

FOREST STEWARDSHIP PLAN  
**North Upton Open Space**  
Town of Upton

WALDEN

FOREST CONSERVATION  
June 2015

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This Forest Management Plan Fulfills Requirements of The Massachusetts’:

- Forest Stewardship Program
- Forest Stewardship Council Green Certification

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APPENDIX I  
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Glossary  
Upton Forest Management Policy



# FOREST MANAGEMENT PLAN

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

300 17 2015



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>383-10381</u>	Orig. Case No.	Owner ID <u>504026</u>	Add. Case No.	Date Rec'd <u>6-17-15</u>	Ecoregion <u>221 Ag</u>
recert. <input type="checkbox"/>	recert. <input type="checkbox"/>	recert. <input type="checkbox"/>	renew <input type="checkbox"/>	Other <input type="checkbox"/>	Plan Period <u>2016-2025</u>	Topo Name <u>Grafton</u>	Green Cert <input checked="" type="checkbox"/>	Rare Spp. Hab. <u>yes</u>	River Basin <u>Blakeslee</u>	
amend <input type="checkbox"/>	amend <input type="checkbox"/>	amend <input type="checkbox"/>	Conservation Rest. <input type="checkbox"/>	CR Holder <u>Upton</u>	<u>Marbled Salamander</u>					
Plan Change: _____ to _____										

## OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) Town of Upton  
Mailing Address Conservation Commission, 1 Main St, Upton, MA 01568 Phone 508-529-6286

Property Location: Town(s) Upton Road(s) Grafton Rd. & North St.

Plan Preparer Rupert Grantham - Walden Forest Conservation Mass. Forester License # 371  
Mailing Address P.O. Box 3371 Westport, MA 02790 Phone 508-493-3973

## 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
4	12	28308	193	22.0	0.0	0.0	0.0	22.0
5	4	47516	123	34.45	0.0	0.0	0.0	34.45
5	5	2977	278	7.44	0.0	0.0	0.0	7.44
7	27	17634	246	202.92	0.0	0.0	0.0	202.92
5	20.65	40532	220	36.57	0.0	0.0	0.0	36.57
				303.38				303.38

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

HISTORY Year acquired \_\_\_\_\_ Year management began 2015

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>none</u>						

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



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## Property Overview, Regional Significance, and Management Summary

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The North Upton Open Space (NUOS) is one of a number of forests conserved and managed by the Town of Upton. This forest is made up of 5 conserved parcels including the Warren Brook Watershed Conservation Area, The Howarth Glen Conservation Area, The Whitney Conservation Area (western parcel), and two small, unnamed open space parcels (see Meets & Bounds Map). Together these parcels total 303.38 acres, with 300.1 acres of maturing forest and a 3.3 acre field. The parcels are managed by the Upton Land Stewardship Committee, a subcommittee of the Upton Conservation Commission. Forest management is guided by the Commission's "Forest Management Policy and Guidelines" (dated June 12, 2013 – Appendix II).

Upton is a relatively rural town with much forest. Although approximately 20 percent of the town is protected open space development is threatening forest fragmentation. The North Upton Open Space is one of several large contiguously owned parcels in the town. It abuts additional conservation land in Grafton (the Pell Farm) and hundreds of acres of undeveloped privately owned land.

The Forest is roughly 100 years old. The last 100 years has seen some thinning and harvesting. Stands 7 and 18 were thinned roughly 15-20 years ago. Prior to that we see evidence of scattered thinning in a 1938 areal photo. Stonewalls are found scattered throughout the forest suggesting most of this landscape had been cleared at one time for pasture. Some of the land was mapped as forest in ca. 1830 and may have been managed over the years as a woodlot but not cleared for pasture. A large fire burned part of the area in 1935. Today the forest is healthy, maturing even-aged forest, with good access and a substantial amount of timber in the form of cordwood and sawtimber that could be removed. The timber industry is still strong in the region and management of this forest would be an important addition to the sustainably managed land-base supporting that industry, the local economy and local jobs.

The forest is characterized by tall, sawtimber-size oak. Stands 1, 7, 8 & 11, together comprising 260 of the 303.38 total acres, make up a large area of well-drained, mostly easily accessible, upland oak forest. Stand 8 supports the handsomest, tall, straight, large diameter oak, maple and other hardwoods. The western edge of stand 11 has steep slopes with interesting cliff and ledge terrain. White pine is quickly establishing itself in this hardwood forest. There are only a couple small mixed oak and pine stands now but pine regeneration is fairly wide-spread and the overall character of this forest will change dramatically in the next 50 years. Small wetland stands are found throughout the landscape adding species and habitat diversity while not adversely effecting accessibility. Warren Brook passes through the Whitney and Howarth Glen Conservation Areas, and the NUOS is drained by several intermittent tributaries of the brook.

Overall this forest is somewhat homogenous in terms of structural and biological diversity. Walking acre after acre of pure, even-aged oak makes this point. But this forest is at a turning point. It is right at the age where it will start to naturally break up, where more trees will naturally mature and decline, or succumb to disease or pests and die. As trees die, snags and canopy gaps will be created. Course woody debris on the forest floor will increase the diversity of micro site habitats. Forest gaps will provide good early-successional habitat and new young, resilient age-classes of trees.

Wetland habitats make up a small part of this forest but they are scattered throughout. Vernal pools occur on the Howarth Glen and Warren Brook Conservation Areas and several others occur nearby on adjacent privately owned property. Patches of thick pine regeneration provide a measure of winter cover for larger animals. This forest supports unbroken forest habitat for forest interior birds. The Howarth Glen Conservation Area is mapped as rare species habitat for marbled salamander. Invasive plants are uncommon, and occur mostly along field edges at the Whitney and Howarth Glen Conservation Areas. Some caterpillar herbivory was noted and this should be carefully monitored. Various combinations of the gypsy moth caterpillar, forest tent caterpillar and recently, the winter moth caterpillar, have caused and are causing significant tree and forest-wide mortality across southeastern Massachusetts.

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Owner(s) Town of Upton

Town(s) Upton



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## Property Overview, Regional Significance, and Management Summary

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Management of The North Upton Open Space will be focused on assisting this forest in its transition to a more mature, diverse and resilient multi-aged structure. The single tree and group selection method has been prescribed throughout to meet this goal. In the short term we can remove considerable volume and value while meeting this goal. Light improvement thinning will help make the healthiest trees more wind firm and provide them with room to grow. Harvested forest patches will start new cohorts of trees and provide early-successional habitat. Creating snags and intentionally leaving large-diameter coarse woody debris on the forest floor will specifically address these important components of late-successional forest while allowing for commercial harvesting. Slowly thru the combination of natural disturbances and active management that mimics natural small-scale disturbances, this even-aged forest will turn into a diverse multi-aged forest. Even-aged management techniques will be employed to maintain a component of larger, 3-5-acre, early-successional patches. Most of the larger stands will include a no-cut reserve as a way of comparing managed and unmanaged forest.

## Landowner Goals

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

Goal	Importance to Commission			
	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	
Protect Wetlands and Vernal Pools	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/Visual Buffers	X			
Improve Hunting or Fishing		X		
Preserve or Improve Scenic Beauty	X			
Protect Water Quality	X			
Protect Unique/Special/ Cultural Areas	X			
Maintain or Enhance Carbon Storage	X			
Protect/Enhance Old Growth Characteristics	X			
Identify and Protect Legacy Trees	X			

1. In your own words please describe your goals for the property:

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### 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 for long-term forest health, productivity, diversity, and quality.
2. Conserving or enhancing water quality, wetlands, soil productivity, 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):

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Christine Scott, Chair Upton Conservation Commission

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Date

## Stewardship Issues

The overarching management goal for this property is to support a maturing, diverse, multi-aged forest cover. By using techniques designed to mimic small-scale natural disturbances management will be focused on assisting the forest in this natural transition to a mature, late-successional structure. This will have a number of impacts on the forest. Revenues will be generated by the harvest of forest products. Revenues that can be used for the benefit of management, public access and long-term ecological health of this forest and other town forests; the average health and vigor and quality of trees will improve by removing poor growing stock; patch cuts will greatly improve the diversity of forest structure by fostering regeneration, and new cohorts of trees; management of forest stocking and the levels of sunlight hitting the forest floor will increase diversity of tree species; this will in turn improve habitat values and increase habitat types thereby attracting a greater number and diversity of wildlife.

### Habitats:

There are a number of general and specific habitat values provided by this property.

Habitat Types							
	Multi-aged Forest	Upland Forest	Wetland Forest	Possible Vernal Pool	Early-Successional	Forest Edge	Deeryard/winter cover
Stand 1		x	x	x			x
Stand 2	x	x					x
Stand 3			x	x	x		
Stand 4	x	x					x
Stand 5			x	x	x		
Stand 6			x	x			x
Stand 7		x			x		x
Stand 8		x	x	x			
Stand 9		x					
Stand 10		x					x
Stand 11		x					
Stand 12			x	x			
Stand 13		x					x
Stand 14			x	x			
Stand 15			x				
Stand 16	x		x	x		x	
Stand 17	x	x					x
Stand 18		x	x	x		x	

### Forest Age Structure:

Most stands on this property are around 100 years in age and are even-aged. This forest is dramatic in the large acreage of relatively similar and relatively homogeneous upland oak forest. Most stands if not all are replacement forests, having become established on abandoned pasture. Most of the stands supporting some multi-aged forest characteristics are stands that have seen some thinning in the past. Stands 2 and 4 were thinned approximately 80 years ago. The residual stand from that thinning, along with the new cohorts of trees that have become established in the last 80 years, have given those stands increased structural diversity. Stands 7 and 18, saw some thinning in the last 15-20 years and show more

of a 2-aged structure. As these stands mature over the next few decades those age-classes will mature and new age-classes will naturally become established and can be encouraged through further thinning.

**Even-aged** forests are defined as having two or less established age-classes. **Uneven-aged** or **multi-aged** is defined as three or more established age-classes. **Even-aged forest** habitat varies depending on the forest type and region. Even-aged forests are generally young (under 100 years) and have grown up from abandoned field or from a large-scale disturbance like clear-cutting, crown fires or hurricane winds. General habitat amenities include large living trees and some dead standing trees with dens and cavities for nesting and feeding, and a number of hard and soft mast producers in the overstory, midstory and understory. Vertical diversity, created by the different living and feeding levels, is somewhat limited by the even-aged structure of the overstory, and the corresponding limit to tree age-classes. **Multi-aged forest** habitat varies depending on the forest type and region, but is generally more diverse than even-aged forests. Multi-aged forests are generally older (>80 years), and are formed as even-aged forests start to lose trees and form gaps in the canopy. These gaps become patches of new age-classes. The development of gaps, and new age-class patches, greatly increases the vertical diversity of a forest. Habitat amenities include large living and dead trees with dens and cavities for nesting and feeding, and a number of hard and soft mast producers in the overstory, midstory and understory. The gaps provide patches of vigorous young tree, bush and herbaceous growth, and open areas for birds and bats to feed.

#### **Upland Forest Habitat:**

Upland forests can provide a number of different habitats. Habitat Types include hardwood or softwood cover, deeryard/winter cover habitat, edge and early-successional habitat. One of the most important habitats provided by uplands is **Wetland supporting habitat**. This habitat is provided by uplands that are adjacent to wetland communities. Wetlands are the critical spawning grounds for many small animals but the neighboring uplands are where most of those same creatures spend the majority of their life cycle.

#### **Wetland Forest Habitat:**

**Forest Wetlands** contain vital habitat and perform essential ecosystem functions. Wetlands can be highly variable. Most serve the function of collecting water, allowing sediments to be deposited, and promoting biological filtration of both water and sediment. Wetland also hold and process flood waters that might otherwise damage property. Wetland habitat provides spawning grounds for vast numbers of invertebrates, amphibians and reptiles. This in turn attracts many predators that feed on these creatures and their eggs.

Wetlands can be managed but only under specific conditions. Rutting and compaction of soils, as well as disruption of water flow and soil penetration are the biggest dangers when operating in wetlands. Heavy equipment should only access wetlands with an approved cutting plan and when grounds are either very dry (usually late summer months) or frozen.

#### **Possible Vernal Pool Habitat:**

**Vernal pools** are areas that hold water for at least a few months, most years. These depressions dry seasonally and cannot support fish. The lack of fish predation creates an ideal spawning ground for a number of reptiles and amphibians. Vernal pools are vital wetland habitat and can be certified with the MA Natural Heritage Program by identifying indicator species. An area would be confirmed as being a vernal pool by identification of specific indicator species.

A no-cut/no-activity buffer of at least 150 feet should be maintained around vernal pools.

### **Early-Successional Habitat:**

**Early-successional habitat** is one of the most biologically diverse types. ‘Early-successional’ refers to this cover type being among the first or youngest that could occupy a site. As trees mature and the vertical structure of the site changes, so does the essential character and habitat values of that site. Early-successional cover types are more diverse because they contain most of the tree species that will be present in later years, plus, pioneer tree species that grow fast and die-out of more mature forests, and a diversity of herbaceous, shrub and bush species.

This habitat can be managed for by implementing small group selection harvesting. Group selections a.k.a. patch cuts, implemented in conjunction with single tree selection improvement thinning, is the best way to foster mature, multi-aged forest structure.

### **Forest Edge Habitat:**

**Edge habitat**, much like early-successional habitat, is one of the most diverse types. The edge is a transitional zone between forest and comparatively open land, and contains some of the habitat values of both. Forest habitat values include full canopy cover, den, cavity, nesting, perching and dead standing trees, as well as hard mast (oak/hickory) and soft mast (black gum, cherry) production. Open land offers an abundance of light for grasses, sedges, herbaceous plants, fruiting shrubs and young regenerating tree species.

### **Deeryard/Winter Cover Habitat:**

**Winter cover** habitat is generally best in thick, young conifer stands but can be provided by American holly or just thick brush. The thick cover reduces the amount of wind and precipitation that reaches the forest floor and can maintain warmer temperatures than surrounding forest or open land. This habitat can be managed for by promoting thick softwood regeneration and is usually a byproduct of successful white pine management.

### **Late Successional or “Old Growth” Forest Characteristics:**

Habitat components that will be managed for in all stands include dead standing trees (snags) and large-diameter course woody debris (CWD). Snags provide important habitat components in the form of feeding, nesting and perching sites, and are indicative of mature forests. Specific targets for numbers of snags per acre are not available, however a baseline target of >10/acre ensures that this habitat component is present and actively contributing to the forest ecosystem. Like snags, course woody debris is indicative of mature forests. Emphasis is placed on large diameter logs. These logs rot over many years providing habitat for microbes including mycorrhizal fungi that break down woody material into nutrients, and directly assist plants in uptake of water and nutrients. Specific targets are not available but regional field evidence suggests 10 cords per acre with average diameters over 10 inches as a baseline. As much as anything, these numbers provide information, at a glance, along with tree diameters and basal area, of the relative maturity of various stands on a property.

The chart below shows the current distribution and volume of snags and CWD. The low levels of both highlights the homogeneity and structural immaturity of this forest.

	St-1	St-2	St-3	St-4	St-5	St-6	St-7	St-8	St-9	St-10	St-11	St-12	St-13	St-14	St-15	St-16	St-17	St-18	Targets
Snags	0	0	0	0	0	0	4.44	0	22.2	0	5.55	0	5.55	0	0	0	0	0	10/acre
Snag Diam	n/a	n/a	n/a	n/a	n/a	n/a	11	n/a	15	n/a	12	n/a	12	n/a	n/a	n/a	n/a	n/a	>10 inches
CWD cds/ac	1.7	2.8	0.0	4.4	0.5	2.8	2.7	3.0	2.0	1.1	2.6	0.7	4.6	1.2	1.4	0.4	6.3	1.4	10 cds/acre
CWD Ave/D	5.6	8.1	0.0	6.9	4.1	4.9	5.7	5.5	7.5	4.6	5.0	4.8	6.6	7.8	4.8	2.4	8.1	3.6	>10 inches
# tally points	4	2	1	2	2	2	5	9	1	2	8	1	4	1	2	2	2	2	

The number of inventory points has been listed on the bottom of the chart. There are a few stands that only had 1 tally point. This is not enough data to provide statistically reliable information. These stands are either 1-2 acre unmanageable swamps or other small anomalies in forest composition, stands too small to effectively manage separately. These stands were not delineated so much as to enable management, as to highlight small areas of diversity.






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## Carbon Inventory and Analysis

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Carbon Dioxide (CO<sub>2</sub>) is the most abundant greenhouse gas in the world. Societal use of fossil fuels has increased atmospheric CO<sub>2</sub> to levels never seen before by human beings. Rapid reduction of greenhouse gas emissions is vital to avoiding rising temperatures and climate change. Carbon is readily sequestered by a number of sources including terrestrial plants. Forests sequester significant amounts of carbon. The protection of forestland, the promotion of healthy, vigorous, mature forests, and the harvesting of wood products are all important tools in increasing the earth's ability to sequester and store carbon (Stern Review on the Economics of Climate Change 2006).

The North Upton Open Space carbon inventory was based on a variable-radius plot sampling method, using a 10-factor prism. All merchantable timber was tallied up to a minimum 4-inch top end diameter. Data collected includes: DBH (Diameter at Breast Height, 4.5 ft), SED (Small-End or Top Diameter), and Number of 8-foot pieces of merchantable wood. Using the Area of a frustum (a cone with different diameter top and bottom), we are able to calculate total volume of merchantable wood in cubic feet. Course woody debris (CWD) was also tallied using a 25-foot fixed radius plot. All sticks greater than 3-feet in length and greater than 3" in diameter were tallied.

Total Hardwood in Forest:        943,486 Cubic Feet  
 Total Softwood in Forest:        150,285 Cubic Feet  
 Total CWD in Forest:            61,741 Cubic Feet

We can calculate total tree biomass (Cubic Feet) using a ratio of merchantable wood to total live tree biomass (roots, trunks and tops) developed by Birdsey et. al. 1996. Using the Specific gravity of hardwood and softwood species we can calculate pounds of carbon per cubic foot of wood. Table 2 below shows the calculations. Region = NE & MA. Forest Types used = Pines, Oak-hickory, and Maple-beech-birch.

**Table 2. Basic Factors for converting merchantable wood yield to carbon yield, by species. The basic formula is (merchantable timber volume (ft<sup>3</sup>)) \* (Multiplier) = (Total wood volume above and below ground). (Total wood volume) \* (lbs. C per cubic foot of wood) = (lbs C in total wood volume).**

Region	Forest Type	a. Specific Gravity	b. Lbs. per cu. foot (a*62.4)	c. Multiply from timber to Total biomass	d. Percent Carbon	e. Lbs C per cubic foot ( b * d)
	SE Loblolly Pine	0.47	29.33	1.682	0.531	15.57
	Longleaf Pine	0.54	33.70	1.682	0.531	17.89
	Oak-Hickory (SI = 79)	0.61	38.06	2.233	0.479	18.23
NE &	Pines	0.41	25.58	2.193	0.521	13.33
MA	Spruce-fir	0.37	23.09	2.193	0.521	12.03
	Oak-hickory (all)	0.61	38.06	2.140	0.498	18.96
	Maple-beech-birch	0.61	38.06	2.140	0.498	18.96
NC	Pines	0.41	25.58	2.514	0.521	13.33
	Spruce-fir	0.37	23.09	2.514	0.521	12.03
	Oak-hickory	0.61	38.06	2.418	0.498	18.96
	Maple-beech	0.58	36.19	2.418	0.498	18.02
	Aspen-birch	0.46	28.70	2.418	0.498	14.29
West	Douglas-fir	0.45	28.08	1.675	0.512	14.38
	Ponderosa pine	0.38	23.71	2.254	0.512	12.14
	Fir-spruce	0.35	21.84	2.254	0.512	11.18
	Hemlock-Sitka sp.	0.43	26.83	1.675	0.512	13.74
	Lodgepole pine	0.42	26.21	2.254	0.512	13.42
	Redwoods	0.42	26.21	1.675	0.512	13.42
	Hardwoods	0.38	23.71	2.214	0.496	11.76

Source: Birdsey 1996 (See also Appendices 2 & 3, Sampson and Hair 1996)

Owner(s) Town of Upton

Town(s) Upton



## Carbon Inventory and Analysis Continued...

The chart below shows the calculations. Total merchantable wood is multiplied by the specific hardwood and softwood multipliers (2.140 & 2.193 respectively). CWD is not included in this calculation. This gives us volume of total forest biomass (merchantable wood, roots and tops & CWD). Total hardwood and softwood biomass numbers are then multiplied by the relevant conversion for metric tons of carbon per cubic meter. This gives us total metric tons of carbon in forest. To convert carbon to carbon dioxide we multiply the carbon by 44/12, the ratio of the molecular weight of carbon dioxide to carbon. Annual growth, and thus annual sequestration, is based on the total biomass of the forest growing at 3% per year. 3% is a common and conservative number used for annual forest growth in New England.

### Total CWD & Merchantable Wood In Forest

Total in CuFt		
	Hardwood	943486
	Softwood	150285
	CWD	61741
Total in m3		
	Hardwood	26716
	Softwood	4256
	CWD	1748
Total Extrapolated for Biomass (m3)		
	Hardwood	57173
	Softwood	9332
	CWD	1748
Total Carbon (Metric Tons)		
	Hardwood	28586
	Softwood	3733
	CWD	874
	TOTAL	33194
Total CO2 (Metric Tons)		
	Hardwood	104817
	Softwood	13688
	CWD	3205
	TOTAL	121710
Annual Sequestration of Live Wood (Metric Tons @3%)		
	Carbon	970
	CO2	3555

The forest is still young and will increase in biomass for many years. There are debates about how total biomass and forest sequestration are affected as forests mature. Over time it is possible that the forest reaches a relatively stable point where new carbon sequestered equals carbon released through decomposition.

Forest management can have a significant affect on the amount of carbon the forest has sequestered, and the sequestration rate. Harvesting is a direct removal of biomass from the system. Thinning can increase the growth rates and carbon sequestration rates. Future harvests can be tallied and those removals from the system adjusted for.

Snags, dead standing trees, make up an additional carbon pool that is not included in the carbon calculations. Snags are an intermediary pool between the live tree and CWD carbon pools. Management is designed to increase the number of snags per acre.

Management of the forest is designed to increase the amount of CWD. This will be in the form of large diameter wood intentionally left on the forest floor, the creation of snags thru girdling live trees, as well as slash, the tops of trees cut to lie low on the ground.

### Wood products:

Carbon stored in wood that is harvested can be quickly released back into the atmosphere, or can become a good long-term carbon sink, depending on the final product. This chart gives an estimated half-life of forest products. The half-life is the time after which half the carbon has been released back into the atmosphere. Wood products removed from the North Upton Open Space will most likely include medium and high valued lumber for home building and various carpentry projects, low-valued lumber for pallets, and fuelwood. The former will have one of the longest half-lives while the later will have half-life of roughly 4-6 months.

Table 5.4—Assumed duration of carbon sequestration in end uses of wood and paper.

End use	Half-life of carbon (years)
Single-family homes (pre-1980)	80
Single-family homes (post-1980)	100
Multifamily homes	70
Mobile homes	20
Nonresidential construction	67
Pallets	6
Manufacturing	12
Furniture	30
Railroad ties	30
Paper (free sheet)	6
Paper (all other)	1

Table 5.4:  
Carbon Sequestration in Wood and Paper  
Kenneth E. Skog, USDA Forest Service, Forest Products  
Geraldine A. Nicholson, Maryland Energy Administration, 2000

Owner(s) Town of Upton

Town(s) Upton

**STAND DESCRIPTIONS**

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
STEW	1	OM4A	12.1	12.8	125	6000 HW BF 1100 SW BF	24 HW CDS 2 SW CDS	60

Stand 1 is an even-aged, overstocked, upland mixed oak stand. This stand is nearly pure oak (90%), dominated by red oaks including northern red, black and scarlet oaks. White pine is the chief associate (8%), with other hardwoods such as red maple, hickory, black gum, sassafras and yellow birch present in locally wetter patches. Height growth and form quality are good in this stand with the overall character being one of tall, straight, sawtimber size oaks. Trees are overstocked and crowded. This stand is even-aged and with little structural or species diversity. There are few snags and little downed woody debris, both characteristics of maturing forests. Regeneration is patchy and moderate overall. American chestnut saplings are everywhere. Growing to about 4-5 inches in diameter before succumbing to the chestnut blight and dying, only to sprout again. Patches of white pine sapling and pole regeneration are scattered throughout and their distribution can be seen on the Aerial Photo Map. Elsewhere regeneration is dominated by scattered red maple with some sugar maple, black birch, and oak mixed in. It is characteristic across the region to have pure oak overstory with almost pure maple understory. Oak does not regenerate in full or even partial shade while maple is very shade tolerant. This is a major indicator of past land use. This stand is probably over 100 years old and almost certainly became established after a large-scale disturbance such as clearcutting or pasture abandonment. The 1938 ortho photos show some patchy thinning, primarily in northeastern areas now including white pine. In most areas regeneration is not sufficient to regenerate the stand and future thinning of the overstory will be important in creating the environment for robust and diverse regeneration. Underbrush is also variable on such a large stand. Lowbush blueberry dominates the uplands. Witch hazel dominates the edges and sweet pepperbush and highbush blueberry dominate the scattered lowland depressions. There is evidence of a recent ground fire near Inventory Point # 32. This is an interesting example of how fire affects a stand. Most small saplings were killed along with all the underbrush. The presence of dead pole-size oaks suggests the fire had enough fuel to burn hotter than it might if it were more common, and as a result killed more of the thicker bark oaks. A couple-acre area along Grafton Road was thinned 20-30 years ago and has a lower overstory stocking with an abundance of pole size hardwood.

Access for forest management is good. The terrain is flat to gently sloped and undulating. The soils are generally well-drained fine sandy loams. There is one small intermittent stream to be crossed, close to Grafton Road. There are isolated pockets of poorly drained soils, usually located within a distinct topographic depression, and including several potential vernal pools.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method is recommended to provide an improvement thinning, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A      STEW/GC= stands not classified under CH61/61A  
 STD= stand      AC= acre      MSD= mean stand diameter      BF= board feet  
 CDS=cords      BA= basal area      VOL= volume      HW=hardwood      SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

**STAND DESCRIPTIONS**

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
STEW	2	WO4B	3.6	14.3	120	4200 HW BF 6700 SW BF	10 HW CDS 6 SW CDS	60/68

Stand 2 is a multi-aged, fully-stocked, upland mixed oak and pine stand. White pine dominates (50%), with a mix of red oaks (40%) and white oak (10%), filling out the stocking. Stocking is high for hardwoods but low for pine, so the mix is at the high end of adequately stocked, a.k.a. fully-stocked. Height growth and form quality are both good with tall, sawtimber-size trees present. This stand can be considered multi-aged. The oak along with some of the pine represent the primary age-class. There is a scattering of big pine that represents an older age-class, probably trees retained during a pre-1938 harvest. There is a third age-class present in the form of pine, and to a lesser extent red maple, saplings and poles. This regeneration is moderate throughout and in patches fully regenerated. That is, enough to occupy and fully regenerate the site in the event of an overstory removal. Underbrush is moderate and dominated by lowbush blueberry and witch hazel.

Access for forest management is good and would be off of Grafton road. The terrain is flat to gently sloped. The soils are a well-drained fine sandy loam.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method is recommended to provide an improvement thinning, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes.

STEW	3	RM2C	1.0	10.3	60	350 HW BF	7 HW CDS	35
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Stand 3 is a red maple swamp. This stand consists of scattered short, stunted pole and sawtimber size red maple over thick highbush blueberry, swamp azalea and sweet pepperbush. The forest floor holds standing water most of the year, with sphagnum moss hummocks. The soils are typed as a Woodbridge fine sandy loam. They are very poorly drained, swampy, with a layer of organic muck on top. Form quality is poor in this acidic and anaerobic environment.

This stand provides critical wetland forest habitat, including some early-successional forest characteristics where canopy gaps allow for a diversity of underbrush species. This stand also provides possible vernal pool habitat, as well as important ecosystem services in the form of floodwater retention and groundwater filtration.

This stand is essentially unmanageable. The wet, delicate soils are rarely if ever dry or frozen enough to be accessed for thinning. This stand will be allowed to grow, and will be a no-cut biological reserve.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A

STEW/GC= stands not classified under CH61/61A

STD= stand AC= acre MSD= mean stand diameter

BF= board feet

CDS=cords BA= basal area VOL= volume

HW=hardwood

SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

**STAND DESCRIPTIONS**

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
STEW	4	WO4B	3.6	12.3	135	3800 HW BF 5600 SW BF	19 HW CDS 6 SW CDS	60/68

Stand 4 is a multi-aged, fully-stocked, upland mixed oak and pine stand. White pine dominates (45%), with a mix of red oaks (57%) and red maple (3%), filling out the stocking. Height growth and form quality are both good with tall, sawtimber-size trees present. Like stand 2, this stand has started the transition towards multi-aged. The oak along with some of the pine represent the primary age-class. There is a scattering of big pine that represents an older age-class, probably trees retained during a pre-1938 harvest. There is a third age-class present in the form of pine, and to a lesser extent red maple, saplings and poles. This regeneration is moderate throughout and in patches fully regenerated. Underbrush is moderate and dominated by lowbush blueberry, witch hazel and some highbush blueberry.

Access for forest management is good and would be off of Grafton road or thru the deeded access corridor off George Hill Road. The terrain is flat to gently sloped. The soils are a well-drained, Woodbridge fine sandy loam.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method is recommended to provide an improvement thinning, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes.

STEW	5	RM3A	3.3	8.8	125	1100 HW BF 1300 SW BF	26 HW CDS 2 SW CDS	45
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Stand 5 is an even-aged, adequately stocked, wetland red maple stand. Red maple is almost pure with yellow birch, black gum and white pine noted. Form quality is poor on this acidic and anaerobic site. Regeneration is light and generally part of the overstory in this pole-size stand. Underbrush is variable and includes heavy patches of highbush blueberry, swamp azalea and sweet pepperbush, and other areas with little to no underbrush.

Access for forest management is limited by wetland soils. The terrain is flat. The soils are typed as a fine sandy loam. Soils are swampy and very poorly drained with a layer of organic muck above the loam. This stand forms the core headwaters for the primary unnamed perennial stream that bisects this property running west to east.

This stand is essentially unmanageable. The wet, delicate soils are rarely if ever dry or frozen enough to be accessed for thinning. This stand should be allowed to grow, and designated a no-cut ecological reserve.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A      STEW/GC= stands not classified under CH61/61A  
 STD= stand      AC= acre      MSD= mean stand diameter      BF= board feet  
 CDS=cords      BA= basal area      VOL= volume      HW=hardwood      SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

***STAND DESCRIPTIONS***

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
STEW	6	WH3B	3.3	12.0	115	200 HW BF 9200 SW BF	7 HW CDS 11 SW CDS	45/60

Stand 6 is an adequately stocked, even-aged, mixed hardwood/softwood stand. This stand is a grouping of several stand types that don't fit into adjacent stands. The core of this stand is a thin red maple riparian stand following the swampy, wetland corridor as it flows northeast and then east into the primary perennial stream. The wetland core of this stand quickly gives way to transitional wetland/upland soils that are moderately well-drained and support good quality pine with some maple and oaks intermixed. The southern wet edge of this stand, adjacent to stand 5, contains a handful of eastern hemlock. This species was not noticed elsewhere on the property and is being devastated regionally by the woolly hemlock adelgid. Hemlock in this stand seems to be untouched by this forest pest.

The terrain is flat. The soils range from well-drained to swampy. Access for forest management is limited by delicate wetland soils.

This stand should be managed for hemlock and allowed to grow for the next management period. In 10 years this stand can be assessed for the need for a light thinning to remove competition and encourage hemlock. The property-wide uniqueness of the hemlock and the dark, swampy nature of this stand may make it a point of interest in future trail construction.

STEW	7	OH4B	35.4	11.4	98	4000 HW BF 900 SW BF	24 HW CDS 1 SW CDS	60/65
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Stand 7 is an adequately stocked, even-aged, upland, oak and maple stand. Red oaks including northern red, black and scarlet oak dominate (55%), with red maple (36%), and white pine (9%) present as the chief associates. This stand was thinned roughly 15-20 years ago and the residual stand is variable with areas significantly understocked and other areas overstocked. Soils are somewhat variable as well with somewhat poorly drained areas supporting the bulk of the maple while well-drained areas support oak. Overall form quality and height growths are good and this stand can grow some high quality oak and pine. Regeneration is moderate to heavy and includes some heavy patches of white pine saplings along with scattered maple saplings and poles and some oak saplings present where canopy gaps allow increased levels of sunlight to hit the forest floor.

Access for forest management is fair to good depending on truck access thru the deeded access corridor off of George Hill Road. The terrain is flat. The soils are a well drained to moderately well drained fine sandy loam.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method is recommended to provide an improvement thinning to overstocked areas, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A      STEW/GC= stands not classified under CH61/61A  
 STD= stand      AC= acre      MSD= mean stand diameter      BF= board feet  
 CDS=cords      BA= basal area      VOL= volume      HW=hardwood      SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

**STAND DESCRIPTIONS**

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
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STEW      8      OH4A    75.88      12.2      124      8300 HW BF    27 HW CDS      62

Stand 8 is an overstocked, even-aged, upland oak and maple stand. This stand occupies the center of the property, contains the entire primary stream, and is very similar in stocking, volumes and growth form to the other two main, uncut stands, stands 1 and 11. The primary difference is that this stand supports a larger percentage of red maple in and around the many small pockets of wetland and poorly drained soils associated with the primary stream. This stand also supports the tallest and most beautiful hardwoods in the transitional upland/wetland soils found along the stream and its tributaries. Red oaks dominate (60%), with red maple (40%) filling out the stocking. Shagbark hickory, yellow birch, black gum, aspen, ash, white pine and sassafras were all noted. Regeneration is patchy in this large stand and on the light side of moderate overall. Patches of thick white pine saplings are found, along with a scattering of red and sugar maple saplings. American chestnut saplings are everywhere. This stand is in its first stages of transitioning from even-aged to multi-aged. The diameter class distribution shows a fairly even spread among sapling, pole, sawtimber and large sawtimber size classes. But canopy gaps, snags and downed woody debris are all scarce. Like stand 1, this stand must be roughly 100 years old. No signs of past cutting were seen on the ground but the 1938 areal photo shows some recent thinning primarily in areas now supporting pine regeneration. Underbrush is light to moderate and includes some heavy patches of witch hazel, generally found along the upland/wetland transitional zone, lowbush blueberry in the uplands and sweet pepperbush and highbush blueberry in wetter areas.

Access for forest management is fair. The terrain is flat to moderately sloped and the soils are a mostly well-drained, but the distance to either Grafton Road or George Hill Road may be prohibitive. The soils are a patchwork of fine sandy loams. Soils are well-drained with patches of somewhat poorly drained and wetland soils. The primary stream, a perennial stream, bisects this stand flowing west to east, with a number of feeder streams running north or south into this stream. Stream crossing during forest management will probably be minimized by most of the forest north of the stream being access thru stand 7.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method is recommended to provide an improvement thinning, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A      STEW/GC= stands not classified under CH61/61A  
 STD= stand      AC= acre      MSD= mean stand diameter      BF= board feet  
 CDS=cords      BA= basal area      VOL= volume      HW=hardwood      SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

**STAND DESCRIPTIONS**

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
STEW	9	WO4B	2.2	16.0	110	8600 HW BF 4300 SW BF	HW CDS SW CDS	60/68

Stand 9 is an even-aged, adequately stocked, upland oak and pine stand. Red oaks dominate (70%), with white pine filling out the stocking (30%). Height growth and form quality are good. Regeneration is moderate with some thick patches of white pine sapling and pole regen. Underbrush is light and dominated by lowbush blueberry. This stand is very small and could have been folded into stand 11, except it represents the future of much of this forest. Pine has historically been a major component of forests in this region and it is coming back quickly. The areal photos show all the understory pine in and around this stand, and throughout the whole property. In 50 years most of this property will be mixed hardwoods and pine instead of pure oak. Pine is valuable economically and ecologically and this transition should be part of the property wide goals of managing for diversity.

Access for forest management is limited only by the long skid distance to potential landing sites near Grafton Road or George Hill Road. The terrain is flat to moderately sloped. The soils are a well-drained fine sandy loam.

This stand should be managed for white pine. Even-aged management is recommended to promote fast growing pine. This stands should be allowed to grow for the next management period. Assess in 10 years for the need to thin.

STEW	10	WO4A	6.0	15.6	165	6700 HW BF 8400 SW BF	14 HW CDS 9 SW CDS	60/68
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Stand 10 is similar to stand 9, but stocking his higher. This is an overstocked, even-aged, upland mixed oak and pine stand. Whit pine and red oaks split the stocking 50:50. Height growth and form quality are good. Regeneration is heavy with some thick patches of white pine sapling and pole regen. Underbrush is light and dominated by witch hazel and lowbush blueberry.

Access for forest management is limited only by the long skid distance to potential landing sites near Grafton Road or George Hill Road. The terrain is flat to moderately sloped. The soils are a well-drained fine sandy loam.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method is recommended to provide an improvement thinning, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A

STEW/GC= stands not classified under CH61/61A

STD= stand AC= acre MSD= mean stand diameter

BF= board feet

CDS=cords BA= basal area VOL= volume

HW=hardwood SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

**STAND DESCRIPTIONS**

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
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STEW	11	OM4B	75.7	12.4	101	6300 HW BF	20 HW CDS	58
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Stand 11 is an even-aged, adequately stocked, upland mixed oak stand. Red oaks including northern red, black and scarlet oak are almost pure across this stand. Red maple, white pine, hickory, aspen, ash, yellow birch, black gum and sugar maple were all noted. Regeneration is moderate overall and characterized by scattered red maple and white pine with thicker white pine patches found. American chestnut saplings are everywhere. Most of the tree species noted above were seen in the regenerating layer and can be encouraged by future management. Underbrush is patchy, with some heavy patches of witch hazel or highbush blueberry but mostly a fairly light lowbush blueberry ground cover. This stand occupies the highest hilltop on this property. The hill has a shoulder where the small wetland of stand 12 can be found. Moving east, the terrain drops steeply. These steep slopes contain interesting and scenic rock ledges and cliffs, with several small intermittent streams and seeps found.

Access for forest management to the western two-thirds of this stand is limited only by the long skid distance to potential landing sites near Grafton Road or George Hill Road. Access to the steep eastern slopes may prove difficult. There is no good access from the east. The slopes are steep enough that finding a good route to skid the wood up the hill will be hard. The soils are well-drained fine sandy loam except along the eastern slopes where it is typed as a Chatfield-Hollis-Rock outcrop complex.

This stand will be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method will be used to provide an improvement thinning, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes.

STEW	12	RM4B	1.8	11.4	80	4300 HW BF	15 HW CDS	58
						400 SW BF	2 SW CDS	

Stand 12 is an adequately stocked, even-aged, wetland red maple stand. Red maple dominates this small stand (50%), with red oaks (25%), ash (15%), and hickory (10%), present. Height growth and form quality are quite good for a wetland stand. This stand is located on a plateau found along the eastern shoulder of the large hill, just above the ledges and cliffs of stand 11. Regeneration is light and consists of scattered maple and pine saplings and poles. Underbrush is light to moderate and includes witch hazel and highbush blueberry.

Access for forest management is limited by the long skid distance and delicate wetland soils. The terrain is flat. The soils are a poorly drained fine sandy loam, most likely with a layer of organic muck built up on top.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. This stand provides important habitat diversity to the relatively homogenous upland oak cover of surrounding stand 11. Allow to grow. Assess in 10 year for the need to thin.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A	STEW/GC= stands not classified under CH61/61A
STD= stand	BF= board feet
AC= acre	MSD= mean stand diameter
CDS=cords	BA= basal area
	VOL= volume
	HW=hardwood
	SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

***STAND DESCRIPTIONS***

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
STEW	13	WB4B	10.2	13.4	187	1300 HW BF 13,000 SW BF	8 HW CDS 37 SW CDS	68

Stand 13 is an adequately stocked, even-aged, upland white pine stand. White pine dominates (90%), with red and white oaks and red maple filling out the stocking. This stand is somewhat variable with the main portions southwest and north supporting the heaviest stocking and a 2-aged structure with a fully stocked overstory and a fully regenerated sapling understory. Along the edges and in between these areas, including the southeastern finger, stocking is lower and oaks and maple are more prevalent. Regeneration is heavy and dominated by white pine. Underbrush is light or absent.

Access for forest management is poor. Access off of North street is unlikely. The slopes are very steep and the wetland corridor of stand 15 is quite wide. Access from the west would involve a mile-long skid, negotiating the steep, ledgy slopes of stand 11 and at least one stream crossing. The terrain is gently sloped. The soils are a well drained fine sandy loam.

This stand should be managed for an even-aged pine forest with hardwood associates. The seed-tree cut in a shelterwood treatment is recommended, as soon as possible. This would remove 30-40% of the overstory, harvesting mature timber and poorly formed trees while allowing crop trees to put on more volume and value. Critically this would also release the thick regeneration to sunlight before it stagnates in the shade and starts to fall over and die. In 10-20 years most of the remaining overstory would be removed allowing the then pole-size regeneration room to grow, while retaining a component of mature pine as legacy trees. Steep slopes and wetland corridors limit access to this stand. Alternate management would include designating this stand as a no-cut ecological reserve.

STEW	14	RM2B	0.6	8.8	100	350 HW BF	17 HW CDS	20
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Stand 14 is an adequately stocked, even-aged, wetland red maple swamp. Red maple dominates this wetland site with the occasional black gum, and oaks found along the edge. Height growth and form quality are poor. Regeneration is light and consists of scattered red maple saplings and poles. Underbrush is heavy and dominated by highbush blueberry.

Access for forest management is poor. The swamp soils make management impractical.

This stand should be preserved as a biological reserve. This wetland site provides critical ecological and wildlife amenities.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A

STEW/GC= stands not classified under CH61/61A

STD= stand AC= acre MSD= mean stand diameter

BF= board feet

CDS=cords BA= basal area VOL= volume

HW=hardwood

SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

**STAND DESCRIPTIONS**

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
STEW	15	RM4A	5.3	12.4	120	3500 HW BF 2300 SW BF	26 HW CDS 2 SW CDS	60

Stand 15 is a handsome red maple stand found along a wetland drainage that follows Warren Brook. This is an overstocked, even-aged, wetland stand. Red maple dominates (80%), with white pine and the occasional oak filling out the stocking. Form quality is fair to good with some good quality sawtimber present in the large-diameter maples. This stand has pockets of 3-aged (multi-aged) structure. Along the trail entering from north street, the forest includes a scattering of large pine, pole to medium sawtimber size maple, over moderate white pine sapling regeneration. Upriver the maples are larger and regeneration is light. Underbrush is light overall.

This stand has similar access issues as stand 13. The terrain is flat. The soils are a somewhat poorly drained to poorly drained fine sandy loam.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method is recommended to provide an improvement thinning, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes. Steep slopes and wetland corridors limit access to this stand. Alternate management would include designating this stand as a no-cut ecological reserve.

STEW	16	RM4A	14.0	12.4	175	10,000 HW BF	40 HW CDS	60
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Stand 16 is a very overstocked, even-aged, wetland red maple stand. Red maple dominates (70%), with yellow birch (15%), red oaks (10%), and ash filling out the stocking. Height growth and form quality are good with much sawtimber value present. This stand has started transitioning to a multi-aged structure. The overstory contains a pole-size age-class and a small to medium-size age-class. Regeneration is moderate and forms a third age-class comprised of birch, maple and pine saplings.

Access for forest management is poor. Access off of North street to this part of the property is possible but would involve significant investment, road construction and numerous stream and wetland crossings. Access from the west has the challenges mentioned above of a very long skid and steep slopes. The terrain is flat. The soils are poorly drained fine sandy loams.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method is recommended to provide an improvement thinning, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes. Steep slopes and wetland corridors limit access to this stand. Alternate management would include designating this stand as a no-cut ecological reserve.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A      STEW/GC= stands not classified under CH61/61A  
 STD= stand      AC= acre      MSD= mean stand diameter      BF= board feet  
 CDS=cords      BA= basal area      VOL= volume      HW=hardwood      SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

**STAND DESCRIPTIONS**

OBJ	STD NO	TYPE <sup>1</sup>	AC	MSD	BA/AC	BF/AC <sup>2</sup>	CDS/AC <sup>2</sup>	SITE INDEX <sup>3</sup>
STEW	17	WO4B	7.6	15.1	95	4700 HW BF 2000 SW BF	14 HW CDS 3 SW CDS	60/65

Stand 17 is an adequately stocked, even-aged, upland mixed pine, oak and maple stand. Red oaks dominate (53%), with white pine (25%), and red maple (20%), present as the chief associates. Height growth and form quality are good in both hardwoods and pine. This stand saw some selective thinning roughly 20 years ago. This stand has started transitioning to a multi-aged structure. Diameter distributions show a good spread. Regeneration is moderate and includes some thick patches of pine along with maple and birch saplings.

Access for forest management is poor (see stand 16). The terrain is flat to gently sloped. The soils are poorly drained fine sandy loams.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. The single tree and group selection method is recommended to provide an improvement thinning, removing poorly formed, diseases and dying trees to provide growing space for the healthiest individuals, and to assist this stand in its move towards a more diverse multi-aged structure. Patches will be opened to encourage regeneration of new age-classes. Steep slopes and wetland corridors limit access to this stand. Alternate management would include designating this stand as a no-cut ecological reserve.

STEW	18	WH4B	8.5	13.6	75	200 HW BF 2000 SW BF	4 HW CDS 16 SW CDS	58/65
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Stand 18 is a variable mix of pine and hardwoods. This is a two-aged stand, the result of cutting roughly 20 years ago. Today the overstory is dominated by widely spaced, large sawtimber size white pine, with a component of sawtimber size maple. In and around these trees and filling in canopy gaps is a distinct pole-size age-class comprised of stump sprouted red maple, as well as oaks, ash, grey and yellow birch and white pine. Regeneration in the form of this pole size age-class is moderate to heavy and is successfully regenerating the stand. Underbrush is light and includes some witch hazel, lowbush blueberry, ferns and skunk cabbage. There is a cellar hole along North street and what seems to be an old well, near the water department building northeast of this stand.

This stand has the same access issue as stands 16 and 17, though less stream crossings. The terrain is flat to gently sloped. The soils are a well-drained fine sandy loam along North street and somewhat poorly drained to poorly drained fine sandy loams elsewhere.

This stand should be managed for mature, multi-aged forest characteristics, including a diversity of tree species and habitat types. Allow to grow. Assess in 10 years for the need to thin.

STEW	19	field	3.3					
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Stand 19 is an old agricultural field that is now maintained as field for ecological and aesthetic purposes. This field is mowed every 2-3 years and provides habitat values in the form of ground nesting bird habitat, browse for larger animals, cover for smaller animals and invertebrates, as well as feeding grounds for birds, bats, butterflies and other pollinators.

<sup>1</sup> See stand type descriptions in appendix I

<sup>2</sup> Volumes calculated using ten-factor prism, number 8 foot sticks, DBH and top end diameter, and frustum volume equation.

<sup>3</sup> Site index found using NRCS Web Soil Survey and field evidence.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A

STEW/GC= stands not classified under CH61/61A

STD= stand AC= acre MSD= mean stand diameter

BF= board feet

CDS=cords BA= basal area VOL= volume

HW=hardwood

SW=Softwood

Owner(s) Town of Upton

Town(s) Upton

**RECOMMENDED MANAGEMENT PRACTICES**  
*to be done within next 10 years*

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	1	OM4A	Single-tree & Group Selection	42.1	25	240 HW CDS 20 SW CDS 30,000 HW BF 5,000 SW BF	2016 2016 2016 2016
STEW	2	WO4B	Single-tree & Group Selection	3.6	10	8 HW CDS 4 SW CDS	2016 2016
STEW	4	WO4B	Single-tree & Group Selection	3.6	20	12 HW CDS 4 SW CDS 2000 HW BF 3000 SW BF	2016 2016 2016 2016
STEW	7	OH4B	Single-tree & Group Selection	35.4	10	100 HW CDS 8000 HW BF	2016 2016
STEW	8	OH4A	Single-tree & Group Selection	75.88	25	500 HW CDS 60,000 HW BF	2016 2016
STEW	10	WO4A	Single-tree & Group Selection	6.0	25	15 HW CDS 10 SW CDS 3,000 HW BF 4,000 SW BF	2016 2016 2016 2016
STEW	11	OM4B	Single-tree & Group Selection	75.7	10	175 HW CDS 25,000 HW BF	2016 2016
STEW	15	RM4A	Single-tree & Group Selection	5.3	20	25 HW CDS 2,000 HW BF	2016 2016
STEW	16	RM4A	Single-tree & Group Selection	14.0	40	115 HW CDS 15,000 HW BF	2016 2016
STEW	17	WO4B	Single-tree & Group Selection	7.6	10	20 HW CDS 5 SW CDS 4,000 HW BF 2000 SW BF	2016 2016 2016 2016

These stands will be treated using the single tree and group selection method. Management will be multi-purposed including the promotion of mature forest characteristics and the harvest of forest products.

This selective treatment has three main components. First is the maintenance of legacy trees and crop trees. Legacy trees are

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OBJECTIVE CODE: CH61 = Forest Products (for Ch. 61/61A)      STEW/GC = Stewardship Program practices  
 STD= stand    Type= Forest type    AC= acre    MBF= thousand board feet    BA= basal area    VOL= volume

Owner(s) Town of Upton

Town(s) Upton

**RECOMMENDED MANAGEMENT PRACTICES**  
*to be done within next 10 years*

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	

healthy well-formed individuals that have the best chance of becoming long-lived old growth trees. Crop trees are the same, only they will be harvested when mature. Improvement thinning will thin between these trees to provide growing space and allow them to become large and wind-firm. Thinning should relieve crown competition while maintaining almost full canopy cover.

The second component of this management regime is a regeneration component. Patches ranging from 1/10<sup>th</sup> of an acre up to 5 acres will be harvested and allowed to naturally regenerate. Patches will be located where existing regeneration is established, releasing that regeneration by removing the overstory, or in areas with unhealthy or poorly formed overstory trees that should be removed. Where regeneration is not present the patch will be cleared of understory trees to allow even regeneration of the patch. Patches will cover roughly 10% of the stand (each 10-year management period). Patch cuts will be repeated every 10-20 years creating a diverse patchwork of different age-classes while maintaining legacy trees, snags, downed woody debris and a mature forest structure. A few larger patches (3-5) acres will be opened property wide each management period to ensure that high-quality early-successional habitat values are present on the property.

The third component is management for old growth characteristics. Other than maintaining a component of large, old trees, the main goal is a diameter distribution that shows a relatively even basal area distribution by age-classes. Also important is managing the number of dead standing trees (snags) per acre by girdling some live trees and protecting existing snags during harvest. This also includes managing downed woody debris with emphasis on large diameter downed wood. Downed wood will be created by naturally falling trees, trees cut and left on the forest floor, and trees girdled that will eventually fall. Create 2-5 snags per acre each 10-year management period.

Most stands over roughly 30 acres will have a no-cut area delineated and maintained as a forest reserve. This will provide a control by which to compare the affects of management activities. The North Upton Open Space is a public forest showcasing forest management styles including even and uneven-aged management, and the choice to leave a forest as is without any thinning or harvesting.

This management style will support a number of Landowner Goals as outlined in the Landowner Goals page. Goals specifically addressed by this management technique include; enhancing the quality and quantity of timber products, promoting biological diversity, enhancing habitat for birds, bats, small and large animals, enhancing carbon storage, enhancing old growth characteristics and protecting legacy trees.

**The appropriate permits must be attained prior to accessing wetlands for forest management. Additional restrictions may apply to harvesting in or around vernal pools, streams, lakes or other water bodies. This plan does not outline all restrictions and it is recommended that you consult your forester or town conservation commission prior to the start of work.**

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OBJECTIVE CODE: CH61 = Forest Products (for Ch. 61/61A)      STEW/GC = Stewardship Program practices  
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Owner(s) Town of Upton

Town(s) Upton

**RECOMMENDED MANAGEMENT PRACTICES**  
*to be done within next 10 years*

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	13	WB4B	Shelterwood – Seed Tree	10.2	60	20 HW CDS 25,000 SW BF 100 SW CDS	2016 2016 2016

Remove poorly formed trees as well as 80% of economically mature trees (diameter > 18”), retaining 20% as reserves and potential legacy trees. Residual stand should be comprised of well-spaced pole and small sawtimber size trees (plus larger retention trees), trees that will respond to the increased growing space and put on volume and value. Canopy closure should be roughly 50% allowing sunlight to reach the forest floor and both encourage established regeneration and promote regeneration where it is absent.

STEW	3	RM2C	Ecological Reserve	1.0	--	--	--
STEW	5	RM3A	Ecological Reserve	3.3	--	--	--
STEW	14	RM2B	Ecological Reserve	0.6	--	--	--

These maple swamps are very delicate and provide important ecological and biological values. They should be designated as no-cut reserves and allowed to mature naturally.

STEW	6	WH3B	Allow to Grow	3.3	--	--	--
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This stand will be managed for hemlock. Thinning may be warranted in 10 years to provide growing space to established hemlock and/or create site conditions to regenerate more hemlock.

STEW	9	WO4B	Allow to Grow	2.2	--	--	--
------	---	------	---------------	-----	----	----	----

Stocking is adequate. Trees are not crowded. Assess in 10 years for need to thin. Consider using even-aged management techniques to favor pine.

STEW	12	RM4B	Allow to Grow	1.8	--	--	--
------	----	------	---------------	-----	----	----	----

Stocking is adequate. Trees are not crowded. Assess in 10 years for need to thin. Favor wetland hardwood species.

STEW	18	WH4B	Allow to Grow	8.5	--	--	--
------	----	------	---------------	-----	----	----	----

Stocking is adequate. Trees are not crowded. Assess in 10 years for need to thin. Manage area along North Street as a visual buffer.

STEW	19	FIELD	Mow	3.3			
------	----	-------	-----	-----	--	--	--

This field should be mowed every 2-4 years. Avoid primary bird nesting times.

STEW BOUNDARY MARKING

Boundaries unmarked should be marked before management activities commence.

OBJECTIVE CODE: CH61 = Forest Products (for Ch. 61/61A)      STEW/GC = Stewardship Program practices  
 STD= stand    Type= Forest type    AC= acre    MBF= thousand board feet    BA= basal area    VOL= volume

Owner(s) Town of Upton      Town(s) Upton

**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.

Signed under the pains of perjury:

Owner(s) *Kim Sherman* Date *16 June 2015*  
*Robert J. Fleming* Date *16 June 2015*  
TOWN OF UPTON SELECTMEN

I attest that I have prepared this plan in good faith to reflect the landowner's interest.

Plan Preparer *[Signature]* Date *June 16, 2015*  
Walden Forest Conservation LLC.

I attest that the plan satisfactorily meets the requirements of CH61/61A and/or the Forest Stewardship Program.

Approved, Service Forester *[Signature]* Date *6-29-15*

Approved, Regional Supervisor *[Signature]* Date *6/29/15*

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) Town of Upton Town(s) Upton

## APPENDIX I

### GLOSSARY

**SILVICULTURE** - The theory and practice of controlling forest establishment, composition and growth.

**FOREST STAND** - A contiguous group of trees sufficiently uniform in species composition, arrangement of age classes, and condition to be a homogeneous and distinguishable unit.

**FOREST STAND TYPE** is an abbreviated descriptive code based on the Massachusetts Forest Land Classification System.(Refer to reference key below)

<u>Stand Type</u>	<u>Stocking Density</u>	<u>Height Class</u>
WP - White Pine	A - Over stocked	1 - 0-20'
WK - White Pine, Hemlock	B - Fully stocked	2 - 21-40'
WO - White Pine, Hemlock	C - Under stocked	3 - 41-60'
PP - Pitch Pine		4 - 61-80'
PO - Pitch Pine, Oak		
OH - Oak, Hardwoods		
OM - Mixed Oak		
OW - White Oak		
RM - Red Maple		
CD - Atlantic White cedar		
NV - No Vegetation		
AF - Abandoned Field		
PS - Plantation Softwood		
OP - Open		
SS - Shrub Swamp		

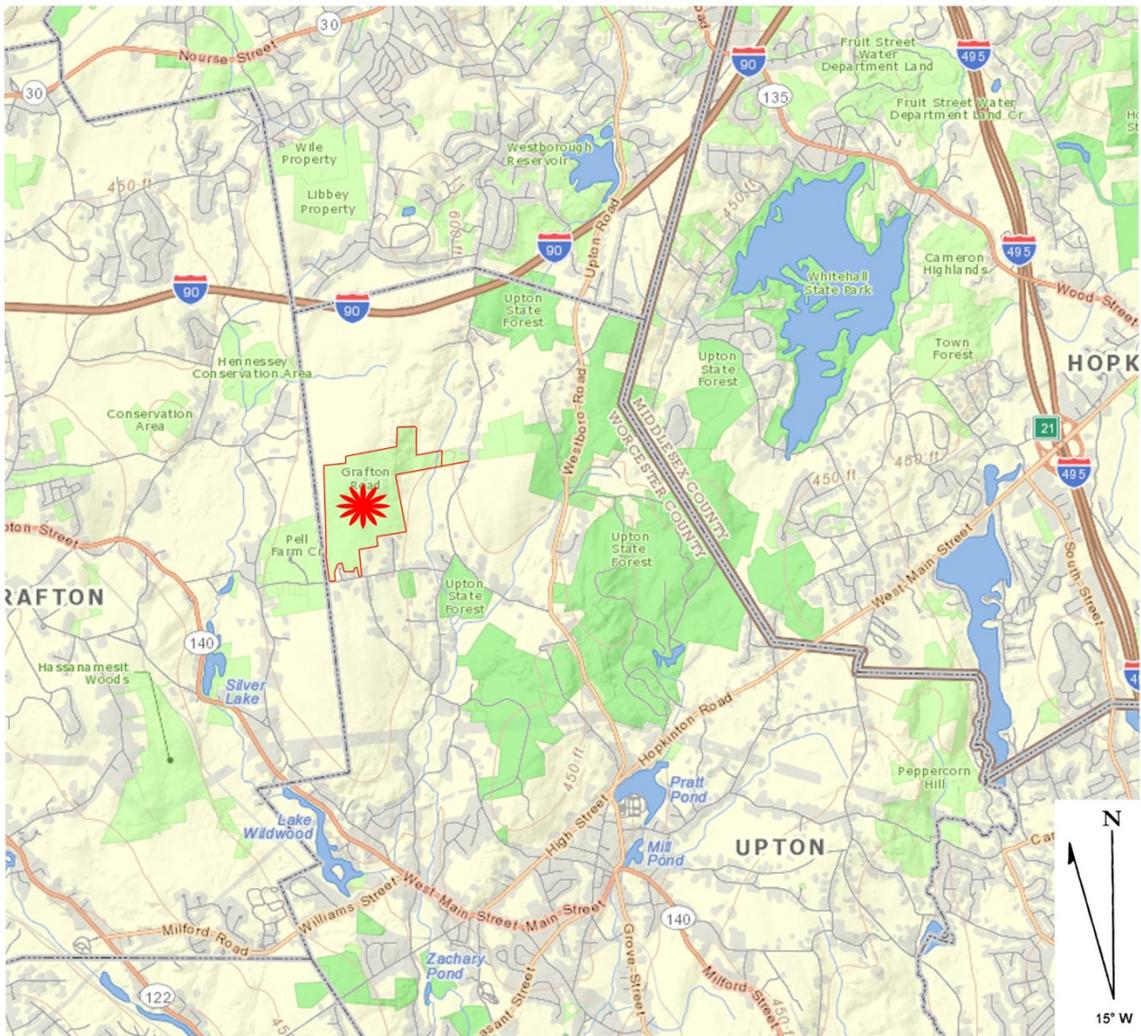
**BASAL AREA (BA)** - The total measure of the cross-sectional area of all or specified classes of standing trees per unit area of land, measured 4.5 feet above ground level. A useful characteristic of a forest stand in that it is directly related to stand volume and is a measure of stand density.

**DIAMETER BREAST HEIGHT (DBH)** - The location on a standing tree 4.5 feet above ground level established as a standard point to measure tree diameter.

**SITE INDEX** - A measure of growing site quality based on the relationship of tree height to age. This number refers to the average height that dominant and codominant trees will attain at the key age of 50 years.

Locus Map  
North Upton Open Space  
Upton, MA  
Warren Brook Watershed CA  
Howarth Glen CA  
Whitney CA  
Open space x2

Town of Upton  
One Main Street  
Upton, MA 01568



0' 4800' 9600'

WALDEN  
FOREST CONSERVATION  
JUNE, 2015

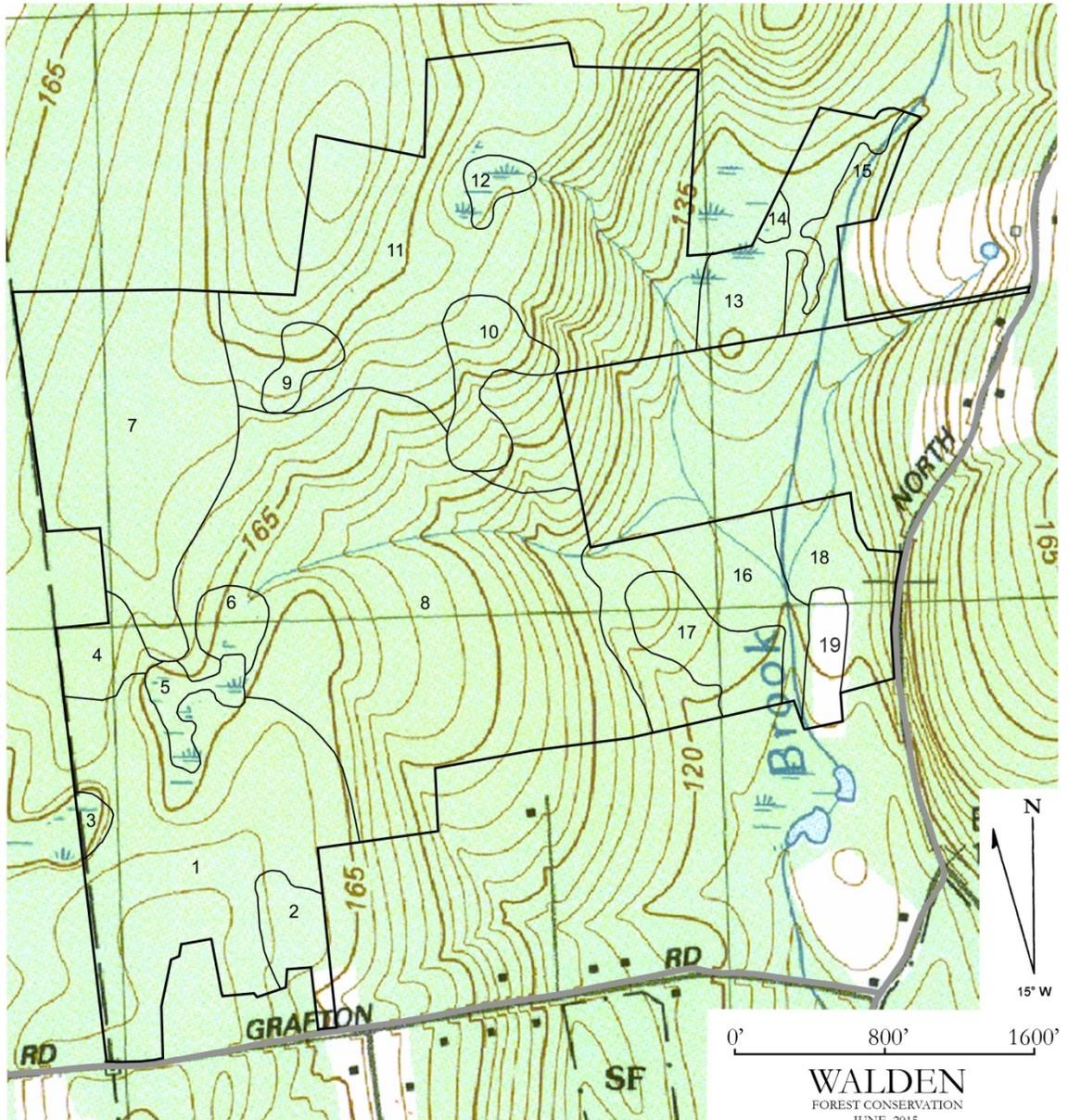
# Topographic Map

## North Upton Open Space

Upton, MA

Warren Brook Watershed CA  
Howarth Glen CA  
Whitney CA  
Open space x2

Town of Upton  
One Main Street  
Upton, MA 01568



WALDEN  
FOREST CONSERVATION  
JUNE, 2015

# Ortho Map

## North Upton Open Space

### Upton, MA

Warren Brook Watershed CA

Howarth Glen CA

Whitney CA

Open space x2

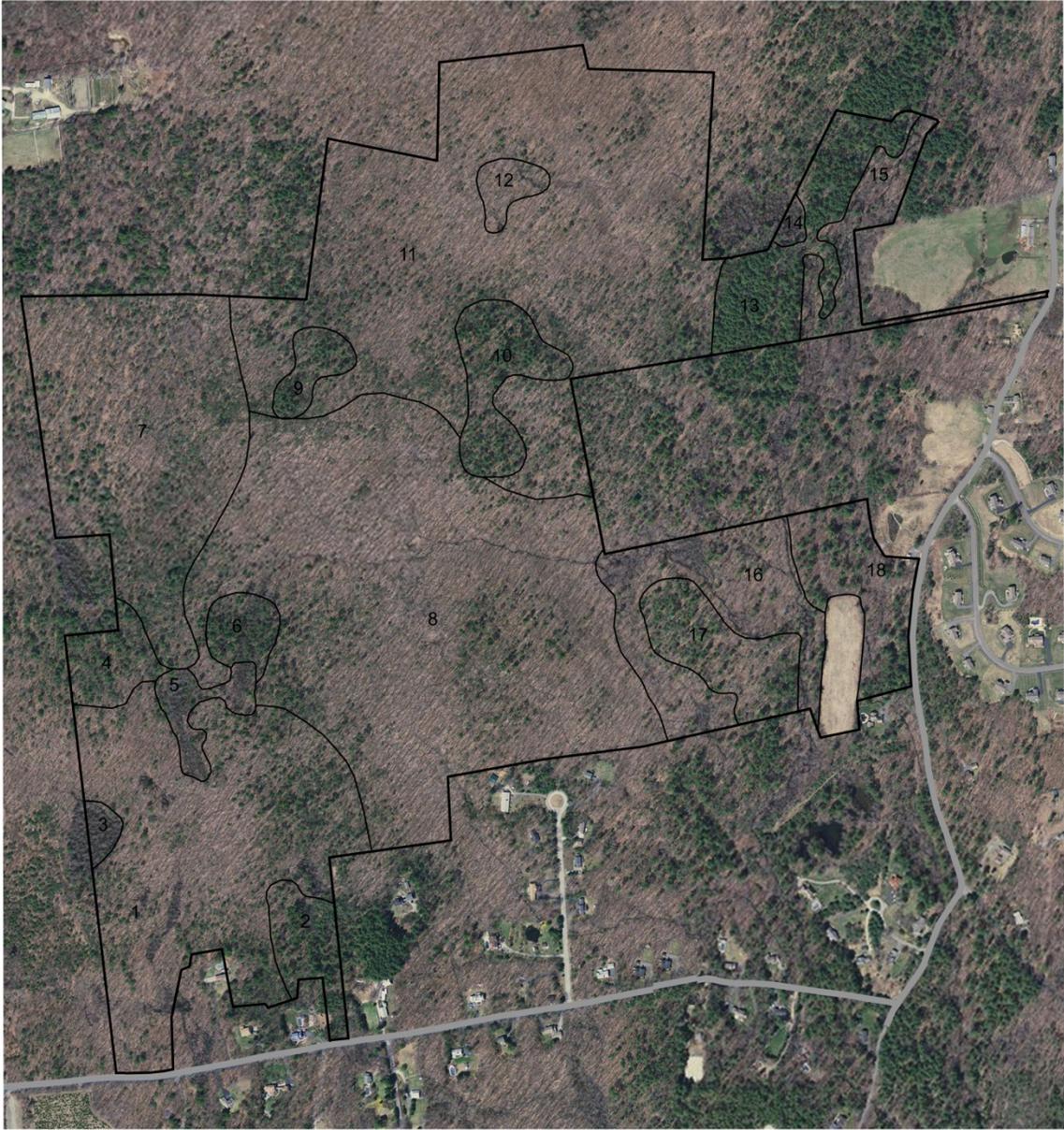
Town of Upton

One Main Street

Upton, MA 01568

0' 800' 1600'

**WALDEN**  
FOREST CONSERVATION  
JUNE, 2015



# Soils Map

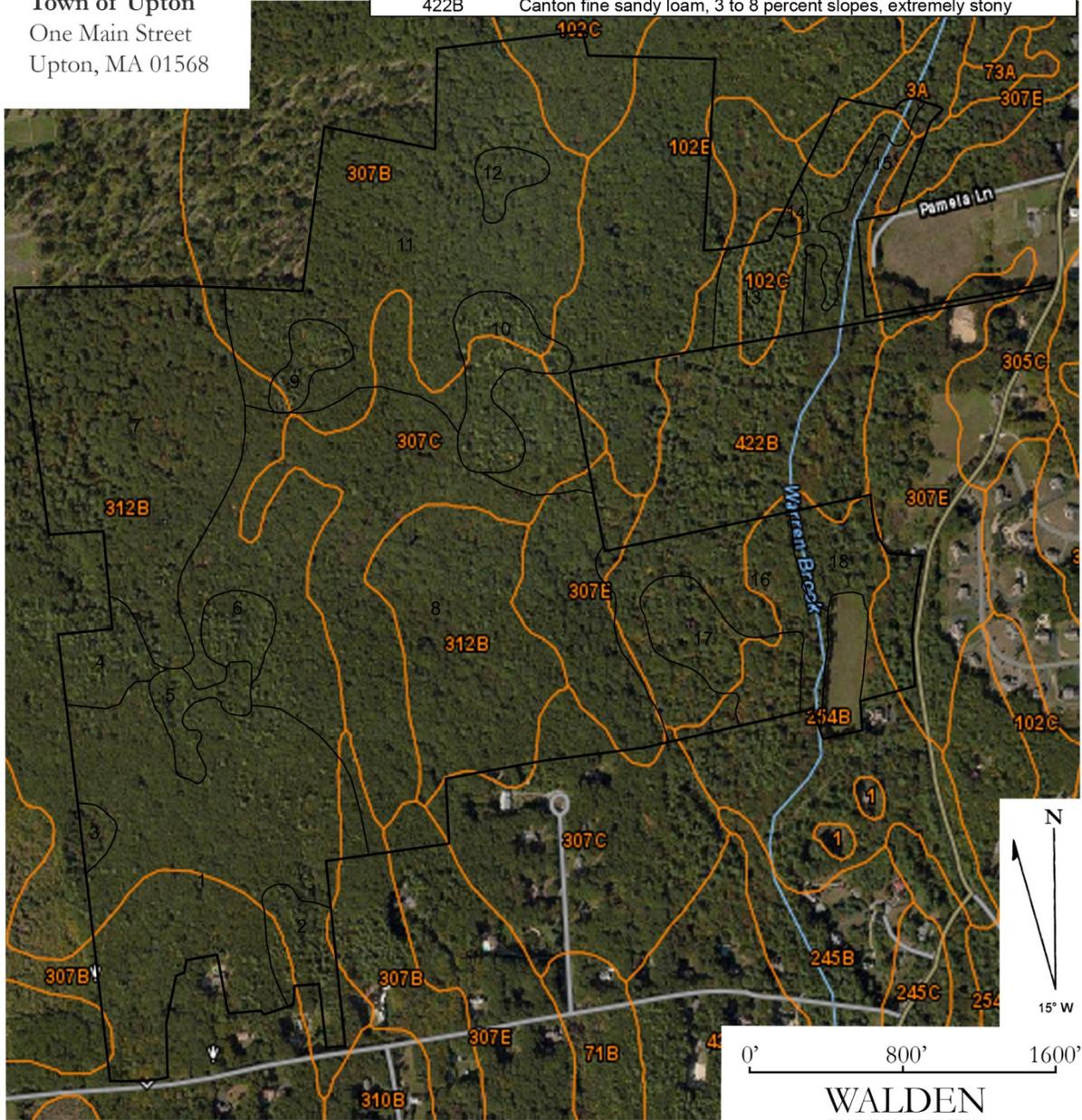
## North Upton Open Space

### Upton, MA

Warren Brook Watershed CA  
 Howarth Glen CA  
 Whitney CA  
 Open space x2

**Town of Upton**  
 One Main Street  
 Upton, MA 01568

Worcester County, Massachusetts, Southern Part (MA615)	
Map Unit Symbol	Map Unit Name
3A	Scarboro and Walpole soils, 0 to 3 percent slopes
102E	Chatfield-Hollis-Rock outcrop complex, 15 to 35 percent slopes
307B	Paxton fine sandy loam, 3 to 8 percent slopes, extremely stony
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony
102C	Chatfield-Hollis-Rock outcrop complex, 3 to 15 percent slopes
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony
254B	Merrimac fine sandy loam, 3 to 8 percent slopes
307E	Paxton fine sandy loam, 15 to 35 percent slopes, extremely stony
422B	Canton fine sandy loam, 3 to 8 percent slopes, extremely stony



0' 800' 1600'

**WALDEN**  
 FOREST CONSERVATION  
 JUNE, 2015





# GPS Points & Legacy Tree Map

## North Upton Open Space

Upton, MA

Warren Brook Watershed CA

Howarth Glen CA

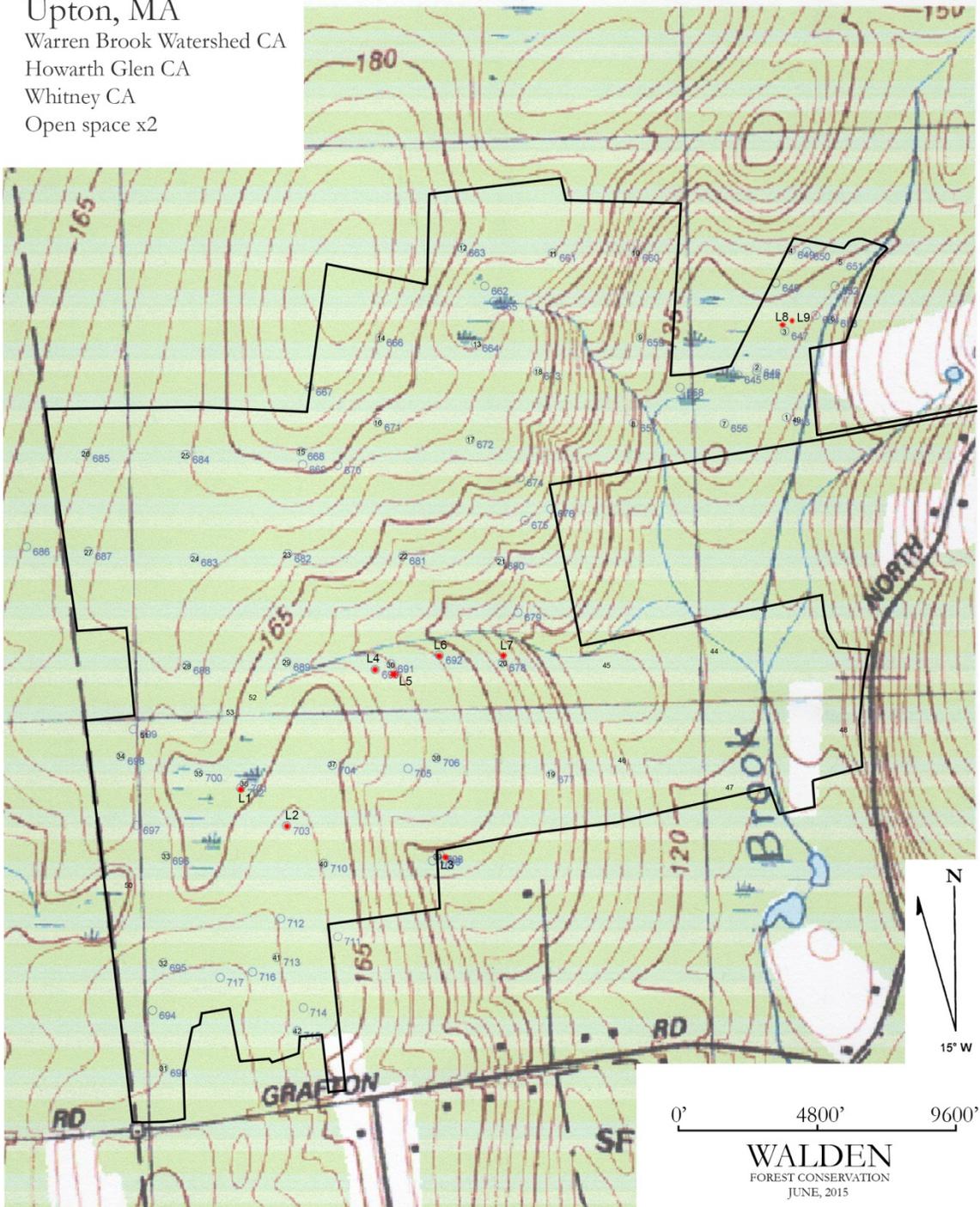
Whitney CA

Open space x2

Town of Upton

One Main Street

Upton, MA 01568



WALDEN  
FOREST CONSERVATION  
JUNE, 2015

# **Upton Conservation Commission Forest Management Policy and Guidelines**

*Approved June 12, 2013*

The Upton Conservation Commission and Land Stewardship Committee currently manage approximately 800 acres of land. These properties include six conservation areas, Stefans Farm, and Goss Pond. The purpose of this document is to establish general goals and guidance for management of forests on these lands and on properties subsequently placed under the care and custody of the Conservation Commission. This information will guide the Land Stewardship Committee and professional foresters tasked with developing land stewardship and forest management plans for the properties.

The policy and guidelines are intended to promote ecologically, economically, and socially responsible land stewardship and forestry. Primary goals include the following:

- Manage forests to enhance wildlife habitat and biodiversity;
- Manage forests for sustainable production of timber and fuel wood;
- Encourage development of late successional forests and forests with late successional or old growth characteristics;
- Manage forests to mitigate climate change through the forests ability to sequester atmospheric carbon;
- Where possible, manage forests to enhance resilience to climate change;
- Protect surface water resources and aquifers;
- Maintain or create early successional habitat in appropriate locations;
- Utilize Best Management Practices (BMPs) to minimize impacts of forestry operations on wildlife habitat, vernal pools, rare species habitat, soils, surface waters, wetlands, and cultural resources;
- Control occurrence and spread of invasive plants;
- Engage and encourage community forest stewardship. Educate the public and solicit public input regarding management of town owned land;
- Protect and enhance opportunities for passive recreation, outdoor education, and hunting;
- Protect stone walls, ancient ways, and other cultural resources;
- Invest in funding land stewardship activities and land conservation.

The overall objective is to assure the long-term viability of the forests while allowing for responsible human use. We recognize our role as land stewards for future generations, the intrinsic value of a forest independent of human needs, the value of ecological services provided by forests, and the need for forest products. We acknowledge that absolutes are rare and that successful land stewardship requires site-specific flexibility, both science-based and commonsense oversight, and adaptive management. Finally, we acknowledge that our understanding of forest ecosystems is limited and responsible management requires a careful,

measured approach, attention to lessons learned, and continued openness to new ideas and scientific information.

## **Policy and Guidelines**

### **1. Forest Classification**

Forests shall be classified in one of the following categories:

Forest Preserve: Parcel with unique or rare forest community (i.e., ranked S1, S2 or S3 by Massachusetts Natural Heritage Program) where no timber or fuelwood or timber harvesting will be conducted unless it is necessary to protect the forest community.

Forest Reserves: Parcels managed primarily to encourage development of late successional forest structure (i.e. old growth characteristics). Harvesting of timber and fuelwood from these areas is permitted only to enhance development of late successional characteristics.

Woodlands: Forests managed for multiple resource uses, including economically and ecologically sustainable production of timber and fuelwood, wildlife habitat, and recreation. Woodlands may contain patch reserves and legacy trees to protect or promote development of late successional characteristics.

Undesignated: Forests which are not categorized as Forest Preserve, Forest Reserves, or Woodlands.

Currently all town-owned forests are classified as “Undesignated”. Over time, land stewardship and forest management plans will be prepared and shall classify forestland as Forest Reserves, Forest Preserves, or Woodlands. The long-term goal is to designate no less than twenty-five (25) percent of forest occurring on town conservation land as Forest Reserves.

Because late successional forest structure require decades to develop, designation of land as Forest Reserves is intended to be permanent but may be reconsidered for ecological reasons.

### **2. Plans**

#### **Land Stewardship Plan**

A Land Stewardship Plan is a plan developed by or for the Land Stewardship Committee to guide management of a parcel or contiguous parcels for a period of time (usually ten years). The plan will typically include a description of the property, goals, existing resources and land use, problems and needs, an implementation plan, and funding requirements. Plans shall be reviewed and approved by the Conservation Commission. Where appropriate, forest management plans prepared to Massachusetts Department of Conservation and Recreation (DCR) standards maybe

incorporated into land stewardship plans. Where possible land stewardship plans shall combine contiguous town owned parcels into one larger landscape management unit. Management of adjacent public and private land shall be considered when developing land stewardship plans (landscape level approach). Opportunities for partnerships with adjacent land owners should be explored.

A public hearing, advertised in a local newspaper, is required prior to Conservation Commission approval of all Land Stewardship Plans.

### **Forest Management Plans**

Forest management plans shall be developed under direction of the Land Stewardship Committee by a Massachusetts licensed consulting foresters according to MA DCR “Directions for the Preparation of Forest Management Plans”.

Goals and objectives for a parcel shall be provided to the forester by the Land Stewardship Committee and/or Conservation Commission. Plans shall be reviewed and approved by Conservation Commission. Where possible the forest management plan shall combine contiguous town owned parcels into one larger landscape management unit. Management of adjacent public and private land shall be considered when developing a forest management plan. Opportunities for partnerships with adjacent land owners should be explored.

A public hearing, advertised in a local newspaper, is required prior to Conservation Commission approval of all Forest Management Plans.

### **Forest Cutting Plans**

Forest management activities and Forest Cutting Plans shall be prepared for bid by a Massachusetts licensed forester and approved by the Land Stewardship Committee and Conservation Commission. Timber harvesting activities proposed in a Forest Cutting Plan (M.G.L. Chapter 132) shall be consistent with approved Forest Management Plans.

Timber harvesting activities will be conducted by a Massachusetts Licensed Timber Harvester

Abutter notification pursuant to state regulations and a public hearing, advertised in a local newspaper, is required prior to Conservation Commission approval of all cutting plans.

## **3. Resource Protection**

When harvesting timber and fuelwood the Land Stewardship Committee and Conservation Commission will use best management practices (BMP's) for sustainable forestry. High priority will be given to “low impact” and “low disturbance” logging, and all logging practices shall be designed to have minimal impact on the forest floor, forest soils, heritage trees, wetlands, streams, vernal pools, rare species habitat, and other sensitive sites.

Recommended setbacks to protect wetlands, vernal pools, and streams are provided in the attached table. These recommendations are intended to be flexible and variances due to site conditions will be considered. Setback guidance may be updated from time to time.

Other protective measures include:

Rare Species Habitat: Massachusetts Forest Conservation Practices for Rare Species, or more stringent protective measures deemed appropriate by the Conservation Commission shall be practiced.

Special Trees: Stewardship and cutting plans shall normally identify, locate by GPS (Global Positioning System) and protect heritage and legacy trees and patch reserves.

Cavity Trees and Snags: Cavity trees and snags shall generally be left standing, consistent with other forest management objectives, unless they pose a safety hazard near established trails.

Invasive Species: Harvested areas shall be monitored for colonization by invasive species and necessary post harvest control measures implemented. All machinery shall be thoroughly cleaned prior to introduction on any parcel in order to prevent introduction of invasive plant species. Herbicides shall be applied by a Massachusetts licensed pesticide applicator pursuant to the Commission's herbicide use policy.

Slash: All slash (coarse woody debris generated by logging operations) shall normally remain on site, but shall not be left higher than 3 feet off the ground. Limbwood greater than 3 inch diameter may be removed for firewood. All slash will be treated in accordance to the Massachusetts Slash Law (M.G.L. Chapter 48, Section 16).

Replanting and Regeneration: Natural regeneration is expected to occur after harvest and replanting will normally not be required. Soil scarification to assist tree regeneration is permitted. Once plant material is available, opportunistic replanting of disease or insect resistant cultivars of American chestnut, American elm, and other native species may one day be included in cutting plans.

Recreational Trails: Avoid and minimize impacts to the existing trail system and trail use during harvesting operations as much as possible.

Cultural Resources: Avoid impacts to stone walls, other stone features, ancient ways, ceremonial stone landscapes, and other cultural resources. An inventory of cultural resources is required prior to development of a cutting plan.

## **4. Other Provisions**

### **Deed Restrictions**

Property deeds shall be reviewed to assure that land stewardship or forest management plans do not violate any recorded deed restrictions.

### **Consultants**

Hiring of Massachusetts licensed foresters and other experts to prepare forest management plans are encouraged. Measures must be taken, however, to assure that unbiased advice is provided. To this end, management plans and cutting plans may be prepared by different entities if the Conservation Commission or Land Stewardship Committee feels this is in the best interest of the town. Full service contracts in which one individual or company is hired to support all aspects of forest management on a parcel or parcels are to be entered into cautiously. Consultants should not benefit directly from the proceeds (i.e. volume) of a timber cut.

### **Timber Harvesting**

No timber harvesting on lands managed by Upton Conservation Committee and Land Stewardship Committee, regardless of volume, may occur without an approved forest management plan and state forester approved cutting plan.

### **Resident Home Fuelwood Harvests**

The Land Stewardship Committee may hold occasional resident home fuelwood lotteries or fuelwood sales for Upton residents. Small fuelwood cuts may occur on parcels without a forest management plan or professionally prepared forest cutting plan with Conservation Commission approval provided such cuts are in accordance with the land stewardship plan.

### **Income from Timber and Fuelwood Sales**

The Conservation Commission shall maintain a revolving fund for proceeds from timber and fuelwood sales. The fund shall be used to support land stewardship activities and possibly land conservation (acquisition).

Sample Town Meeting Article: Land Stewardship Committee "Land Stewardship Fund" – the purpose of this fund shall be to pay costs associated with management of conservation areas and open space parcels owned by the Town, to include, preparation of forestry and land stewardship plans, habitat management, trail development and maintenance, installation and maintenance of parking areas, bridges, boardwalks, fences, kiosks, and signage, and snow removal from parking areas. Monies to be deposited into this fund shall be fees and other receipts received in connection with the sale and harvest of timber and other agricultural or forestry products derived from properties managed by the Land Stewardship Committee. Expenditures from this fund shall be authorized by the chairperson of the Land Stewardship Committee and be limited to xx thousand dollars for fiscal year 20xx; or take any other action relative thereto.

### **Early Successional Habitat**

Creation, expansion, and maintenance of early successional habitat (grassland, shrubland, or young forests) is encouraged. Clearing of areas which may never have been cleared for pasture or farmland should be avoided. Forested areas to be managed to include early successional habitat shall be identified in approved Land Stewardship or Forest Management Plans.

### **Tree Nurseries**

The Land Stewardship Committee may establish a tree nursery for use by town to replace shade trees along roadsides, cemeteries, and other public places. If revolving fund is in place, nursery stock may also be sold to raise funds as described above.

### **American Chestnut and American Elm Restoration**

Efforts and partnerships to establish disease resistant American chestnut and American Elm on town conservation land are encouraged.

### **Biomass (Bioenergy) Harvesting**

Management of town lands for bioenergy production is not authorized. Incidental removal of slash, and non-merchantable trees for wood chips may be permitted so long as it does not compromise other management objectives.

### **Invasive Species Control**

Use of herbicides to control invasive plants following a cut is permitted by a Massachusetts licensed pesticide applicator pursuant to the Commission's herbicide use policy.

## **5. Policy Review & Reassessment**

This document is intended to be reviewed and updated as the Conservation Commission and Land Stewardship Committee gains experience with forest management. A public hearing is required for any proposed updates.

## Definitions

### Biomass Harvesting

*Biomass harvesting refers to vegetation removed from the forest for bioenergy use, including logging slash, small-diameter trees, tops, limbs, and whole trees not considered merchantable in traditional markets.*

### Biomass Harvest

*Refers to the harvest of additional woody material (non-merchantable/poor quality trees) beyond traditional timber harvests to provide the raw material for energy (electrical generation) or heat (wood pellets) production.*

### Cavity Tree

*Dead, dying, or live trees with cavities large enough to provide nesting habitat for birds and mammals. Typically these trees will be larger than 4" dbh and taller than 10 ft*

### Conservation Management Forestry Practices

*Forestry Conservation Management Practices (CMPs) are specific, science-based guidelines for conservation of rare species during forest harvesting. CMPs are somewhat analogous to Forestry Best Management Practices (BMPs), except whereas BMPs focus mainly on protection of water resources, CMPs specialize in protection of rare wildlife. The primary objective of CMPs is to guide harvesting activities such that rare species listed under the Massachusetts Endangered Species Act (MESA) are not impacted in a way that jeopardizes long-term viability of local populations.*

### Forest Cutting Plan (MA Forest Cutting Practices Act)

*Forest Cutting Plan means a plan for the cutting of trees on forest land prepared and submitted in accordance with M.G.L. c. 132, §§ 40 through 46 and 304 CMR 11.00. A forest cutting plan shall meet the requirements for a notice of intent to cut under M.G.L. c. 132, §§ 40 through 46. The Massachusetts Forest Cutting Practices Act was created to ensure the long-term public benefits provided by forests. Applicable to timber harvesting on both public and private forestland, the Forest Cutting Practices Act regulates any commercial timber cutting of wood products greater than 25 thousand board feet or 50 cords on any parcel of land at any one time.*

## Forest Stewardship Plan (Forest Management Plan)

*A forest stewardship plan is a 10-year forest management plan based on defined goals. It documents management options and practices designed to maintain the land in a productive and healthy condition for the next generation. Soil and water quality, wildlife and fish habitat, timber and other wood products, and outdoor recreation are among the many factors taken into account. It recommends actions that will protect or increase the environmental values of the land while yielding desired social or economic benefits. The plan is prepared by Massachusetts licensed forester in accordance with MA DCR standards.*

## Forest Reserve

*Parcels managed primarily to encourage development of late successional (i.e. old growth characteristics). Harvest of timber and fuelwood from these areas is permitted only to enhance development of late successional characteristics.*

## Forest Preserve

*Parcel with unique or rare forest community where no timber or fuelwood harvesting is permitted. Forest communities classified as S1, S2 or S3 by the Massachusetts Natural Heritage Program are considered rare communities.*

## Fuelwood

*Fuelwood, more commonly referred to as firewood or cordwood, is any wooden material that is gathered and used for heating and/or cooking. Firewood is not highly processed and is in some sort of recognizable log or branch form, compared to other forms of wood fuel like pellets or chips.*

## Heritage Tree

*A notable specimen because of its size, form, shape, beauty, age, color, rarity, genetic constitution, or other distinctive features; A prominent community landmark; A specimen associated with a historic person, place, event or period; A tree associated with local folklore, myths, legends, or traditions; A tree that is a remnant of different climate conditions or cultural practices.*

## Land Stewardship

*Stewardship is the recognition of our collective responsibility to retain the quality and abundance of our land, air, water and biodiversity, and to manage this natural capital in a way that conserves all of its values, be they environmental, economic, social or cultural. It is the active long-term management of lands and natural resources by focusing on specific land management practices. Elements of land stewardship include:*

- *Establishing goals and objectives for the land and developing measures and metrics of success.*
- *Defining strategies, including science-based actions, to meet goals and abate threats.*
- *Developing the capacity to implement through funding, cooperation, personnel, and commitment.*
- *Monitoring progress towards goals and adjusting actions according to results.*

## Land Stewardship Plan

*Comprehensive land management plan for a parcel or parcels prepared by or for Upton Land Stewardship Committee and approved by Upton Conservation Commission. The plan may or may not include a MA DCR approved forest management/forest stewardship plan.*

## Legacy Tree

*A legacy tree is defined here as a mature overstory tree which is generally larger and older than most trees within the local landscape. Legacy trees may provide large hollows or cavities that can be used for shelter and nesting sites, have large branches which provide horizontal and vertical structure within the canopy, and have dead branches which provide foraging habitat. They may provide habitat for uncommon insects, lichens, and other biota. They may be of aesthetic value and provide insights into land use history. When they die, legacy trees may provide habitat value as a large snag or downed log on the forest floor for many years.*

## Old Growth Characteristics

*Characteristics that are generally more abundant in old-growth forests include the following: a diversity of tree ages and sizes, including very large trees (> 25 inches in diameter); large downed logs, and gaps in the forest canopy.*

## Patch Reserve

*An array of legacy trees located in a well defined geographic location.*

## Rare Species

*Species of plants and animals that are officially listed as Endangered, Threatened or of Special Concern in Massachusetts and tracked by the Natural Heritage and Endangered Species Program. These are species considered to be at risk, or potentially at risk, of extirpation from Massachusetts, or at risk of global extinction. The Conservation Commission may choose to consider other uncommon species as “rare” when implementing this policy.*

## Snag

*A standing dead or dying tree.*

## Slash

*Slash”, tops, branches, damaged trees, slabs, sawdust from milling operations, or debris left from logging or land clearing operations.*

## Sustainable Forest Management

*The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems (definition adopted by Food and Agriculture Organization (FAO)).*

## Timber

*Wood in any of its stages from felling to readiness for use as structural material for construction. In general, it refers to felled trees, later milled into boards referred to as lumber.*

## Woodland

*Forest managed for multiple resources, including sustainable production of timber and fuelwood, wildlife habitat, and recreation.*

## Setback Guidelines

Resource	Recommended Protection	
	Management Zone (feet)	No Harvest Zone (feet)
Intermittent Stream	25 - 100	0 - 25
Perennial Stream	50 - 100	0 - 50
Wetland (BVW)	0 - 50	-
Isolated Wetland	0 - 50	-
Vernal Pool	100 - 600	0 - 100
Pond	25 - 100	0 - 25

Notes:

1. No harvesting within vernal pools and within 100 feet of vernal pools.
2. Within wetlands and the stream, wetland, and pond management zones maintain greater than 50% basal area and cut no more frequently than once every 20 years. A Variable width management zone (based on slope percent) shall be used when slopes adjacent to resource areas are greater than 10% (see MA Forestry BMP Manual).
3. Within the 100 to 600 foot vernal pool management zone maintain a minimum of 70% of the area greater than 75% canopy cover (or equivalent basal area) composed of trees at least 30 feet tall and a moist forest floor with deep litter and abundant coarse woody debris. Any portion of this zone containing less than 75% canopy cover shall retain at least 10 square feet basal area per acre of dominant/co-dominant tree at least 10 inches dbh. Harvesting shall occur only during frozen or dry ground conditions.
4. Additional restrictions may be required to protect rare species habitat. For purposes of this policy, rare species include but are not limited to, blue-spotted and marbled salamander, and wood and Eastern box turtle.
5. Follow all relevant BMPs recommended in the most recent edition of the MA Forestry Best Management Practices Manual and restrictions required by MA DCR forest cutting regulations.
6. Forest management may be considered in “No Harvest Zones” for eradication of introduced forest pests (e.g., Asian Long-horned beetle) and/or ecological restoration purposes.