of title to insure continuation of Ch. 61/61A classification.

Owner(s) City of Northampton Town(s) Northampton