Inventory of Old Pine Nook Road Parcel on the Pocumtuck Ridge, Deerfield, MA

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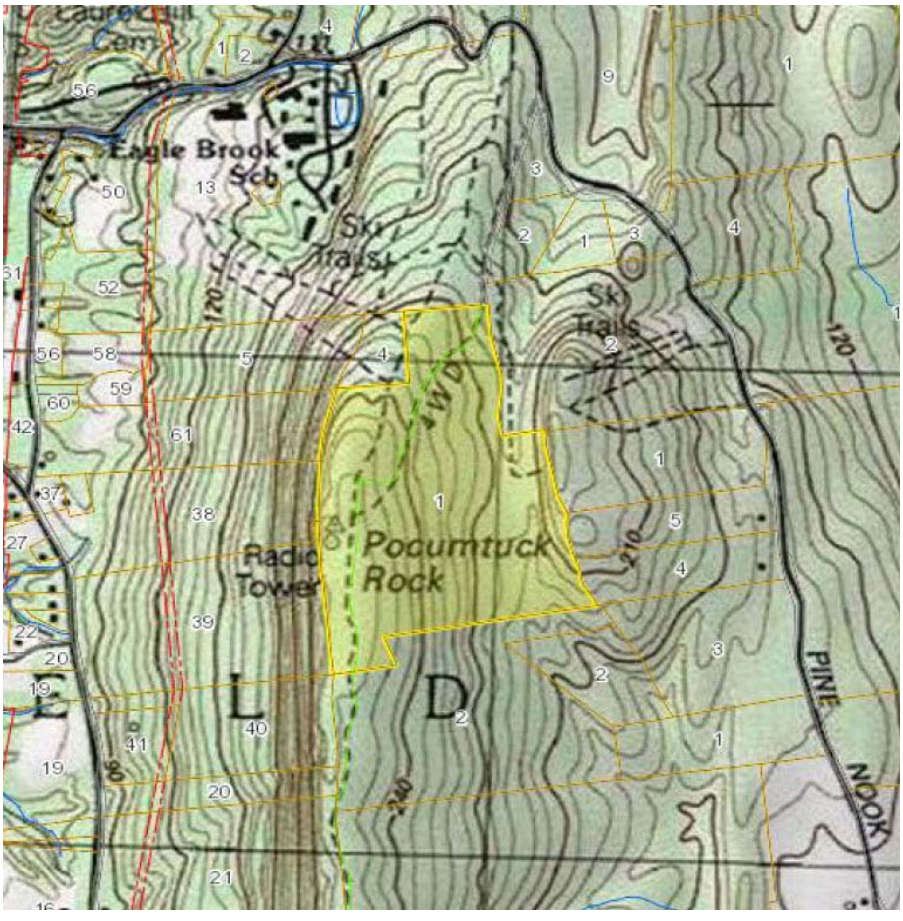
Prepared as a part of the Natural Resources Inventory of Local Lands Class

University of Massachusetts, Amherst

Department of Environmental Conservation

2012



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Purpose

In order to help the Town of Deerfield reach their goals and to inform their decisions concerning the Old Pine Nook Road parcel, we designed natural resources inventories to:

- Characterize the forest overstory – Oak dominated forest that covers the majority of the property. To measure the extent of the forest structure to understand the structural and compositional make up of the trees within the property.
- Characterize the forest understory – Identify the diversity and distribution of the properties herbaceous, shrub and vine layers.
- Determine wildlife habitat and unique features
- Find out the types of wildlife species using or likely using the property
- Recreational uses and identify user groups.
- Illustrate the connection between the community goals and what was identified in the inventory to help guide management decisions.

In addition, we collected information on the following information:

- History
- Landscape context
- Soils and geology
- Recreational use

The goal of this report is a comprehensive natural resource inventory that identifies the unique qualities that the Town of Deerfield holds on top of Pocumtuck Ridge. The inventory developed throughout the property can be used to better assess the broader landscape range that the property encompasses in Deerfield that serves as a guide when creating management objectives.

General Recommendations

Considering the community's goals and applying the information from the inventories and data collection, we have developed a number of recommendations that we offer at the start of this report in order to give the Town of Deerfield some additional information in order to help guide in the decision making process when outlining management goals.

This property has great potential for educational and outreach opportunities due to its location, accessibility, and its unique scenic features. These opportunities could include, community forest walks, wildlife viewing, recreation, and environmental education, among many other things. Below are some recommendations that could be used in order to maintain the Pocumtuck's natural features and make it a better learning experience for all to enjoy.

- Informational Kiosk constructed by the gate at the intersection of Pine Nook and Old Pine Nook roads. Ideas to what to include in the Kiosk:
    - Trail map
    - Qualities listed that make the property unique
    - Information on invasive plant species: how to identify them.
    - What wildlife to look for
    - Posting of upcoming events or news briefs: Show how public can get involved.

- Wildlife/Forest management considerations. When considering active forest management below are recommendations to keep in mind. The idea of these recommendations is to use them for educational uses. For instance, if a decision is made to create early successional habitat, signage can be used to explain what the purpose of the operation is for. After the operation an interpretive trail can go by the area explaining what to look for, i.e. specific wildlife, new herbs and seedlings.
    - Snags/cavity trees
    - Old growth habitat
    - Early successional habitat
    - Mast trees

- Citizen science monitoring
    - See Community Outreach Section page 50

- Maintenance of trails already established
    - Create trail steward group
    - Including not adding anymore trails

    - Installation of water bars on steep trails
    - Monitor unwanted off-road vehicle use

- Lock on gate to minimize traffic and erosion

General Property Description and Location

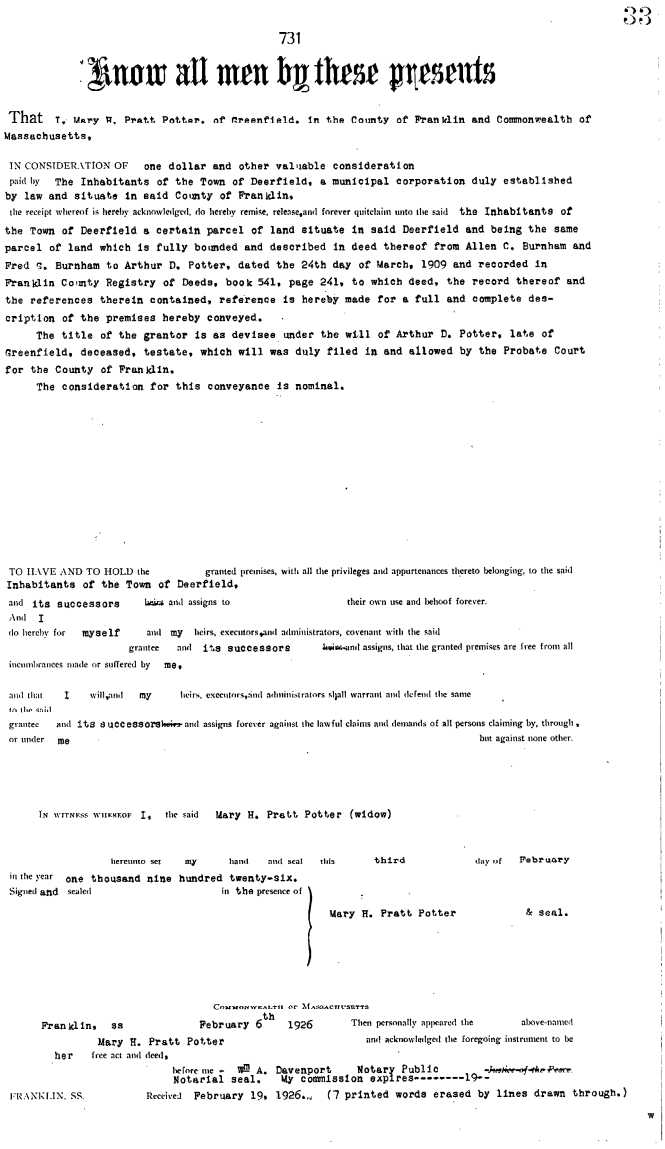
There is a gated access road (Old Pine Nook Road) off Pine Nook Road, which leads to the top of Pocumtuck Ridge, which provides the only road access to the parcel. The road serves as access to the radio/cell towers that include six structures located on top of the ridge known locally as “The Rock”. The boundary of the parcel begins approximately 1,400 feet up the access road from Pine Nook Road just before the chair lift on top of Eagle Brook ski hill.

The property is bordered a variety of abutter, which include; five individual property owners; one parcel by the Department of Conservation of Recreation; two parcels are owned by the Town of Deerfield; four by Eagle Brook School; and one by Deerfield Academy. Refer to the Town Of Deerfield Assessor website for parcel information:

http://www.deerfieldma.us/Pages/DeerfieldMA_Assessors/index.

Click on the ASSESSOR’S MAPS OUTLINE to search for maps that identify boundaries and information on abutters.

Property information can be found in the Franklin County Registry of Deeds in Book 731 Page 33.



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731

Know all men by these presents

That I, Mary H. Pratt Potter, of Greenfield, in the County of Franklin and Commonwealth of Massachusetts,

IN CONSIDERATION OF one dollar and other valuable consideration paid by The Inhabitants of the Town of Deerfield, a municipal corporation duly established by law and situate in said County of Franklin, the receipt whereof is hereby acknowledged, do hereby remise, release, and forever quitclaim unto the said the Inhabitants of the Town of Deerfield a certain parcel of land situate in said Deerfield and being the same parcel of land which is fully bounded and described in deed thereof from Allen C. Burnham and Fred G. Burnham to Arthur D. Potter, dated the 24th day of March, 1909 and recorded in Franklin County Registry of Deeds, book 541, page 241, to which deed, the record thereof and the references therein contained, reference is hereby made for a full and complete description of the premises hereby conveyed.

The title of the grantor is as devisee under the will of Arthur D. Potter, late of Greenfield, deceased, testate, which will was duly filed in and allowed by the Probate Court for the County of Franklin.

The consideration for this conveyance is nominal.

TO HAVE AND TO HOLD the granted premises, with all the privileges and appurtenances thereto belonging, to the said Inhabitants of the Town of Deerfield, and its successors ~~heirs~~ and assigns to their own use and behoof forever. And I do hereby for myself and my heirs, executors, and administrators, covenant with the said grantee and its successors ~~heirs~~ and assigns, that the granted premises are free from all incumbrances made or suffered by me, and that I will, and my heirs, executors, and administrators shall warrant and defend the same to the said grantee and its successors ~~heirs~~ and assigns forever against the lawful claims and demands of all persons claiming by, through, or under me but against none other.

In witness whereof I, the said Mary H. Pratt Potter (widow) hereunto set my hand and seal this third day of February in the year one thousand nine hundred twenty-six.

Signed and sealed in the presence of

Mary H. Pratt Potter & seal.

Commonwealth of Massachusetts

Franklin, ss February 6th 1926 Then personally appeared the above-named Mary H. Pratt Potter and acknowledged the foregoing instrument to be her free act and deed,

before me - Wm A. Davenport Notary Public ~~Justice of the Peace~~

Notarial seal. My commission expires--------19--

FRANKLIN, SS. Received February 19, 1926.. (7 printed words erased by lines drawn through.)

Land Use History: Native American to Present Day

In the 1600's, the Pocumtuc Indians inhabited much of the land in Deerfield along the Connecticut and Deerfield Rivers, and they used them as a prime food source for fish, game, and fertile soil for agriculture. At this time, it was approximated that there were about 5,000 members of the tribe that communicated with other surrounding tribes, such as the Mohawk, whom they feuded with, and the Mahican. The Pocumtuc tribe was allies with the Mahicans and frequently battled the Mohawks over ownership of territory. This controversy between tribes was only deepened when the Dutch arrived and there were trading pressures between the Mahican and Mohawk tribes; luckily, the Pocumtuc Indians did not bear the brunt of these battles because they were not directly influenced.

They did, however, suffer sufficient population loss that followed the arrival of the Europeans in 1633 and the following few years. "A major smallpox epidemic swept across New England in 1633-35, and at least 500 Pocumtuc fell victim to it" (Sultzman). The Pocumtuc continually lost members of their tribe to an ongoing war between many changing allies and opponents, including the Seneca and the Mohawk. This eventually, a year later, lead to the abandonment of Fort Hill, in Deerfield, Ma, the village of the Pocumtucs. The events after this continued to force the tribe out of the Connecticut River Valley. King Phillips War against the English settlers from 1675-76 was the breaking point for the Pocumtucs. Standing behind King Phillip, they first came off as a strong powerful army, but by the end, they had been defeated not only by English soldiers, but by famine and disease. This defeat drove what was left of the Pocumtuc population to New York and Canada, and many of the tribes lost their heritage as they all blended together in order to stay alive.

Picture 1 Native American Tribes

Although many recounts of the Pocumtucs end with their decline and dispersal, there are also legends referring to triumphant warriors who made names for themselves. After King Phillips war and many other battles, some Native Americans remained in the area, and one of which was a fierce war leader named Grey Lock, whom the mountain was named after. Also, when looking back to pre-settlement times, there are many Native American legends that are still talked about today, one of which is the giant beaver that they called Wequamps. After glacial lake Hitchcock was formed, there lived a giant beaver that ran out of food and began to eat the Pocumtucs so a brave "spirt man" named Hobomuck whom everyone admired and battled it and the body of the beaver was said to have sank to the bottom of the lake and turn to stone. Because of this, it is said they the range of mountains from Mt. Sugarloaf, with the body being the Pocumtuck range and Cheapside in Deerfield the tail. All of this information can be found at the www.pocumtuck.org website, along with others referenced.

Picture 2 Mountain Range

Evidence of settlement in Deerfield dates back to 1667, but the town wasn't incorporated until 1673. The early settlers learned quickly from the Pocumtuck, who had inhabited and controlled the area for thousands of years prior, to take advantage of the fertile soils of the Connecticut River and abundant game the land provided. Forestland was eventually cleared for agriculture and by 1790 half the land in the Connecticut River Valley was being used in this way. Deerfield itself grew, eventually becoming a prosperous agricultural community known for crops such as wheat, cucumbers and tobacco.

As mentioned previously, the forests have changed dramatically since the 1700's, beginning with the pre-settlement, old growth forest in the late 1600's and early 1700's. These forests were only disturbed by natural causes like hurricanes, fierce storms, insects, and many other factors. This brought diversity to the forest, allowing different species of trees to grow along side one another because of disturbances, the age classes of trees were also spread out, and the sizes also varied among stands. This opened up wide niches for wildlife because of the range of habitat suitable

and available. The only human disturbance was by the Native Americans, but their carbon footprint was miniscule compared to what followed them.

Between 1830 and 1880, European settlers had arrived and clear cut 60-80 percent of the forest for development and agriculture. This significantly impacted the wildlife, as expected because of the rapid loss of habitat and rural landscape that degraded the soils and overall quality of the environment. Herbivores that depend on mast or fruit trees would not have a food supply to survive on. Because of their decline, carnivores, as secondary consumers would not meet their metabolic needs either, and this would continue until there was not enough energy in the system to produce food and species diversity would be extremely low.

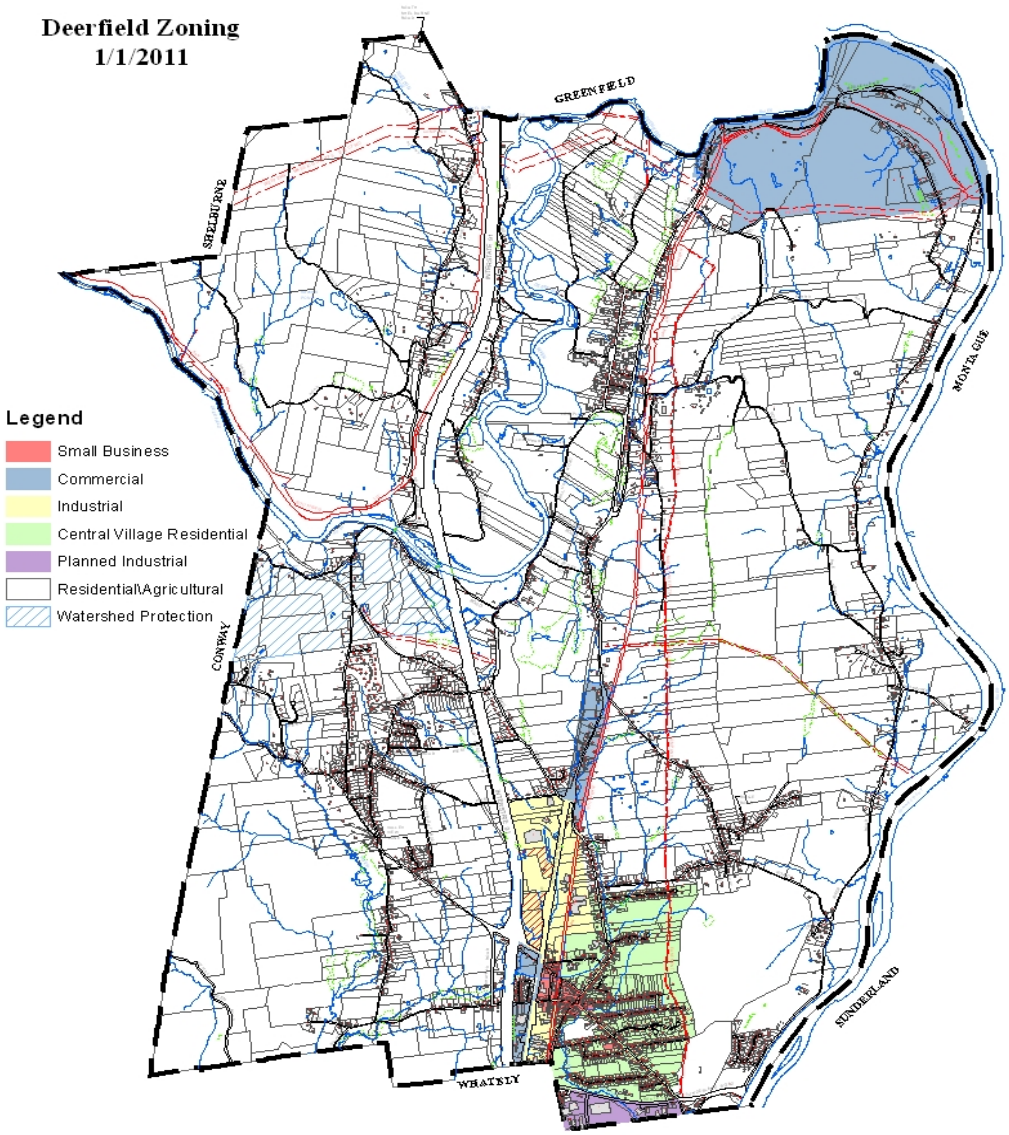
Picture 3 Harvard Forest Dioramas

Also, mentioned above, rapid farm abandonment occurred in the 1850's and continuing until the 1900's. Due to more fertile soil for farming in the West, the famous "gold rush" and transportation advances due to the industrial revolution. Because of the move West, the vast farmlands were able to redevelop, and were mostly dominated by the early successional species, White Pine. This abundance of Pine was seen as a new opportunity for those who remained in the area to make a profit. They were cut and shipped to saw-mills where they were then made into boxes used for shipping containers in the 1910's. This had a profound effect on the wildlife because they were beginning to reclaim some of their old habitat, and had it taken away once again. About five years after the initial cutting of the Pines, came the sprouting of mixed hardwoods like Oak, Cherry, Birch, and Maple. By 1930, the forest was developing into a mixed array of species with different height classes and continues to develop through the years. Although the forests are extremely young, they started to develop some of the diversity it once had, helping the wildlife species successfully increase in population size because of the resource abundance that they so severely lacked. For more about how the forests have changed throughout the years, see the Harvard Forest Dioramas at harvardforest.fas.harvard.edu/dioramas.

Picture 4 Harvard Forest Dioramas

Following the abandonment of farmland, the town, population wise, would eventually recover, its economy soon being defined by manufacturing and tourism. During the period of 1971-1997, the town's largest losses in area were seen in forest and cropland, its largest gains in residential developments. Unfortunately, because of this, we are facing many anthropogenic challenges and losing land due to sprawl. According to Mass Audubon's "Losing Ground" statistics, along the Connecticut River, there has been between 3 and 5.5 acres of new development per square mile added to the landscape between 1999 and 2005. This is not as severe as cities like Boston, but they are still in danger of being more and more developed because that open space is available. The town of Deerfield has only developed about 10-20 percent of its land, compared to Springfield, at greater than 50% right down the road. Through a program called CAPS, the Audubon website provides a map showing the loss in index of ecological integrity, or IEI. This map shows that between 1971 and 2005, Deerfield has lost 15 to 25% of its ecological integrity. What this means is that the amount of challenges wildlife face has increased over the years. Some of the areas of interest used in the study are connectedness between habitats, domestic animals impacts on wild ones, invasive species, and the list continues. Despite these facts, Deerfield still maintains its agricultural identity to this day, currently dedicating 24% of its land area to agricultural activities.

Landscape Context



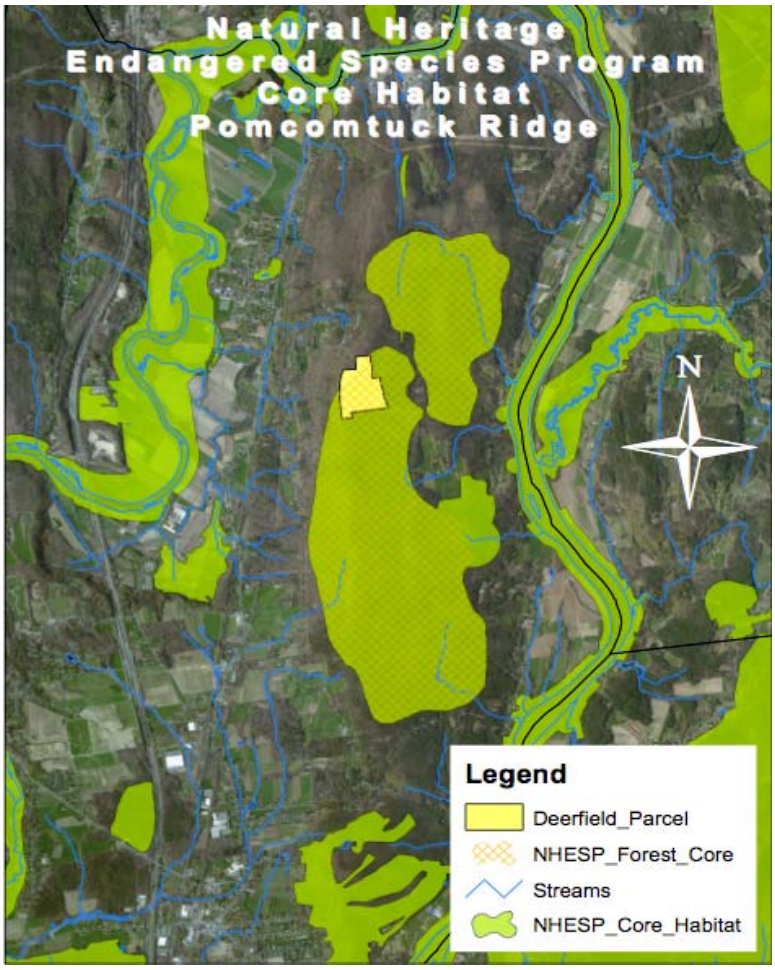
Map 1 .2001 Deerfield Zoning Map

Map:

Town of Deerfield Zoning Board of Appeals Website

The town of Deerfield contains a rich mosaic of landscape features within its 21,409 acres, while maintaining a population of approximately 4,750 people. Natural land, comprised of forests, wetlands and power lines, constitutes 62% of the town's area. Deerfield ranks sixth in Massachusetts in terms of agricultural area; approximately 20% of its total acreage is in use as cropland, pasture, orchard or nursery. It is important to note that Deerfield also is, comparatively speaking, one of the least developed towns in Massachusetts, with 11% of its land in development. The densest area of development occurs in the southern portion of the town, in the census-designated place (CDP) of South Deerfield. Population density is relatively low at 147 people per square mile. Consequently, open space is abundant within the town. Half of the total land area (50%) of Deerfield can be described as open space with some level of protection via conservation restrictions and tax easements. The vast majority (41%) of total land area is composed of privately owned farmland and forestland, suggesting that private landowners are the bastions of open space protection in the town. Between 1999-2005, 158 acres of natural land were converted to development, a number that ranks 116th out of the 351 towns in Massachusetts.

A great quantity of transportation corridors exist within Deerfield. Massachusetts Route 10 runs north-to-south through Deerfield connecting it with the towns bordering it in these directions, Greenfield and Whately. U.S. Route 5 runs concurrently with route 10 through Deerfield, providing access to Connecticut to the south and Vermont to the north. From Sunderland, Massachusetts Route 116 ends its concurrency with routes 5 and 10 in Deerfield and continues in a north-south direction to Conway. Interstate 91, a major highway, runs parallel to both of these routes and provides access to much of western New England, as well as a connection to the Massachusetts Turnpike.



Map 2 NHESP

The property surveyed lies within the Forest Core and Core Habitat as designated by the NHESP

Deerfield is located within the watersheds of three rivers: the Connecticut River, the Deerfield River and the Mill River, the floodplains of which provide excellent farming soils. The rivers, and their associated streams and wetlands, also provide a valuable matrix of aquatic areas that provide benefits to humans and wildlife. In contrast to these low lying aquatic systems, the Pocumtuck Range runs through Deerfield in the north-south direction. These mountains provide some of the largest blocks of contiguous forestland in Deerfield and it's surrounding area. The location of this 63-acre property within the Pocumtuck Range, surrounded by a mixture of developed and wild land, make the area ecologically significant. It has been recognized as such by the Massachusetts Natural Heritage and Endangered Species Program, designating much of this area as forest core habitat and critical natural landscape. These two designations identify the Pocumtuck Range as having significant amounts of intact land with mostly natural vegetation that is least disturbed by roads or other types of development. Currently, 7% of these core habitats in Deerfield are protected. The loss and fragmentation of habitat are some of the biggest threats to the loss of biodiversity. Thus, land like the Pocumtuck Range holds much ecological value and serves a number of functions that provide a host of values to the community surrounding it

Geology and Soils

Soils: The whole eastern aspect of the Pocumtuck ridge has little variation in soils composition due to its geological formation compared to the lowland fertile farmland below. The vast majority of the 63 acre parcel is comprised of Holyoke extremely rocky very fine sandy loams with a designated symbol (HxD). The western edge of the property has an (HxF) designation. Holyoke soils occur in very steep areas. Holyoke soils can be less than a foot deep with areas of outcrops of bedrock. Holyoke soil's have small moisture holding capacity. Holyoke soils on the property host upland oaks, northern hardwoods, and white pine. Tree species growing at such high elevations, with thin rocky soils, may produce less than desirable trees for a timber sale because they don't have ideal growing conditions. However, these trees play a key role in holding these soils together and protecting the property from erosion.

Along the entire eastern edge of property, there is a continuous drop in elevation moving north to south. As the elevation gradually lowers you will start to notice most of the same tree species but the trees will be larger and more vigorous. The reason being is the trees have better growing conditions where the soil is thicker, able to retain more water and nutrients. The soils on these lower elevations are called Cheshire extremely stony fine sandy loam. (CrD) (*See Figure 1 and 2*)

Symbol on Map	**Soil Name**	**Description of Soil**	**USDA Texture**	**Permeability** (In./hr.)	**Water Capacity** In./ In. of soil
HxD & HxF	Hadley extremely rocky sandy loam	2' or less depth.	Fine sandy loam / bedrock	.63"	.13-.20"
CrD	Cheshire extremely stony fine sandy loam	3-5' soil depth.	Fine sandy loam	2-6"	.13-.18"

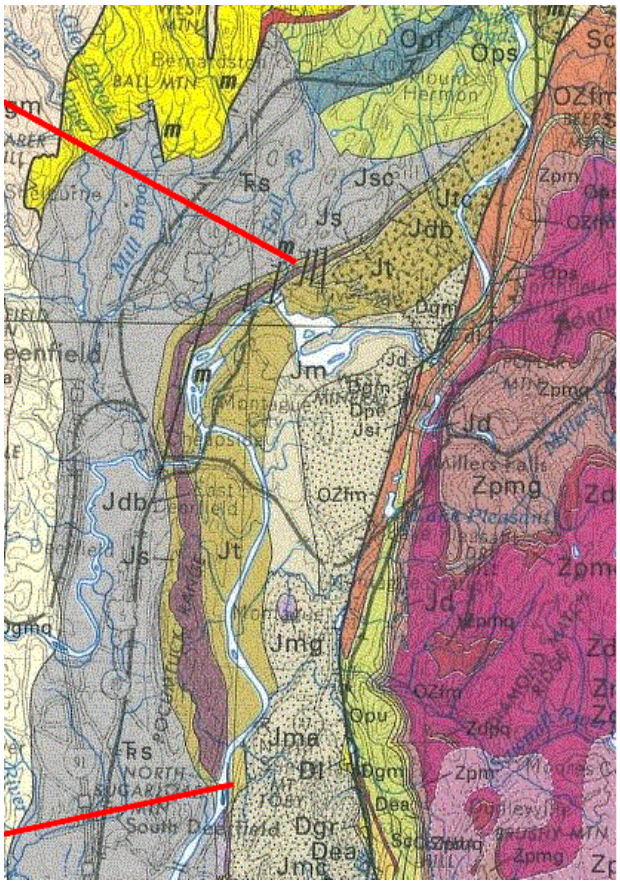
Table 1 Soil Attributes

The 63 acre parcel in the Connecticut River Valley in Deerfield developed over 200 millions years ago. Drastic temperature changes and geologic activity transformed the land. Glacial sculpting of the Connecticut River Valley formed during the Pleistocene age 1.8 million years

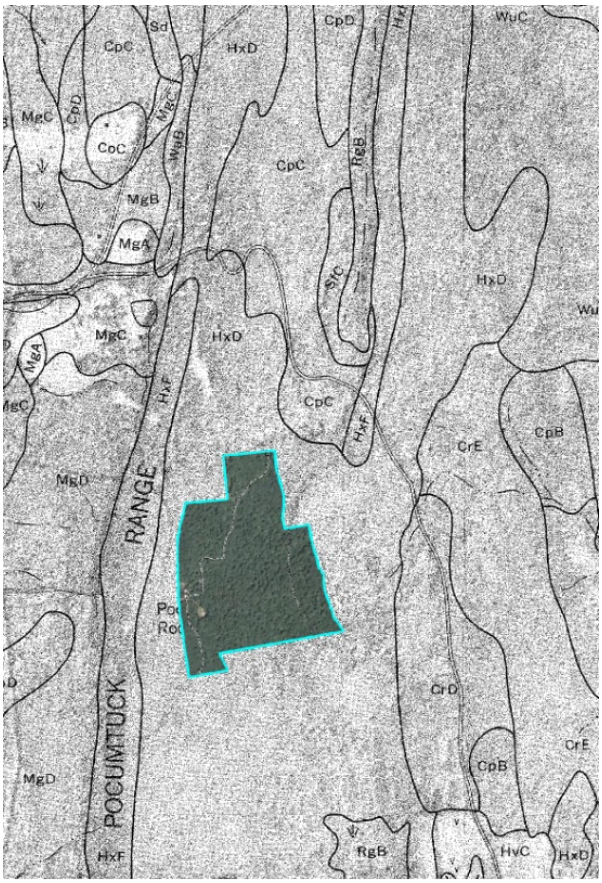
ago and molded sedimentary rock. A glacier, estimated to be two miles thick, scraped and wore deep grooves into the land, creating what are soon to be deep rich lowland glaciated soils of the Connecticut River Valley. When the glacier melted, Lake Hitchcock formed. Over thousands of years, sediments ran off the hills (Pocumtuck) surrounding Lake Hitchcock and collected on the glaciated lake bottom. When the lake drained, the rich sediments were left behind. The Connecticut Rivers carved valleys and terraces into these deep, varied glacial deposits of sand, gravel, silt, and clay.

The property along the east of the ridge has small variation in soil composition due to its bedrock geology and glacial history which in turn directly affects the components of soils composition which ties to species composition. The Pocumtuck mountain ridge that the property is a piece of encompasses some of the breathtaking scenic views with some of them being seen on this 63 acre property. (*See Picture 5*)

Picture 5



Map 3 Bedrock Geology



Map 4 1967 Franklin County Soil Survey Map 58

Most of the ridge consists of the Sugarloaf arkose (Brown, Blue-Gray). Traprock is (Purple) below bottom red arrow and extends north. but isolated outcrops of volcanic basalt occur on the eastern side and along the ridge's northern extension (Beige).

Bedrock: The Majority of the Pocumtuck ridge consists of sedimentary rock known as Sugarloaf arkose, which is a weather resistant rock capped in places by a thin ridge of volcanic trap rock. (*See Map 3*)

Natural Heritage classifies natural communities in Massachusetts in order to provide a basis for discussing and conserving the diversity of the types of vegetation in the state. Their purpose is to describe and prioritize natural communities of conservation interest in Massachusetts. On the Pocumtuck natural communities which include:

1. Acidic Rocky Summit/Rock Outcrop (ARS)

    This community type is found in scattered locations on the eastern slope of the Pocumtuck Ridge and on the crest of the west- facing ridge, south from Pine Nook Road. Scattered open rock, little vegetation, soils are very thin and acidic are also characteristics of this particular. ARS soils will host low ph and very low water availability for plants. ARS soils near the radio tower favor Lichens and Moss which do not require a lot of water and nutrients. The Lichens cover the rocks and soil on level ground near the radio tower as patches on steep slopes below the chestnut oaks.

2. Isolated Outcrop

    An isolated rock outcrop on the eastern aspect of the Pocumtuck Ridge Natural Heritage stated to contain a large population of Rock Spikemoss. Spikemoss is on Natural Heritages Plant Watch List, but was currently delisted, so it is a plant of concern. (*See Picture 6*)

Picture 6 Rock Spikemoss

Forest Inventory

Introduction

The west portion of the property runs in a north south direction following the steep cliff associated with Pocumtuck Ridge. Despite the ridge line the majority of the property is on the east slope of Pocumtuck Ridge. Much of the soil is thin, acidic and the underlying bedrock is identified as a 200 million year old sedimentary rock known as Sunderland Arkose, with exposed trap rock or volcanic basalt on the southeastern extent of the property. The steep cliff of the ridge identifies the western extent of the parcel boundary. Much of the slopes across the ridge are covered in glacier till.

The dominant tree species is northern red oak (*Quercus rubra)* with black/sweet birch (*Betula lenta),* red maple (*Acer rubrum*) among the oak species. Some hemlock are scattered throughout the parcel becoming more dominant closer to the southeast corner of the parcel. See species list below. Although other species were observed, they did not fall within the inventory plots and thus not included in the inventory—pignut hickory (*Carya glabra*), striped maple (*Acer pensylvanicum*), black oak (*Quercus velutina*), and american beech (*Fagus grandifolia*).

Inventory Species List: Town of Deerfield Old Pine Nook Rd.

northern red oak (*Quercus rubra*)
paper birch (*Betula papyrifera*)
sweet birch (*Betula lenta*)
white oak (*Quercus alba*)
chestnut oak (*Quercus prinus*)
eastern white pine (*Pinus strobus*)
eastern hemlock (*Tsuga canadensis*)
red maple (*Acer rubrum*)

Table 2 Tree Species List

Forest Inventory

The overstory forest inventory was conducted using a variable radius plot method. A sampling intensity of 5% was determined to estimate sampling accuracy with transects established running west to east to cover the slope gradient of the property. Once plot center was distinguished a wedge prism with a basal area factor of 10 was used to conduct the inventory. Each tree that was considered "in" was identified by species; Diameter Breast Height (DBH) was measured; and merchantable log length estimated. Each plot represents 1/10 of acre. Calculations were extrapolated to a per acre basis with NED 2 software provided by the United States Department of Agricultural Forest Service (http://nrs.fs.fed.us/tools/ned/products/ned2/). The graphs below describe the estimated structure and composition of the overstory stand according to basal area and volume. See images below that illustrate basal area.

Species	Mean Diameter	Trees/acre	Basal Area (Ft^2/acre)
Red Oak	15.29	58.88	80
Red Maple	7.85	38.93	11.11
Black Birch	8.41	70.45	18.33
Chestnut Oak	14.28	6.76	7.22
White Oak	13.39	5.18	3.89
Hemlock	10.54	14.99	6.10
White Pine	10.33	3.29	1.67
Paper Birch	8.88	5.59	2.22

Table 3 Forestry Parameters

The parameters above—diameter, trees/acre, and basal area are measures used in assessing the growth qualities in trees. For instance, basal area the cross section, see figure 1, of a tree is measured in units of square feet per acre. The amount of basal area in a stand is a function of the number of trees and the size of the trees. As such, it is a measure of the overall level of competition for resources between trees in the stand, and it is frequently used to determine whether a stand should be thinned (Smith et al. 1997). Acquiring such measurements allows one to determine how well stocked the forest is. These stocking level measurements—basal area and trees/acres—provide the necessary information needed to assess the growth of the stand or forest.

Upon assessment of stocking levels silviculture prescriptions can then be made to improve the growth of the forest.

In general the species composition is dominated by northern red oak consisting of the largest basal area of 80 square feet per acre with approximately 59 trees per acre. Black birch, primarily found in the understory, shows to have more trees per acre at 70, but with a much smaller basal area of 18 square feet per acre. In regards to mean diameter size the oak species illustrate larger diameters indicating that they are more established than the smaller diameter black birches and red maples. Oak species are shade intolerant indicating that past land use might have played a part in its establishment. This area may have been cleared once allowing full sun exposure for the oaks to grow. Black birch and red maple are shade tolerant, which explains the midstory composition of these species and that they grow under the shade of the oaks. Note, in some cases smaller trees could be just as old or older but growth had been suppressed for some reason or another.

Below are tables that describe the forest stand statistics in more detail that include wood volume in tons; board feet per acre; and total biomass in tons per acre. See page 57 in the appendix to view the entire results from the inventory.

Estimated Totals per acre

Name	Value
Stand ID	Deerfield
Stand area (ac)	63.0
Basal area (sq.ft/ac)	115.0
Gross board-foot volume (bd.ft/ac)	7658.57

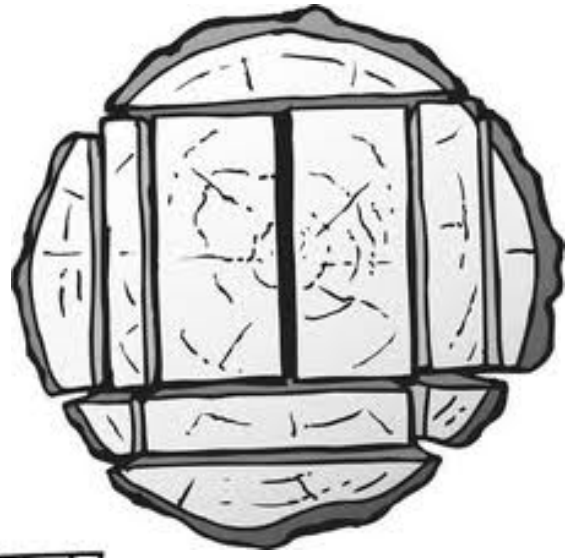
Name	Value
Gross cord volume (cords/ac)	32.28
Gross tons (tons/ac)	64.56
Total biomass (tons/ac)	102.73

Table 4 Estimated Forestry Totals

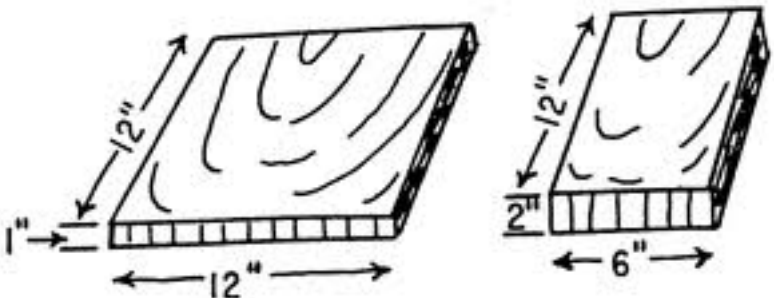
The average basal area (the cross-sectional area of a tree at 4.5 feet above the ground) is approximately 115 sq ft per acre or 9,765 sq ft across the entire parcel. Gross board foot volume (see figures below), which is the unit for most merchantable timber that is sold on a board foot basis estimated at 7,659 bf per acre. See figure 1 for board foot example. Extrapolated to the entire 63 acre approximately 482Mbf were Mbf unit is thousand board feet. In terms of total biomass the trees weight are approximately 103 tons per acre, or 6,489 tons across the whole extent of the property. Additionally, on average there are 195 stems per acre, were stems are

referred to as single trees. Again, the calculations above begin to paint a picture of the growth processes of the forest and aid in forest management considerations.

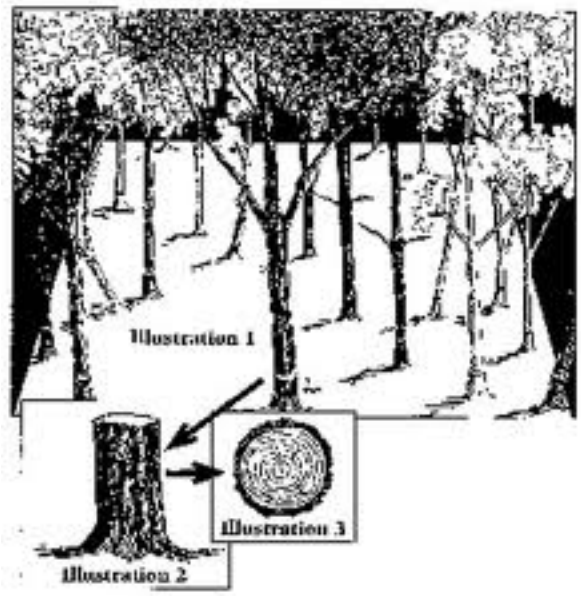
Picture 5: illustrates a board foot unit and how it can be cut from a sawlog or tree.



Picture 7 Cut Boards from Tree



Picture 8 Board Foot

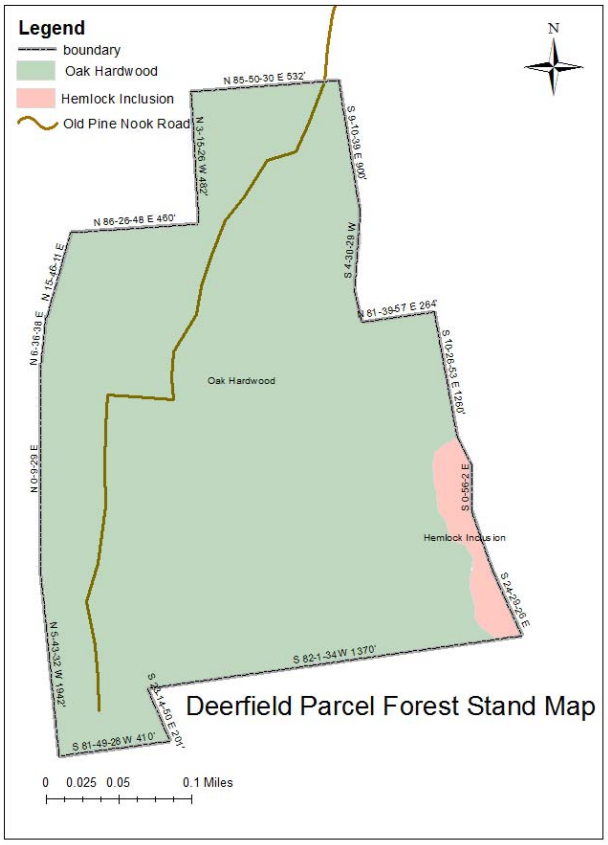


Picture 9 at right: Example of Basal Area measured 4.5 feet from the ground.

Picture 9 Basal Area

Discussion

The top of the ridge consists of a good mixture of northern red oak and some chestnut oak species that area a function of the acidic rocky soils with this section of the parcel. From the top of ridge going east along the gradient of the slope chestnut oak gives way to the dominant overstory northern red oak as the soils begin to transition into circumneutral rock cliff type. Some red oak trees measured up to 22” in diameter and 100’ high. Black birch and red maple are interspersed among with the red oak comprising much of the midstory structure and composition. The bottom of the parcel at the most eastern extent flattens out before a large volcanic trap rock outcrop. The parcel boundary ends at the beginning of the rock outcrop as it climbs to the top of the “Forgotten Deerfield Academy Ski Hill” to the east.



Map 5 Forest Stand Map

Here in the transition zone from the eastern slope to the ledge outcrop this small valley bottom contains an eastern hemlock inclusion. This section of the parcel is less exposed and is afforded more shade and cooler microclimate due to the rocky outcrop shade cover. This transition from the east slope to a west facing slope—but shaded out from the ridge above to the east—experiences the most tree diversity of the property. Although this area comprises on a small valley of sorts, there is no hydrologic features of any kind observed in this area. In times of heavy rain this area may accumulate pools of water and it may flow south along the contours of the terrain.

The property lacks tree regeneration and certainly has almost no oak regeneration throughout the property. The top of the ridge—that has experienced the most disturbance due to the radio structures and access road—has the majority of tree regeneration that consists primarily of black birch and red maple. Striped maple (*Acer pensylvanicum*) is found throughout the ridge top, which is short lived and rarely grows higher than 25 feet.

The cause for the lack of oak regeneration has mostly to do with over browsing from white tailed deer and that the area is not exposed to much disturbance needed to such regeneration to occur.

Shrubs

The dominant understory plant species is Mountain laurel (*Kamlia latifolia*), which is prevalent throughout the property. Some witch-hazel (*Hamamelis vernalis*) was observed on the eastern most extent in the small valley bottom but seemed generally restricted to that one area. These two shrubs species inhibit tree regeneration by outcompeting and shading out necessary resources for tree growth.

Dead Wood or Coarse Woody Debris

Although numbers were not collected on the snags (dead standing trees) and cavity trees (trees that are used to tree nesting animals) they were evident throughout the property. Snags and cavity trees ranged in size from 6 to 15 inches in diameter breast height. Another term, coarse woody debris (CWD) can range from a dead standing tree to an almost completely decomposed tree on the forest floor. See picture 10. Coarse woody debris recycles nutrients back into the soil through decomposition and hosts a variety of detritus and insects. Furthermore, this type of structure creates critical habitat for reptiles, amphibians, and provides seedbeds for plant and tree species. See wildlife section on the importance of snags and cavity trees.

Picture 10 Example of coarse woody debris

Forestry Considerations

If the town of Deerfield were to take the step towards active forest management below are some recommendations to consider.

One consideration to forest management is managing for wildlife habitat. There are many ways to approach this. First, the town must decide what kinds of wildlife to manage for. For instance, some species prefer forests that have old growth characteristics and others prefer early successional habitat. Early successional habitat can be defined as the grasses, shrubs, and seedlings that grow into young forests.

These considerations must be put into a landscape context. First by understanding the historical land use of the property to ascertain why certain species grow there and what might be the results of management practices, i.e. knowing how the property has been used in the past, present, and

the future. Much of the forests in Massachusetts are relatively young—80 to 100 years. The region lacks old growth forests as well as early seral, or very young forest characteristics. Putting the property into a landscape context can assist in deciding what might be the management goals of the property.

Generally speaking the property is part of a larger forest core along the Pocumtuck ridge. The property and much of the eastern aspect of Pocumtuck ridge is identified as one homogenous stand type of mixed oak species. As mentioned in the forest inventory section of the report there is almost no oak regeneration and much of the midstory structure is black birch and red maple.

Early Successional Habitat

One method of forest management practice would be to try and create early successional habitat for songbirds and other species such as ruffed grouse that are in significant decline (Clayton et al. 2011). Since oak is a sun loving species, this type of management may also be able to regenerate oak. Creating small canopy openings of 1 or 2 acres by removing a selection or group of trees close to a seed source, such as a large oak species, can do this. The harvest of trees will disturb the soils (depending on the time of year)—which is good for oak regeneration—and the new growth from the new sunlight reaching the forest floor will fill in with shrubs and seedlings (early succession) that is preferred habitat for many wildlife species. Indeed, this type of forest management will diversify the properties forest structure and composition, thus diversifying wildlife habitat.

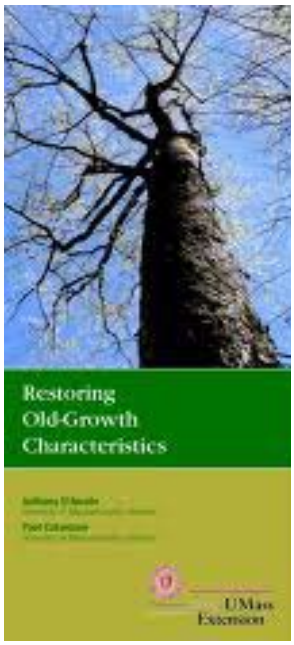
Picture 11 Early Successional Habitat in Harwick, MA

Below are is an excellent resource for managing for early successional habitat:

Managing Grasslands, Shrublands, and Young Forest Habitats for Wildlife: A guide for the Northeast.

http://www.wildlife.state.nh.us/Wildlife/Northeast_Hab_Mgt_Guide.htm

Old-Growth Characteristics



Picture 12 Restoring Old Growth brochure: Umass Extension can be found at www.masswoods.net

Another approach is to manage for old-growth characteristics. Massachusetts forests are relatively young and the state has limited old-growth forest, therefore not a lot of structure one would find in old growth forests such as diversity of very large trees and sizes, and deadwood either standing or on the forest floor. Although old-growth cannot be recreated, it is possible to restore structure that is missing from our current forests. There are ways to promote tree growth by removing trees around an area of a desired tree, or trees, that increases the resources for tree growth. For instance, to increase growth and mast productivity (acorns) of oak species one can remove other competing tree species—such as the black birches, red maples, or other oaks that are defected—around the oak species to increase productivity. The increase in productivity will provide food for wildlife and a much needed seed source for oak regeneration. Additionally, in combination to single selected, or group selected tree removal, another step would be to create cavity trees for wildlife. This approach involves the girdling of trees that stops the tree from transporting nutrients, where the end result is a standing snag that will be used for certain cavity nesting animals.

It is important to note that this kind of management (whether it is active or passive management) takes decades to begin to see results. In areas that all ready have these features are the areas where this type of management should take place. Identifying such areas has its limitations and might not to effective across the entire property.

Additional Benefits

An additional benefit to active forest management is the activity of a harvest can knock down much of the mountain laurel found throughout the forest. Mountain laurel forms dense thickets (clonal shrub) that replace the herbaceous layer of the forest floor that excludes the establishment and development of oak reproduction. By disrupting or removing the Mountain laurel it will provide the necessary space and resources for new tree establishment. The slash associated with harvesting will provide coarse woody debris habitat for additional wildlife species such as amphibians and reptiles as well as detritus and insects.

By thinning out undesirable trees to make room for new ones will improve the conditions for optimal tree growth conditions that improves the overall resilience of the forest. Depending on the objectives, the wood removed from the property can be used and promoted locally as a sustainable renewable resource.

Do Nothing Approach

Natural disturbances such as windthrow (trees blown down), ice and snow storms will eventually happen, and when they do it will provide the necessary disturbances that create similar situations, such as canopy openings, as mentioned above, which can diversify the structure and composition of the forest. For instance a strong wind can topple a group of trees that disturbs the soils and create a opening in the canopy that allows the sun to reach the forest floor. This can be good for oak regeneration. The toppled trees will provide the benefits derived from deadwood on the forest floor such as wildlife habitat and nutrient recycling. This option can be valuable when considering management opportunities especially in an area that has so much recreational use.

Picture 13 Example of Coarse Woody Debris

Understory Forest Inventory

Introduction

The structure and composition of forest understory communities can be easily overlooked, yet is integral to the complete understanding of the forest community as a whole. Wildflowers, herbs and shrubs are a few of the life forms that exist under the forest canopy that provide food and shelter to wildlife and aesthetically pleasing scenery to recreational users of the forest. The diversity of the species present in a community is a good proxy of the resiliency of that community to disturbance and other stressors. A greater number of species increases the chance that a community can maintain its integrity if one species is eliminated or greatly weakened. This idea takes on greater importance as invasive insects like the Hemlock Wooly Adelgid and Emerald Ash Borer threaten entire populations of Hemlock and Ash trees, respectively. Non-native, invasive plant species pose a threat to the health of any ecological community as they outcompete and replace native species. The understory vegetation of the 63-acre property was surveyed to accomplish three goals:

- Provide a snapshot of the structure, composition and diversity of the understory vegetation on the property
- Obtain a baseline estimate of understory vegetation to aid in future monitoring
- Detect the presence of invasive species

The property surveyed lies off of Old Pine Nook Road and contains varying elevations along an east-facing slope. The property is bisected by a dirt access road and contains a small network of trails that experience heavy recreational use. The overstory is predominantly oak (red oak, chestnut oak, white oak), with some maple and birch. An eastern hemlock inclusion was observed in the southeast corner of the property.

Understory Inventory

To inventory the community, a series of 4m x 4m square plots were established at 15 of the 31 points used in the timber survey. In each plot, the following data was recorded: a list of all species present within the plot and the number of individuals of each species (defined as stems rooted in the plot). Using this data, the following community attributes were calculated: species richness (the total number of species present), frequency (number of times a species is present in a given number of plots), and density (the number of species present per unit area). A community diversity index is also provided in the form of the Shannon Diversity Index.

A total of 10 species were encountered throughout the 15 plots. Species richness was comprised of:

Mountain Laurel (Kalmia latifolia)
Sheep Laurel (Kalmia angustifolia)
Witch Hazel (Hamamelis virginiana)
Maple-Leaf Viburnum (Viburnum acerifolium)
Low-Bush Blueberry (Vaccinium angustifolium)
Tree Clubmoss (Lycopodium obscurum
Wintergreen (Gaultheria procumbens)
Canada Mayflower (Maianthemum canadense)
Partridge Berry (Mitchella repens)
Common Yellow Wood-Sorrel (Oxalis stricta)

Table 5 Understory Species List

Picture 14 Mountain Laurel (Kalmia latifolia) in bloom

Picture 15 Tree clubmoss (Lycopodium obscurum

The most frequent species found were mountain laurel and tree clubmoss. Mountain laurel was present in every plot; clubmoss was recorded in 60% of plots. The least frequent species were: sheep laurel, partridge berry, and common yellow wood sorrel, each exhibiting a frequency index of 6.7%. Density, referring to the number of stems of an individual per unit area, did not follow the same pattern. The densest species in the understory of the property was low-bush blueberry, with a density of 6.17 individuals per $10m^2$. This was followed by tree clubmoss and mountain laurel with densities of 4.6 and 4 individuals per $10m^2$, respectively.

Picture 16 A dense stand of mountain laurel (Kalmia latifolia) as seen from the interior of the forest

	Frequency Index	Relative Frequency	Density (Stems/10m^2)	Relative Density
Mountain Laurel	100%	31.0%	4.0	18.3%
Tree Clubmoss	60.0%	18.0%	4.6	21.2%
Low-Bush Blueberry	46.7%	14.1%	6.2	28.2%
Wintergreen	33.3%	10.1%	1.9	8.9%
Maple-Leaf Viburnum	26.7%	8.2%	0.4	1.9%
Witch Hazel	26.7%	8.2%	0.7	3.0%
Canada Mayflower	13.3%	4.1%	2.6	12.0%
Sheep Laurel	6.7%	2.1%	0.2	0.8%
Partridge Berry	6.7%	2.1%	1.1	5.2%
Common Yellow-Wood Sorrel	6.7%	2.1%	0.08	0.4%

Table 6 Frequency, relative frequency, density, and relative density values for each species encountered

The Shannon Diversity Index is the most commonly used index of diversity in ecological studies. It takes into account not only the number of species present, but also their abundance relative to each other. A community consisting entirely of 1 species will have a Shannon Index of 0. More species will lead to a higher Shannon Index. This measure of diversity emphasizes evenness, meaning that a community containing 5 species with 5 individuals of each will have a higher index than one containing 5 species with 15 individuals of one species and 2 individuals of the others. Scores can range from 0-5. Typical values range from 1.5-3.5 The Shannon Diversity Index for the understory on this property based on the data collected from 15 plots is 1.86. To reiterate, this number was calculated solely for the understory community, the number would undoubtedly be higher if calculated for the entire community, including overstory trees.

Conclusions

Frequency is an attractive and useful attribute for describing plant communities. It is defined as the number of times a species is present in a given number of plots. For the purposes of this report it has been expressed as a percentage. It is easy to obtain and easily comparable between and within communities. However, it is easily influenced by the size and number of plots used. The same advantages and pitfalls apply to density. Therefore, care should be taken when declaring these values absolute. Nevertheless, the community attributes presented in this report do accurately describe the understory on the property.

Picture 17 Canada mayflower (Maianthemum canadense) is a common wildflower throughout the property and grows in dense patches

Witch hazel is the dominant tall shrub, growing in dense clusters of stems that reach 10-15 feet in height. It occurred mostly in the interior of the forest. Striped maple (Acer pensylvanicum), while treated as a small tree for the purposes of this report because of the height it is able to obtain, was very frequent and comprised a lot of the understory, each individual attaining various heights. Just below that, Ericaceous shrubs dominate. Members of the Ericaceae, or Heath, family: mountain laurel, low-bush blueberry and wintergreen were the dominant species of their respective layer. This family of plants thrives in acidic soils, providing a hint to what the pH of the substrate may be. They are also a major component of the Oak-Heath Forest plant community, consistent with what is seen in the overstory. While differing in frequency, tree clubmoss and Canada mayflower exhibited fairly high densities. These plants often grow in large patches due to their proliferation via rhizomes, which are modified underground roots capable of sending up shoots through the soil. Maple-leaf viburnum was also present, albeit as young individuals and in relatively low densities.

Picture 18 Common Wintergreen (Gaultheria procumbens) A common, low-growing shrub found throughout the property. Its leaves and fruit persist through the winter providing valuable forage for wildlife.

In an effort to describe the plant community as accurately as possible, observations about the community were made while traversing the property and between plots. None of the plots used

fell in or around the access road or trails. Despite this fact, a number of plants were found on the side of the access road that were not found anywhere else on the property. Red raspberry (Rubus idaeus) was frequent along road edges. Bracken fern (Pteridium aquilinum) was noted as occurring in isolated bunches and Christmas fern (Polystichum acrostichoides) was seen as an individual, though not frequent. Invasive species were not counted in any plots, but individuals of multiflora rose (Rosa multiflora) and Morrow's honeysuckle (Lonicera morrowii) were observed on trail margins.

Considerations

Diversity is a key component of any ecosystem, but not the only component. Despite the low diversity index of the understory community, the vegetation present contributes greatly to the vitality of the ecosystem. The varying heights of vegetation under the canopy provide structure and cover for an array of wildlife. The evergreen nature of mountain laurel ensures that this habitat persists throughout the winter. The fleshy fruits of small shrubs like low-bush blueberry, wintergreen and partridgeberry can supply food for birds mammals. Furthermore, the vibrant, cup-shaped flowers of Mountain Laurel are a sight to behold for recreational users of the property in late spring and early summer.

Non-native, invasive plants were observed on the property. Though not abundant, one of the qualities that make some non-native plants prone to invasion is their ability to set seed and reproduce quickly. Monitoring of the plant community can detect important changes in vegetation, including invasive species. This can be done informally, through "citizen scientists" documenting and reporting their presence using the new "Outsmart Invasive Species Project" application for iPhones and Androids, or formally by coordinating monitoring efforts using community volunteers or local students engaging in a form of environmental education. The information in this report can aid these efforts by providing a sampling protocol that could be altered to fit time and labor constraints, as well as baseline data on the community for comparison of results. An informational kiosk at the entrance of the property can provide visitors with information on the plant community they are about to observe, as well as information on invasive species, the threat they pose, and actions they can take to mitigate their impact.

Picture 19 Multiflora Rose (Rosa multiflora)

Picture 20 Morrow's honeysuckle (Lonicera morowii)

Increasing the diversity of the understory community is an option. Any silvicultural treatment that opens up gaps in the canopy will create opportunities for various herbs, grasses and shrubs. However, it is important to note that these disturbed gaps are also hotspots for invasive plant species and, if silvicultural treatments were employed, monitoring of those areas would take on greater importance.

Wildlife Inventory

Introduction

Throughout the semester, our class conducted a wildlife survey on the 63 acre parcel of land in Deerfield, Ma. The wildlife inventory was done by setting out several camera traps along parts of the land to capture medium/large sized mammals. For those that weren't so easily caught on camera, we maximized our range of species by also placing baited track plates that smaller mammals can get into in order to leave their tracks behind while investigating the bait at the end of the trap.

We put in a series of point counts randomly along transect lines in order to listen for birds and develop a species list also. With the results of these different methods of counting wildlife, we are able to provide information that, if analyzed further, can be used for habitat assessments with regards to specific species and their particular needs, like cavity trees for birds for example. This is extremely important when thinking about species diversity, because it is a crucial part of a complete ecosystem.

Also, this inventory will point out certain key species that are threatened or endangered and have a possibility of occurring on this parcel of land, or that currently persist in the area. The area can then be managed, actively or passively, in a way that will increase the diversity and existence of some of those threatened or endangered species if chosen to.

Habitat

Throughout the 63 acre parcel of land, many different habitat features occur, giving a wide range of wildlife the opportunity to persist within it. Some of the features include a rocky ridge, Oak/hardwood forest with a coniferous inclusion, the Connecticut and Deerfield Rivers, and also the vast farmland that surrounds the parcel. The surrounding areas in the valley exhibit a similar variety of tree species, which means wildlife species that use the forests can transition easily between forest boundaries if not fragmented by human or naturally caused disturbances. These special features are very important to an ecosystem because they act as microhabitats that certain species depend on

Picture 21 Coyote

and cannot persist without. The rocky outcropping can be very important for migratory birds, hawks, reptiles, and small mammals which use it for hunting throughout the farmland below, nesting, and for shelter. The Peregrine Falcon, for example, is an endangered species that depends on rocky ledges for nesting, which is important to it's survival and reproduction. The riparian areas that boundary both rivers surrounding the parcel serve as critical habitat for predatory birds and bring a vast variety of species during migration seasons. The mix of forest and farmland shows that there is an extremely diverse community within the surrounding areas of the parcel. The spread of forest types provides cover to wildlife in different seasons, conifers providing the most cover in winter, for example. The farmland provides food and access to riparian areas for predatory birds like Red-Tailed Hawks feeding on mice and other small rodents. The dirt access road through the parcel can also be used by wildlife as a "path of least resistance" for larger predatory species such as coyotes. All of these features connect into an ecosystem usable by many species in various parts of their lives depending on their needs.

Picture 22 Camera trap on Tree

Wildlife Inventory

- **Cameras**

We used a total of three cameras all placed at different spots throughout the parcel, as shown on the map at the end of this section. They were placed specifically on low-lying areas where we had previously seen many scats and tracks of mammals, mostly deer. We did not predict much wildlife would occur on the ridge, with the exception of birds because it is a steep slope with no water sources,

Picture 23 Female Deer smelling bait on stick

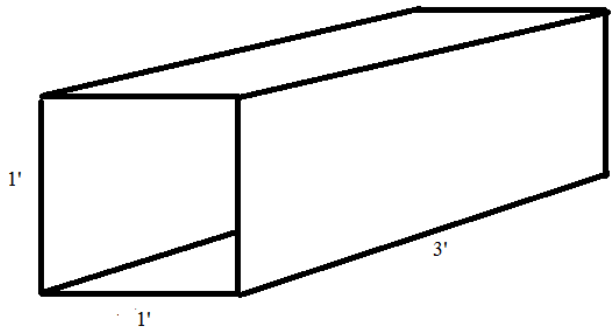
and also a large amount of anthropogenic activity because of the cell phone tower and hiking trails. One of the cameras was placed on the boundary of the property near a vernal pool that the wildlife would use as a water resource. The first two were in the field for roughly a month, and the last week, the third was set out and put on video to record active movements. In order to maximize our results in such a short time, we used bait to attract the wildlife surrounding the cameras. The bait used was made by O'Gorman Long Line Lures and it is a paste-like lure that is spread on the tree above and about 5 feet above where the camera is placed. We did this in order to attract both small and large mammals and spread the scent out in all directions for as far a distance as possible. After spreading the lure on the tree, we then placed the stick used in the middle of the open area in the ground to concentrate activity around this scent (See Picture 21). There were many important considerations that we took into account while placing the cameras also, like making sure they are facing North and South in order to avoid glare from the sun and pictures of shadows devoid of wildlife. We also made sure that the space we placed the camera was wide open enough that simple branches swaying in the breeze would trigger the cameras. For more information on how to set wildlife cameras refer to this article written by Kevin Heath: wildlifenews.co.uk. If this section of the inventory is something that would interest a school or class, follow the steps listed in the article and bait the area surrounding the camera for best results.

- **Point Counts**

Point counts were used to develop a species list of birds in the area. Along previously delineated transect lines, we chose ten point counts in order to inventory the relative abundance of birds on the parcel. These points are spaced 850 feet apart vertically (E-W) on lines 2, 4, and 6, 275 feet on lines 1 and 2, and on lines 3 and 5, roughly 1,100 feet . The reason we chose to space the points East to West was because the parcel shows the most diversity in topography, so we would be less likely to hear one bird more than once and also because the diversity of the species will change with elevation. This is intended to be a random sample, and these point counts are spaced out relative to the number of points next to them and length of the transect line, for example, lines 1 and 7 only have one point on them because they are only about 500 or so feet long. Horizontally (N-S), the points are relatively all spaced out about 550 feet apart. These points can also be illustrated on the map at the end of this section. If sampling for an estimated abundance of species, the points should be spaced out far enough that one will not hear the same bird twice, but our parcel size is relatively too small to eliminate that bias. At each point, we listened and recorded all birds heard or seen within a five minute period. In order to repeat this activity, it is important to have a reliable GPS unit or navigational instrument, such as a compass. The points are set out randomly, and the only birds that are counted are ones seen or heard at those points, so there are surely many species that we missed, but as a part of our sampling, we did not include any while walking to our next point for example.

- **Track Boxes**

Track boxes were also used to try and find evidence of wildlife.
These boxes are very simple to make. The boxes we used were made of corrugated plastic. They were about three feet long, a foot wide and a foot tall. One end of the box was closed off by some wire mesh, while the other remained open. A metal sheet was on the bottom of the box so it could easily be moved in or out. On the far end of the box, on the closed off side, some chicken was placed. In the middle of the sheet we placed contact paper sticky side up. The first third of the metal sheet had toner on it. When an animal walks into the box to get the meat, they cross the toner and leave tracks on the contact paper. Animals are lured to the boxes by strongly scented bait on a nearby tree. They are used to target small mammals that cannot be photographed with the cameras. Rodents, foxes, fishers, skunks, badgers, and a number of other small animals can be observed by using these boxes. They are very simple to make. When placing a box it is best to find a flat area that, ideally, shows animal use. Animal trails can often be found by looking for a clear path through the underbrush, scat, or tracks. If these cannot be found, a clear area is the best option for box placement. If a flat area cannot be found, be sure to have the opening of the box facing downhill so that rain does not run across the toner. It is also advised to build up leaves or other debris at the entrance so that small rodents are able to climb into the box.



Picture 24 Track Box Dimensions

Picture 25 Turkey Track

Picture 26 Fisher Track

Results

After gathering information and doing work out in the field, we are able to provide a species list composed of wildlife that should occur in the type of environment on the parcel along Old Pine Nook road, and also a list of species that we actually saw or encountered along the property. It is important to consider both of these sets of results because our sample time was short, and given the time of year, we were not able to sample and record every species within the parcel; Also, the parcel is relatively small compared to the ranges of a lot of the wildlife species shown in the generated list, the time of year and lifecycle they use this particular habitat type for. Through a program from the US Forest Service called NEwild, we were able to generate a list of species that should occur in the parcel of land. Again, because the acreage of the land is not very large, it may not be as accurate as a larger parcel, and also the results depend on the amount of development and agricultural land surrounding it, among other variables that are discussed in the landscape context section of this report. Out of NEwild's list of total 338 species, 160 of them can be predicted to live and persist in this habitat type. Of these 160, we can account for the species listed below in Table 7.

Taxonomic Group	**Common Name**
Mammal	Fisher
Mammal	Gray Squirrel
Mammal	Eastern Chipmunk
Mammal	Coyote
Mammal	White Tailed Deer
Mammal	Raccoon
Bird	White Breasted Nuthatch

Bird	Turkey Vulture
Bird	Barred Owl
Bird	American Robin
Bird	Common Raven
Bird	Downy Woodpecker
Bird	Pileated Woodpecker
Bird	American Crow
Bird	Wild Turkey
Bird	Black-Capped Chickadee

Table 7 Wildlife Species List

Along with this array of species, the Natural Heritage Program has developed a list of Rare Occurrences of species that are currently on the Endangered Species list. These species are either of Special Concern, Threatened, or Endangered, and have been recorded in the town of Deerfield. This can be extremely important when managing for wildlife, in order to protect these possibly threatened species within the parcel, or to alter the landscape in a way that benefits them in comparison to their specific habitat needs. The table shown in the appendix illustrates the threatened and endangered species that have been spotted on the land, but this chart is not limiting. The complete list of species can be found on the Natural Heritage main web page, and as the environments change with time, so do the occurrence and abundance of species, so there could also be some that are not on this list that do persist within the parcel.

For the most part, the cameras proved very successful in capturing an abundant population of a few species. Unfortunately, the results of the track boxes only yielded two tracks. They were of a Fisher and a Turkey. The box that received visitors was at the top of the ledge, near the far corner of the property. The box placed about halfway up the ridge was untouched by wildlife. Given a longer period of time or perhaps a different season, it is very likely more tracks would be observed. Also, larger track boxes would have a chance of yielding a wider variety of animals, since bobcats and coyotes are be unable to climb into the boxes used.

The overall results of the cameras, track boxes, point counts, and general observations showed that the most abundant species that occur on the parcel are turkeys, deer, and coyotes. In the discussion, we will interpret what these results mean and how they can or will affect the parcel, or any other ecosystems with similar species.

Discussion

Some of the features used to describe the land in order to generate the list of species in NEWild are that it is a mostly Oak/hardwood forest with a small inclusion of coniferous trees, which is extremely important to something like a Barred Owl that depends on mature conifers for hunting and living and often nest in large Oak trees. The diversity of the parcels forested habitat is directly correlated to the diversity of wildlife because it encompasses both hardwood and coniferous trees. The abutting parcel has more Hemlock cover than the Old Pine Nook parcel, and this can serve as a refugee for wildlife, like Deer, during the cold winters that use it for

shelter and warmth in contrast to the deciduous hardwood stands. An important idea to consider about wildlife is that they do not follow property boundaries as humans do, so their range spreads out as far as the habitat conditions that are suitable for them. Other habitat components entered had to do with the tree size and variation, ranging from less than 30% ground vegetation, mixed mid-story, and the distribution of living and dead trees. Some of the species on the computer generated systems may not be as accurate also because they are limited in the species that are in their database.

When comparing the list of 160 possible species in the area, there is one species also listed as endangered, the Bald Eagle, which we did not see, but because it is making a comeback in the area, it is likely that one will see one along the river from the Pocumtuck ridge. The Marbled Salamander is a threatened species, and although it is not on the list of expected species in NEWild, it was spotted in the town of Deerfield in 1995. This is why it is important to utilize resources such as the Natural Heritage and Endangered Species program because our ecosystems can be dynamic and change in ways that open up new niches for species that aren't commonly found there. In order to find specific habitat types for endangered species, a program called NED2, also through the US Forest Service can be used to manage for habitat diversity with certain species in mind. For example, the requirements for the Marbled Salamander can be found in the appendix.

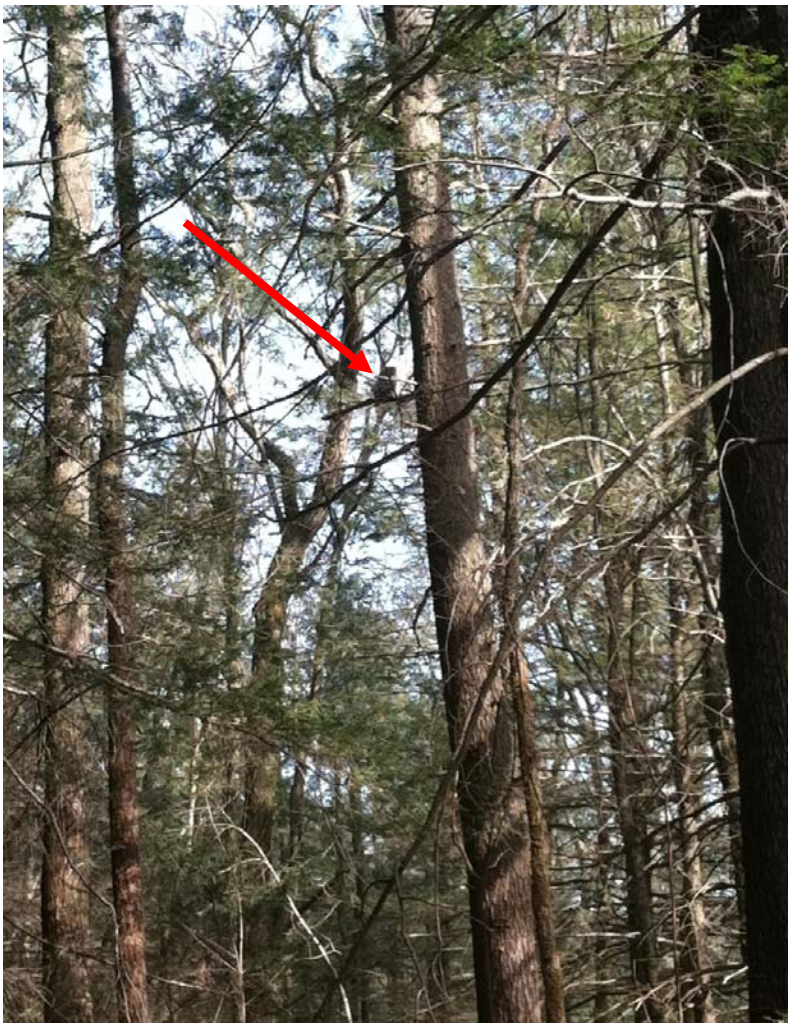
The results of the wildlife inventory can be compared to the forest and vegetation inventories, and our findings showed a strong correlation between a high deer density and little regeneration of certain trees and various understory plants or shrubs. According to deerandforests.org, preferred foods of deer include, among many others, blackberry, honeysuckle, sugar maple, birch, oaks, and white ash. On the other hand, some of the species less-preferred foods are mountain laurel, beech, striped maple, hemlock, pine, and various ferns. Throughout the parcel, one of the most abundant shrubs is mountain laurel and as for sapling trees, striped maple, as discussed in the inventory elsewhere. It was also stated that there is no oak regeneration; this proves a distinct connection between the species and the food in which they consume relative to their densities.

Considerations

Things to consider when managing for wildlife are vernal pools, cavity trees, and snags. Many birds and small mammals depend on snags or cavity trees for den sites, such as fishers and owls, which both were found in the inventory. Throughout the parcel, there are a great number cavity trees and also dead snags. They add

Picture 27 Cavity Tree

diversity to the forest and provide many mammals homes and nest sites. Cavity trees are used for three wildlife purposes: nesting, shelter from storms, or feeding in insects inside the tree. The most important being nesting, because if disturbed, young may not be able to escape danger as quickly as an adult. Because of rapid deforestation of this area in the past for farming and settlement, our forests are very young, which in turn affects how many old and large cavity trees are available for wildlife. Most cavity nesters now depend on man-man nest boxes and many have been extirpated in certain areas, like the ivory-billed woodpecker in the south for example. The Pileated Woodpecker also declined in population due to habitat loss; they fortunately adapted to smaller patches of forest that are now aging and transforming into the older and more mature trees that the species relies on. According to a handbook released by the Forest Service U.S. Dept. of Agriculture, there are 85 species of cavity nesting birds in North America. Some of them include: Wood Duck, Peregrine falcon, American Kestrel, 12 species of owls, about 20 species of woodpeckers, Black Capped Chickadee, Bluebirds, White, Breasted Nuthatch, and many more. Of this list of species, 6 birds have been identified on the 63 acre parcel in Deerfield. In order to manage land with these species in mind, here are some things to keep in mind in order to leave behind the trees with the most importance to wildlife provided by the Landowner Research Centre of Ontario:



Picture 28 Barred Owl

• Leave at least six cavity trees on about every 2.5 acres

• In order of priority, leave living trees with nest and den cavities, followed by escape and roost cavities, then feeding cavities.

• Protect potential cavity trees (trees that may appear to have rotten cores) when there is a shortage of trees with existing cavities. Some of these trees may include Oaks and Hemlocks, that have a long life-span and can be utilized for many generations

• Leave trees with many cavities of various sizes, which are more valuable than those with a single cavity.

• Choose trees that have cavities in the upper trunk, which are more valuable than those in the lower trunk.

• Leave cavities of all sizes, but give priority to big cavities which provide habitat for more species than small cavities.

• Give priority to hardwood cavity trees, which live longer than softwood trees.

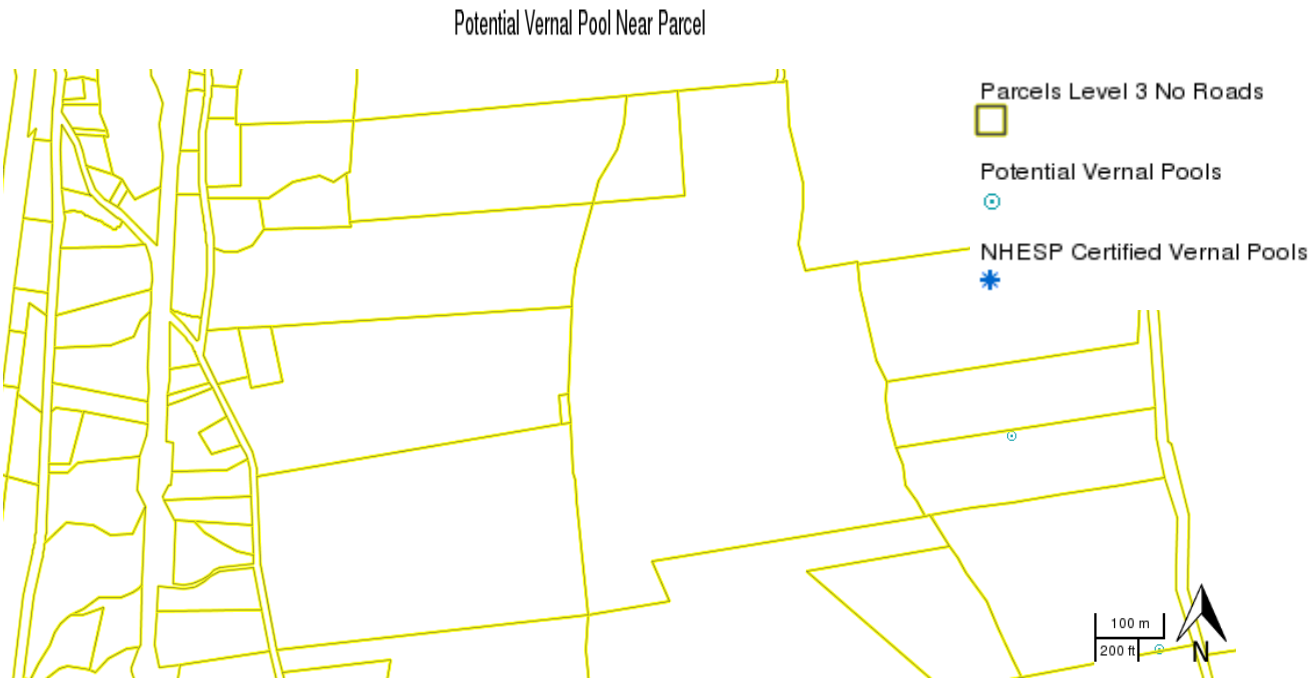
• Leave cavity trees that have a low risk of blowing down.

• Remove trees that pose a risk to human safety or property.

Picture 29 Vernal Pool Near Property

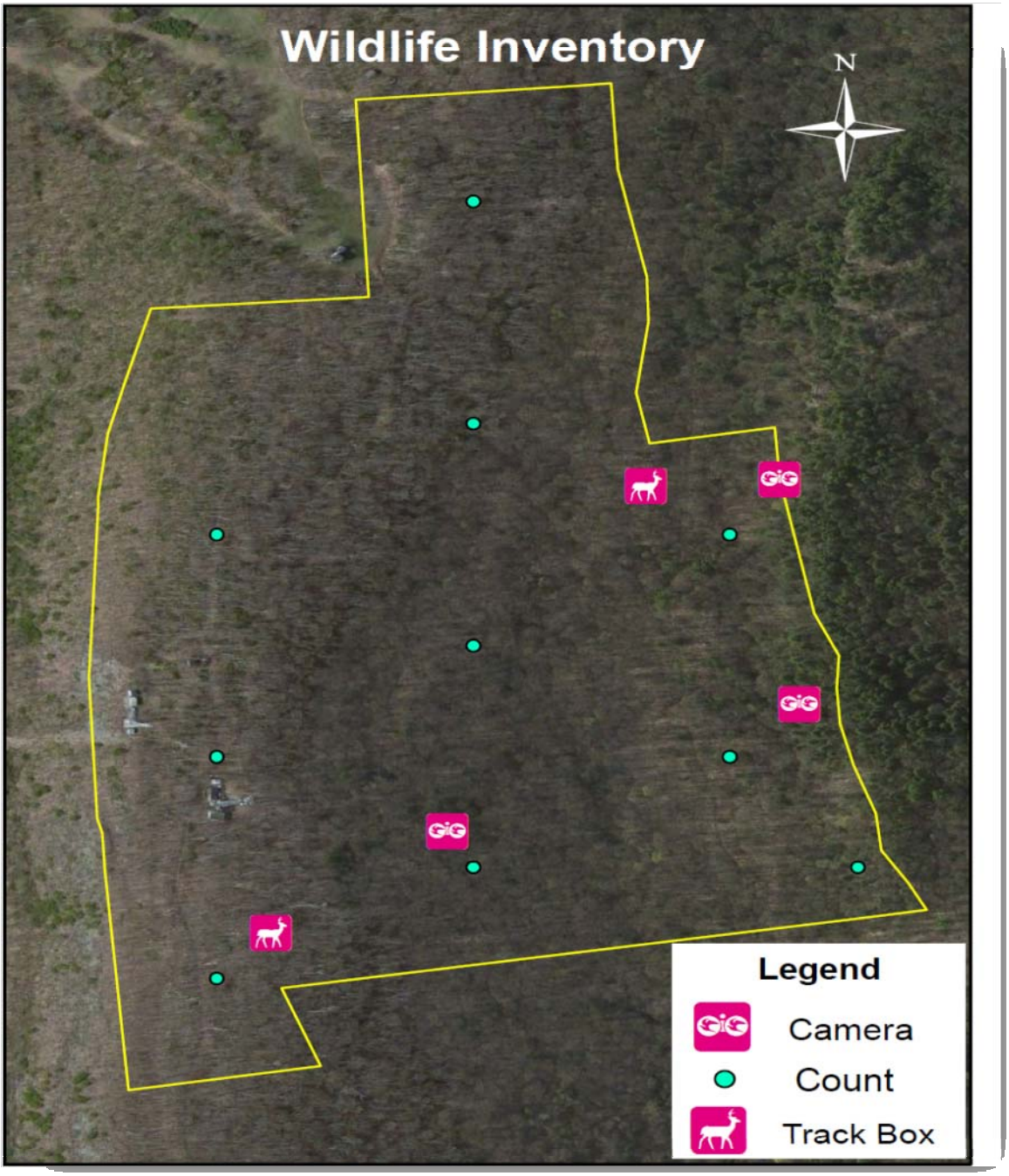
There is also a vernal pool on the land that abuts this parcel. This may be very important for many amphibians and reptiles that use the uplands to live throughout the dry season and lay their eggs back down in the pool when the conditions best suit the animals. If the forest is not suitable for the migration to the uplands because of deforestation and exposure to predators, this wildlife will not have the opportunity to pass its genes on and continue inhabiting these areas. This idea ties back to the marbled salamander previously mentioned because of its specific habitat needs and that fact that it is a threatened species. There were eggs found in this vernal pool, most likely of Wood Frogs because they are one of the first to lay eggs in the spring. A study from the Environmental Protection Agency stated that the home range of wood frogs is estimated to be about 700 square feet. This means that most likely, the frogs will spread out into some of the area on the surrounding property of the vernal pool that lies within the 63 acre parcel. If a vernal pool is protected, depending on the importance of the land surrounding it on the species that inhabit it, usually there is a 100 foot buffer zone around the wetland that also protects any development or harvesting in order to preserve the habitat. Other vernal pool species include: marbled salamander, spotted salamander, fairyshrimp, wood turtle, and many others. Along with certified vernal pools, there are also many we do not know about that are potential vernal pools that should be considered when doing a harvest of any kind. According to the Mass GIS database,

there are two potential vernal pools near the area, one of them being less than 200 m from the parcels boundary. The map of that can be found below:



Map 7 MASSGIS OLIVER Potential Vernal Pool

Other concluding considerations are if implementing a timber harvest for wildlife, income for projects, or any other reasons, make sure that diversity is in mind. In order to have a complete ecosystem, all ages of forest are equally important. Be cautious of snags and cavity trees, making sure that there is no wildlife nesting in them or in the vicinity before performing any forestry practices. Also, respect the invisible 100 foot buffer zone around vernal pools and also potential vernal pools if they are not yet certified. If decided that the lack of regeneration may be a problem holding the ecosystem back from reaching its goal of higher diversity, consider managing deer that browse the oak saplings. An example of a success story regarding organized Deer hunts would be at the Quabbin reservoir; the managed hunts provide the opportunity to control the population to a stable level and that allows other species to thrive in absence of the high deer density. There are many steps that can be taken in order to maximize the wildlife within the parcel of land because of the diverse landscape and unique features that can attract visitors and provide as recreational opportunities. These small steps can open new and exciting experiences for wildlife viewing and education.



Map 8 Wildlife Inventory

Trails

There are many trails that intertwine throughout property. The trails on the map neither begin nor end on the property, but serves as the mode for the necessary open space for this trail network to exist. The only trail that is marked is the Pocumtuck trail that zig zags its way through the property. The Pocumtuck is marked with blue paint thus identified in blue on the map. Much of the Pocumtuck trail on the property is single track until it overlaps with the access road heading up to the radio towers where it follows the ridge—heading south—to north Sugarloaf Mountain.

Picture 31 Trail Marker

Another prominent trail runs along the east boundary in a north-south direction labeled as 'other' in yellow on the map. This other trail is big enough for ATV and or snowmobile traffic. We believe the trail was used to gain access to the backside of the Forgotten Deerfield Academy Ski Hill. There is a small concrete structure near the intersection of this trail and Pocumtuck trail.

Beginning from the top of the ridge at the radio towers another trail—the Chair lift trail labeled in red—heads north for a short distance to the Eagle Brook Ski Hill chair lift and terminates at the access road.

The total distance of the trails on the map is 4.4 miles; the total distance of trails within the property is 1.9 miles. Note the Pocumtuck traverses the entire length of the Pocumtuck ridge from Sunderland to Greenfield—24 miles in total.

Trail users

The trails on this property are quite popular with a variety of user groups. It seems that the most popular user group are hikers and walkers. Mountain bikers and horseback riders have been observed using the trails. Many types of off road vehicles have also been observed primarily on the access road and the 'other' trail.

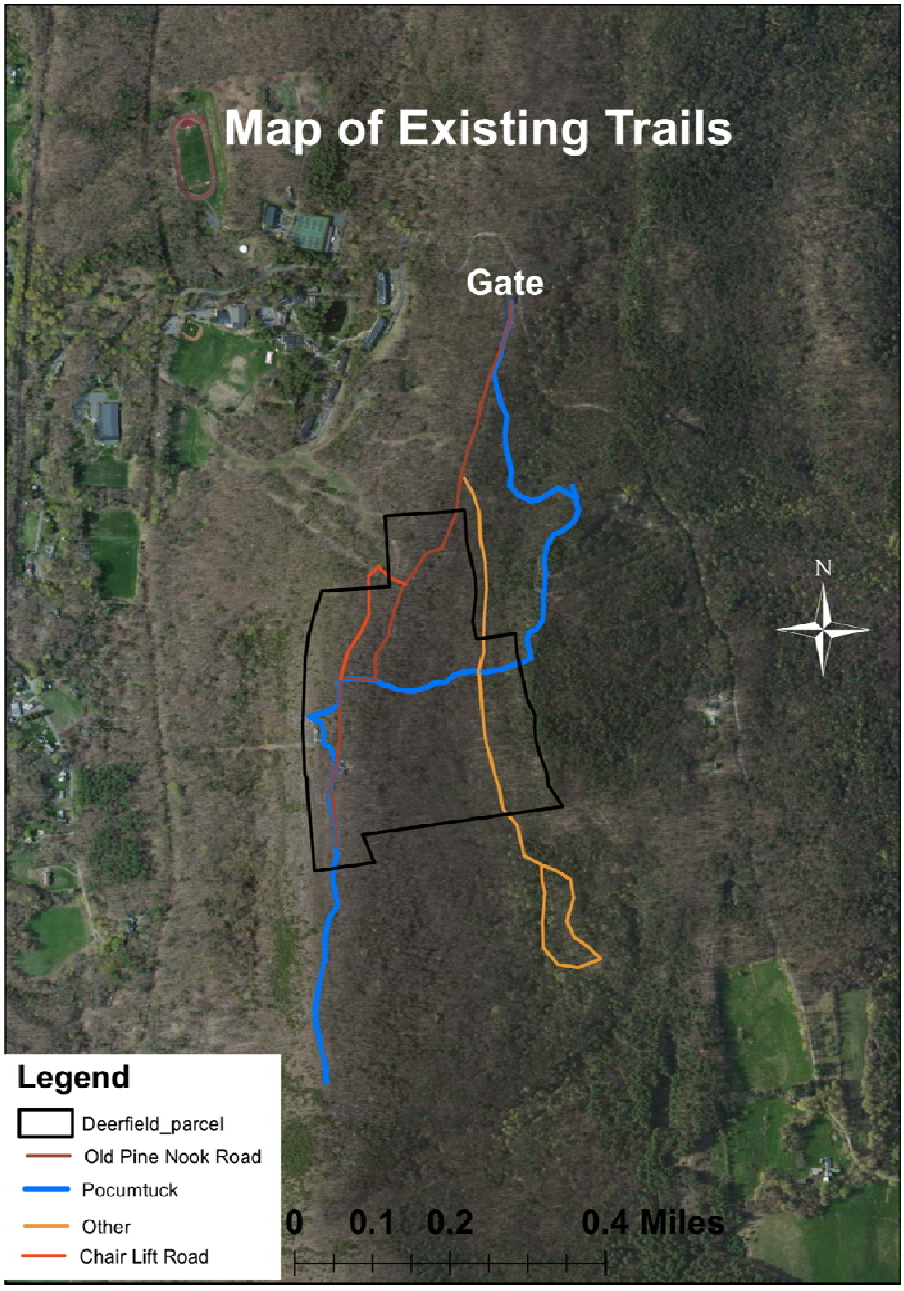
Trail Opportunities

Due to the wide variety of trail users there is great educational potential that can be developed. These opportunities fall in line with the community goals where signage can be used to describe features throughout the property—such as an interpretive trail. Additionally, ideas include signs that talk about invasive plant species and what the users can do to create better experiences on the trail. A trail steward group can be created that help manage the trail network that post meeting date and times.

Trail concerns

In general the trails are in good shape and are maintained throughout the property. The off road vehicle users seem to stay on the access road and the other trail.

The section of the Pocumtuck trail that cuts through the center of the property in an east-west direction could benefit from the installation of some water bars to slow erosion on the trail.



Map 9 Existing Trails

Community Outreach

When creating management goals on publicly used land, it is important to know the opinions of the community and to get them involved. Engaging the public is essential so that the reasons behind the management goals on the parcel is understood and appreciated.
A common and well-liked approach is guided forest walks. Local natural resource professionals can be asked to lead the walks such as foresters, wildlife biologists, and conservation specialists to name a few. It is an opportunity to educate the public about the land and engage them in any changes that may happen if management goals are implemented that benefit recreational uses, wildlife and the general ecology of the land.

Having town meetings and articles in local newspapers informing the community about goals and changes for the land will get more people involved and more opinions heard. It is especially important to inform those who live near the parcel or those who frequently use the trails of any changes they may see on the land. Pocumtuck.org is a one example where community members can share information and make announcements concerning the Pocumtuck Ridge.

More than just informing the community, it is possible to get them involved in a more hands-on way. Volunteer days to maintain the trails would greatly benefit the Pocumtuck parcel and encourage use of the land. Small incentives such as a simple lunch make people more apt to volunteer while still keeping the cost of the trail maintenance low.

A recreational and educational opportunity would be to use the inventory as a tool for replication. Local schools could use it as wildlife/forest botany based projects that would educate students and give them experience in the field.

All of these options would engage the community and increase their interest and use of the land. Perhaps one of the best results of this report would be to discover the best ways to attract the public to the land so it will continue to be cared for and protected for years to come.

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Appendix

NED2 Example of Habitat Recommendations for a Marbled Salamander

"Habitat: Sandy and gravelly areas of mixed deciduous woodlands, especially oak-maple and oak-hickory, trap rock slopes. During breeding seasons, found in low areas around ponds, swamps, and quiet streams. Inhabits somewhat drier areas than other species of Ambystoma. During the summer usually found under logs and rocks. Found at 900 feet above sea level in Connecticut. Larvae usually found in temporary water throughout the winter. Probably hibernates in deep burrows.

Special Habitat Requirements: Ponds or swamps in wooded areas for breeding.

Food Habits/Preference: Arthropods including adults and larval insects and crustaceans. Also takes earthworms and mollusks. Marbled salamander larvae eat small aquatic insects, crustaceans, and other small invertebrates and are cannibalistic. Larvae rise in the water column to feed.

Desired Future Conditions (DFCs)

To achieve this goal, the following DFCs must be met:

Management unit level

If at least one stand in the management unit passes the stand level DFCs, then the management unit "passes minimally".

If no stand in the management unit passes the stand level DFCs, then the management unit "fails".

Stand level

HAM forest type = red maple, or white pine/red oak/red maple, and

Province (ignored) = Allegheny plateau, valley and ridge, blue ridge, New England lowlands, piedmont plateau, or coastal plain, and

Temporary ponds or Permanent ponds = present, and

Coarse woody debris > 50 cu ft/ac, and

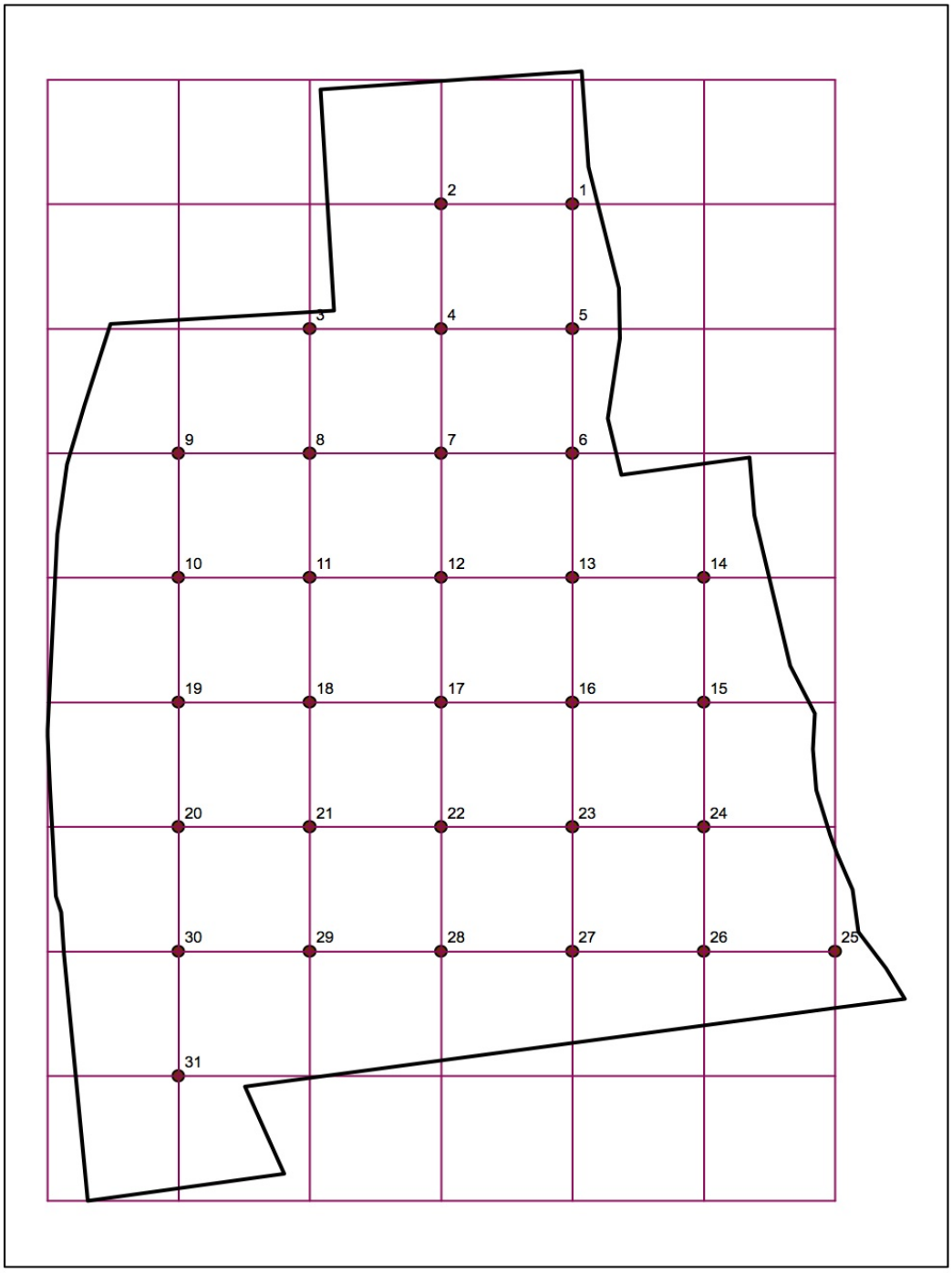
Percent cover rock >= 25%, and

Percent cover of leaf litter > 30%"

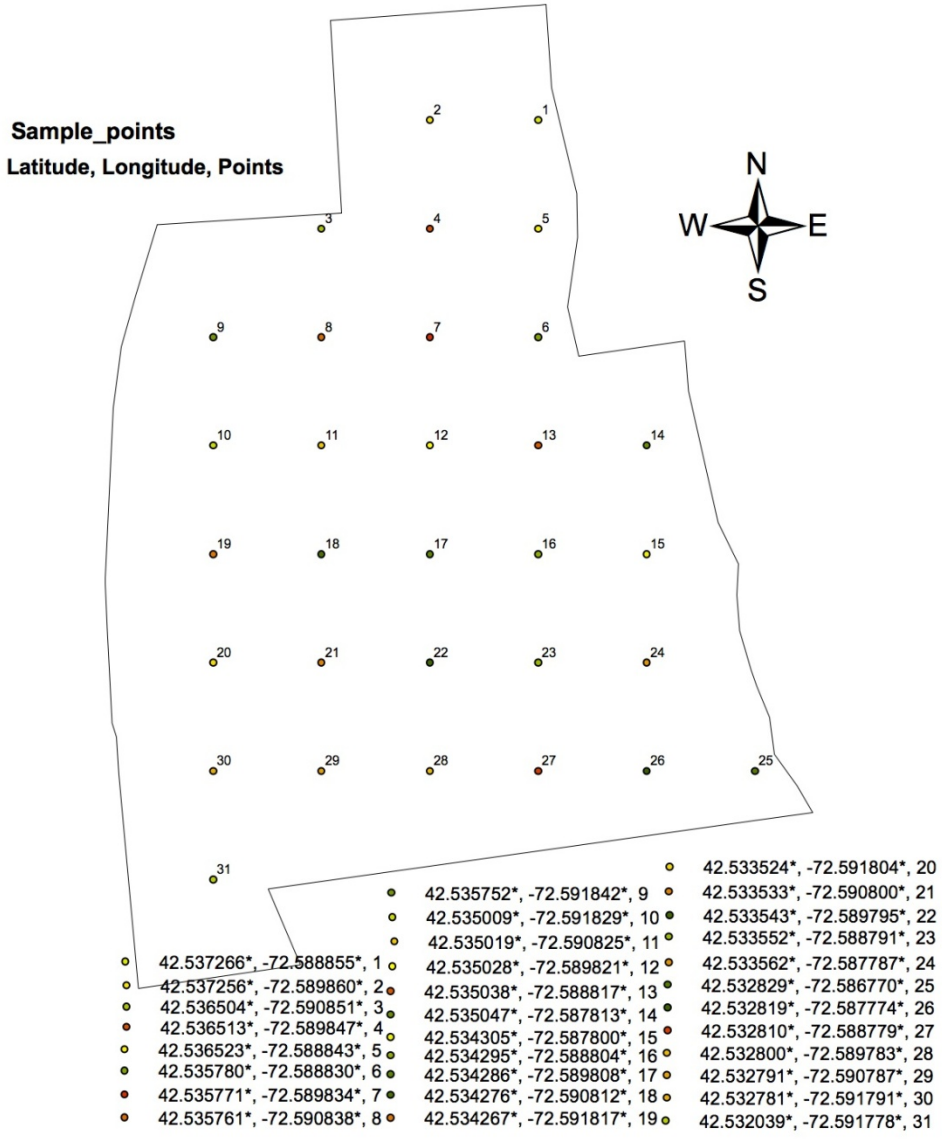
Natural Heritage and Endangered Species List of Rare Occurrences

Town	Taxonomic Group	Scientific Name	Common Name	MESA Status	Federal Status	Most Recent Observation
DEERFIELD	Amphibian	Ambystoma opacum	Marbled Salamander	T		1995
DEERFIELD	Bird	Cistothorus platensis	Sedge Wren	E		1951
DEERFIELD	Bird	Falco peregrinus	Peregrine Falcon	E		2006
DEERFIELD	Bird	Haliaeetus leucocephalus	Bald Eagle	E		2009
DEERFIELD	Bird	Ixobrychus exilis	Least Bittern	E		2006
DEERFIELD	Bird	Podilymbus podiceps	Pied-billed Grebe	E		1951
DEERFIELD	Bird	Pooecetes gramineus	Vesper Sparrow	T		1994
DEERFIELD	Fish	Acipenser brevirostrum	Shortnose Sturgeon	E	E	1999
DEERFIELD	Mussel	Lampsilis cariosa	Yellow Lampmussel	E		1987
DEERFIELD	Mussel	Ligumia nasuta	Eastern Pondmussel	SC		Historic
DEERFIELD	Reptile	Glyptemys insculpta	Wood Turtle	SC		2009

Grid Map for Inventory Transects



Inventory Map of Sample Points



Overstory Forest Inventory

Summary statistics

Summary statistics

	Basal area (sq.ft/ac)	Gross bdft vol (bd.ft/ac/ac)	Gross cubic vol (cu.ft/ac/ac)	Gross pulp cubic (cu.ft/ac/ac)	Net bdft vol (bd.ft/ac/ac)
Minimum	40.00	0.00	355.83	355.83	0.00
Maximum	220.00	15751.12	5018.93	2168.78	15751.12
Mean	115.00	7658.57	2582.77	1375.82	7658.57
Variance	1791.18	11191470.40	897003.62	199526.20	11191470.40
Std dev	42.32	3345.37	947.10	446.68	3345.37
Std error	9.98	788.51	223.23	105.28	788.51

Summary statistics (cont)

	Net cubic vol (cu.ft/ac/ac)	Net pulp vol (cu.ft/ac/ac)	Rel. dens. (%/ac)	Stems/area (stems/ac)
Minimum	284.66	284.66	40.52	65.39
Maximum	4015.14	1735.02	181.12	374.21
Mean	2066.21	1100.66	94.23	195.41
Variance	574082.32	127696.77	987.26	8864.99
Std dev	757.68	357.35	31.42	94.15
Std error	178.59	84.23	7.41	22.19