

FOREST STEWARDSHIP PLAN

HOP BROOK CONSERVATION AREA

DUTTON ROAD
SUDBURY, MA



PREPARED FOR
THE TOWN OF SUDBURY
CONSERVATION COMMISSION

By:
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SHAVONNE SARGENT
BROAD ARROW FORESTRY
JUNE, 2010



FOREST MANAGEMENT PLAN

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



| CHECK-OFFS | | | | | Administrative Box | | | |
|-------------------------------------|--------------------------------------|--------------------------------------|--|---|--|----------------------|---------------------|--|
| CH61 cert. <input type="checkbox"/> | CH61A cert. <input type="checkbox"/> | CH61B cert. <input type="checkbox"/> | STWSHP new <input checked="" type="checkbox"/> | C-S EEA <input checked="" type="checkbox"/> | Case No. _____ | Orig. Case No. _____ | | |
| recert. <input type="checkbox"/> | recert. <input type="checkbox"/> | recert. <input type="checkbox"/> | renew <input type="checkbox"/> | Other <input type="checkbox"/> | Owner ID _____ | Add. Case No. _____ | | |
| amend <input type="checkbox"/> | amend <input type="checkbox"/> | amend <input type="checkbox"/> | Green Cert <input type="checkbox"/> | | Date Rec'd _____ | Ecoregion _____ | | |
| Plan Change: _____ to _____ | | | Conservation Rest. <input type="checkbox"/> | | Plan Period _____ | Topo Name _____ | Framingham /Maynard | |
| | | | CR Holder _____ | | Rare Spp. Hab. <input checked="" type="checkbox"/> | River Basin _____ | Sudbury | |

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) Town of Sudbury Conservation Commission attn. Deborah Dineen
Mailing Address 275 Old Lancaster Road, Sudbury, MA 01776 Phone 978-443-2209. ext.1366

Property Location: Town(s) Sudbury Road(s) Dutton Road.

Plan Preparer Roger Plourde Jr., C.F. Mass. Forester License # 192
Mailing Address PO Box 20062, Worcester, MA 01602 Phone 508-792-2414

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 |
|--------------------|----------------|-----------|-----------|--------------|-----------------------------|------------------------------|------------------------|---------------|
| H04 | 0009 | 11608 | 127 | 80.28 | | | 0.0 | 80.28 |
| H03 | 0001 | 14882 | 138 | 13.0 | | | 0.0 | 13.0 |
| TOTALS | | | | 93.28 | | | 0.0 | 93.28 |

Excluded Area Description(s) (if additional space needed, continue on separate paper)

N/A

HISTORY Year acquired 1968, 1983 Year management began 1995

Is subdivision plan on file with municipality? Yes No

Are boundaries blazed/painted? Yes No Partially

Have forest products been cut within past 2 years? Yes No

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

stand no. _____ treatment _____ reason _____

(if additional space needed, continue on separate page)

Previous Management Practices (last 10 years)

| Stand # | Cutting Plan # | Treatment | Yield | Value | Acres | Date |
|---------|----------------|-----------|-------|-------|-------|-------|
| _____ | _____ | _____ | _____ | _____ | _____ | _____ |

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

Landowner Goals

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

| Goal | Importance to Me | | | |
|--|------------------|--------|-----|------------|
| | High | Medium | Low | Don't Know |
| Enhance the Quality/Quantity of Timber Products* | | | X | |
| Generate Immediate Income | | | X | |
| Generate Long Term Income | | | X | |
| Produce Firewood | | | X | |
| Defer or Defray Taxes <i>n/a</i> | | | | |
| 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 <i>n/a except for abutters</i> | | | | |
| Improve Hunting or Fishing | | | X | |
| Preserve or Improve Scenic Beauty | | X | | |
| Protect Water Quality | X | | | |
| Protect Unique/Special/ Cultural Areas | X | | | |
| Other: <i>Improve coldwater trout streams</i> | X | | | |

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

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

Protecting the natural resource values and diversity of our lands while promoting public enjoyment of the outdoors. Specific objectives to this goal needs to be developed in the forest stewardship plan. We are not sure at this point if we will consider stewardship for timber production.

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):

[Handwritten Signature]
 (on behalf of Conservation Commission)

Date:

6/29/10



Property Overview, Regional Significance, and Management Summary

Landscape Context

The very scenic, 93-acre Hop Brook Marsh Conservation Land, owned by the Town of Sudbury Conservation Commission, is located in western Middlesex County near the western boundary of the town of Sudbury. The property is part of an open space matrix of protected lands located in a highly desirable suburb of Boston, reasonably close to several highways. As a result of its location, Sudbury has undergone extensive commercial and residential development. While the Conservation Land is representative of the excellent land conservation work carried out in the Sudbury River valley, this property and the adjacent protected parcels exist within a highly fragmented landscape. In spite of high development pressure, there are still a number of upcoming and established farming enterprises in Sudbury including a 50-acre market farm in the northeast corner of town and a large commercial greenhouse operation farming about 200 acres to produce a variety of plants for the landscape industry. The Town of Sudbury licenses the right to farm a number of town conservation parcels to both of these farmers as well as a small garlic producer.

Property Overview

The forest land on this property covers about 68 acres, and has very different features east and west of Hop Brook, which runs south to north through the center of the property. Complex microtopography of small ridges and hillslopes surrounding wet kettle holes defines the eastern half of the property, which is covered by mixed oak and pine and pure pine forests. In the west, the topography is more even, forming a dry south to southeast slope covered with scarlet oak and pitch pine, and cut, deeply in some places, by a small intermittent stream that drains the western portion of the property into Hop Brook. Ranging in elevation from 170-190 feet above sea level, this glacial lake bed area is characterized by very well drained sandy soils. As a rule these excessively drained, glacial outwash soils have low timber growth potential but will grow better quality pine than oak. In this case, these soils are very well suited to growing white pine, pitch pine and scarlet oak, which are commonly found in a range of densities and ages across the Conservation Land. For forest management purposes, the eastern portion of the property can be accessed from frontage on Dutton Road, but the west will require cooperation the U.S. Fish and Wildlife Service and DCR (Sudbury State Forest) in order to gain access from Hudson Road.

Of the 394 thousand board feet (MBF) of timber inventoried, roughly 64% is white pine while scarlet oak (20%), pitch pine (6%) and mixed hardwoods (mixed oak, 8% and red maple, 2%) make up the remaining timber volume. There is no evidence of past harvesting activities though there is evidence of past fire in the area west of Hop Brook. This lack of forest management, along with poor site characteristics, has left a significant amount of low-grade material on the forest (about 460 cords of fuelwood and 980 cords of softwood pulp) much of which is unacceptable growing stock. Advanced regeneration varies from stand to stand depending on canopy closure but overall is dominated by white pine, red maple and mixed oak. Pitch pine regeneration is noticeably absent. There are the several invasive species that have become established to different degrees and pose a significant threat to the biodiversity of this property. Of primary concern is glossy buckthorn, which has become well established along trails, wetland edges, and along the northern boundary and is poised to become a serious pest in the interior forest areas. In terms of wildlife habitat, the pitch pine-scrub oak association occurring west of Hop Brook is considered a threatened natural community that supports a number of threatened and endangered species, particularly birds and invertebrates. One of the principal threats to this habitat is the exclusion of natural fire. There is a relative lack of age class diversity (ages range from 65-120+ years old) on this property with a noticeable lack of early successional forest and the absence of late seral stage forest, both of which are important wildlife habitat features. The western half of this property is listed as priority habitat for Box Turtle while the eastern half of the property is dotted with vernal pools (two certified) and shrub swamps which are ideal habitat for the Blue spotted salamander (thought to be utilizing this area).

Regional Significance

All runoff from this woodland drains either directly into Hop Brook or indirectly via the small intermittent stream in the west. Hop Brook flows northeasterly and then southeasterly before draining into the Sudbury River just south of Route 20 at the Sudbury/Wayland town line. This watershed is not part of a local water supply. Residents of this part of Sudbury obtain water from town wells. This property is part of an extensive matrix of contiguous, protected open space parcels owned by various agencies totaling nearly 2600 acres. The bulk of this open space is one parcel (2230 acres) of land that was formerly an annex to the Fort Devens military base and is currently part of the Assabet River National Wildlife Refuge. The other parcels include DCR state forest, Sudbury Valley Trustees Memorial Forest, and Marlboro conservation land. These properties are all heavily used by the public for hiking and an integrated trail system has been created and mapped. While this area is not classified as "core habitat" on the state's Bio-Map, it is clear that this property plays an important role in terms of watershed protection, enhancement of recreation resources, and as part of a larger open space matrix with significant wildlife habitat value. Healthy forest cover and careful logging practices will help safeguard the quality of these public resources.

Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

Overview (cont.)

Management Summary

The town's management goal for the property is to protect the natural resource values and diversity of their lands while promoting public enjoyment of the outdoors. Their specific objectives are focused around this central goal and include the following:

- Habitat restoration and creation
- Habitat protection (turtles, vernal pools)
- Water quality protection
- Enhance passive recreation/scenic beauty
- Promotion of biological diversity
- Invasive species control
- Educational/interpretive use
- Protection of cultural resources

The town wishes to be good stewards of the land and desires to accomplish this in an active manner, one that demonstrates habitat management but also takes advantage of opportunities to integrate sustainable forestry as a means of furthering their primary goals. The challenge of this plan is to weave all of these objectives together so that each management activity serves more than one purpose, maintain aesthetics, and integrate educational components. Though not specifically stated as a goal, long-term periodic income production will provide an useful income to help fund stewardship efforts. Recreational management is not a specific focus of this plan though it should be stated that additional hiking trails is not a goal of the conservation commission. There are some trail management issues that should be addressed such as trail stabilization and erosion control as it relates to horseback riding.

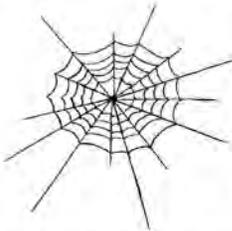
The forest management recommendations outlined in this plan are a reflection of these goals and begin by underlining the importance of developing an aggressive and comprehensive invasive species control program as a prerequisite to any other management activities that result in forest disturbance. With some success achieved in this area, it will be possible to consider actively managing the forest to improve forest products and promote habitat diversity. Many of the harvesting recommendations outlined in this plan draw on the Mass Wildlife *Forest Management Guidelines for Wildlife Management Areas* which provides an excellent blueprint for conserving biological diversity while allowing public recreation and wood production. This plan adopts goals from this document of 1) creating structurally diverse stands, 2) promoting a range of seral forest stages (particularly early- and late-seral habitat), and 3) incorporating practices that promote oak regeneration. It is not the aim of this plan to achieve these conditions in the next ten years, but rather to put in place a management regime that ongoingly creates these conditions at the least cost to the town. The forest management practices that will help achieve these goals include the following:

- Establishing passive management areas on about 50% of the acreage coinciding with sensitive habitats, areas of high recreational use and area with old forest characteristics. There will be minimal cutting in these areas that are designed to promote late-seral forest conditions. (i.e. old growth)
- Carry out active management on portions of the remaining woodland designed to promote timber species suited to dry sites as well as species valued for mast production (oak, cherry) and unique habitats (pitch pine-scrub oak barren). The pattern of harvesting will promote a heterogeneous stand structure maintained by creating a range of cut patch sizes to create early-seral forest habitat. Aggregate retention areas will be incorporated into any large opening harvest in order to maintain structural complexity and retain important habitat elements.

The actual management activities will involve the use of non-restricted herbicides for the control of invasive species, the commercial and pre-commercial removal of trees and brush, and possibly the use of prescribed fire. The configuration of management activity into two blocks is meant to allow flexibility in the management timeline given restrictions (access and invasive species) and allow for cooperation with abutters. This segmentation of the project may also serve to reduce the visual impact of the cutting by staggering the harvesting over time. The nature of the harvesting in both sections is such that they will be break even or at cost sales, otherwise described as "pre-commercial". All harvesting activities will be reviewed by NHESP to ensure protection of rare species. Any management activity on this forest is an opportunity to educate the public through educational signs that explain the purpose and nature of the work being done. Maintaining the aesthetics of the property is a concern and a challenge with any logging job. Proper siting of log landings, a well designed road network, hiring a conscientious logger, and maintaining age class diversity are some of the practices that will help to ensure that these value are protected. Finally, a true ecosystem-based approach to managing the Hop Brook Marsh Conservation Land will involve outreach to neighboring landowners. Possible goals for this type of collaboration would include 1) creating a combined inventory of acreages in different seral stages and determining the best opportunities for addressing deficiencies, 2) carrying out joint timber sales or other management operations (such as access roads) to obtain cost efficiencies, and 3) exchange of management knowledge.

Stewardship Issues

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



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

While the biggest threat to biodiversity in Massachusetts is the loss of habitat to development, another threat is the introduction and spread of invasive non-native plants. Non-native invasives like European Buckthorn, Asiatic Bittersweet, and Japanese Honeysuckle spread quickly, crowding out or smothering native species and upsetting and dramatically altering ecosystem structure and function. Once established, invasives are difficult to control and even harder to eradicate. Therefore, vigilance and early intervention are paramount. *The field work done in conjunction with this plan found relatively manageable densities of invasive species which confirmed a 2009 invasive species survey carried out by SVT with one exception, glossy buckthorn. In spite of these droughty soils, glossy buckthorn seems to be well established along the trail corridors and wetland edges and poses the most significant threat to species biodiversity on this property. Studies have shown that high density buckthorn populations greatly reduces the survival of most tree saplings under closed canopies which in turn will reduce the biological diversity of this forest. The primary management activity outlined in this plan is to develop a program for controlling these invaders.*

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



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

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

Indispensable to rare species protection is a set of maps maintained by the Division of Fisheries and Wildlife's Natural Heritage & Endangered Species Program (NHESP) that show current and historic locations of rare species and their habitats. The maps of your property will be compared to these rare species maps and the result indicated on the upper right corner of the front page of the plan. Prior to any regulated timber harvest, if an occurrence does show on the map, the NHESP will recommend protective measures. Possible measures include restricting logging operations to frozen periods of the year, or keeping logging equipment out of sensitive areas. You might also use information from NHESP to consider implementing management activities to improve the habitat for these special species.

Potential habitat for the box turtle and blue spotted salamander –two species rare in Massachusetts– is present on the Hop Brook Marsh Conservation Area. *The box turtle is a terrestrial species that spends its entire life cycle on land in hardwood and pine forests. It nests in open areas and overwinters in the soil. The blue spotted salamander is aquatic and terrestrial, overwintering in well drained soils and breeding in vernal pools.*

*Management implications for both species involve reducing risk of crushing them with motorized vehicles, including timber-harvesting equipment during the terrestrial portion of their life cycle. Specific guidelines for management vary by species. The **box turtle** requires a harvesting period of December 1 to March 31, while they are most likely buried in the soils while overwintering. Site scarification should be limited to hand tools. During harvesting, two snags per acre minimum should be retained, fallen logs should remain undisturbed and limbs and tops of cut trees should be left in the woods. **Blue spotted salamander** restrictions involve a 450 foot buffer around breeding sites. Within this buffer zone, >75% canopy cover must be retained on 70% of the area and there is a restriction on the use of any motorized vehicles between March 1 and May 15. No harvesting is allowed within 50' of any breeding pool. A winter harvest is preferable.*

Harvest plans (i.e.. Chapter 132 Forest Cutting Plan) should involve management specifics for both species and habitat areas and buffers should be flagged prior to the harvest, preferably prior to snow. For more information and management recommendations, please see the attached condensed version of "Massachusetts Forestry Conservation Management Practices" (CMP's) for both species.



where land and water meet.

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

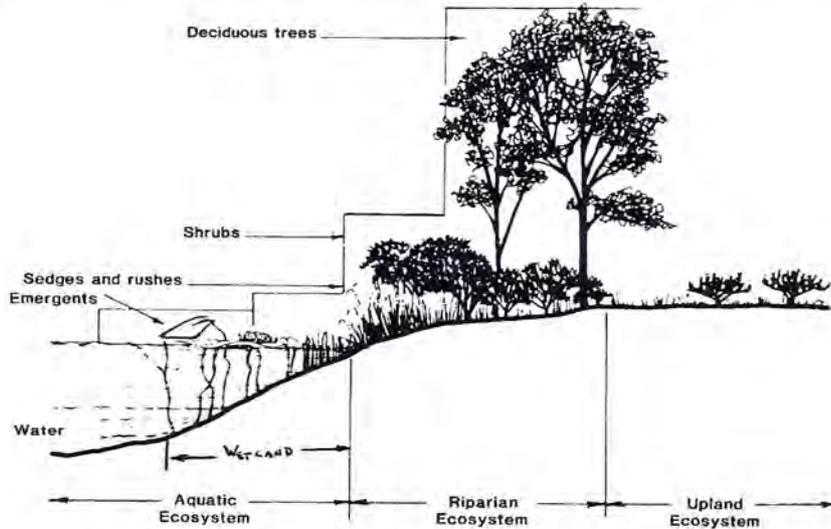


Figure 1: Example of a riparian zone.

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

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

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

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

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

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

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



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

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

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



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

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



Fire: Most forests in Massachusetts are relatively resistant to catastrophic fire.

Historically, Native Americans commonly burned certain forests to improve hunting grounds. In modern times, fires most often result from careless human actions.

The risk of an unintentional and damaging fire in your woods could increase as a result of logging activity if the slash (tree tops, branches, and debris) is not treated correctly.

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

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

This property is dominated by loamy sand soil types that once were a glacial lake bed. Associations of pitch pine and scrub oak of different ages and densities are common throughout the property and many areas have a known history of fire. There is a good deal of variation in the appearance of these stands as they compare to the classic open, shrubland pine barren. Currently pitch pine is fairly common as is often found on abandoned agricultural sites but the successional trend seems to be towards white pine. Over time and without the presence of fire, it is expected that tree oaks and white pine will take over. The loss of this rare habitat is of greatest consequence to the numerous species of butterflies and moths that depend on scrub oak/pitch pine habitats. In addition to the exclusion of fire, human development has greatly reduced the amount of pine barren habitat in Massachusetts and, in fact, the northeast. A management recommendation for this property is to utilize prescribed fire, if possible, to aid in the restoration of this declining habitat.



Wildlife Management: Enhancing the wildlife potential of a forested property is a common and important goal for many woodland owners. Sometimes actions can be taken to benefit a particular species of interest (e.g., put up Wood Duck nest boxes). In most cases, recommended management practices can benefit many species, and fall into

one of three broad strategies. These are **managing for diversity, protecting existing habitat, and enhancing existing habitat.**

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

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

Enhancing Existing Habitat – This strategy falls somewhere between the previous two. One way the wildlife value of a forest can be enhanced is by modifying its structure (number of canopy layers, average tree size, density). Thinning out undesirable trees from around large crowned mast (nut and fruit) trees will allow these trees to grow faster and produce more food. The faster growth will also accelerate the development of a more mature forest structure, which is important for some species. Creating small gaps or forest openings generates groups of seedlings and saplings that provide an additional layer of cover, food, and perch sites. *As mentioned in different ways above, a principal focus of this plan is to enhance the existing pitch pine/scrub oak habitat through exclusion of non-native species, timber harvesting, brush removal, and prescribed fire.*

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



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

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

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



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

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

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

One particularly ubiquitous legacy of this period is stone walls. Most were constructed between 1810 and 1840 as stone fences (wooden fence rails had become scarce) to enclose sheep within pastures, or to exclude them from croplands and hayfields. Clues to their purpose are found in their construction. Walls that surrounded pasture areas were comprised mostly of large stones, while walls abutting former cropland accumulated many small stones as farmers cleared rocks turned up by their plows. Other cultural features to look for include cellar holes, wells, old roads and even old trash dumps.



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

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

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

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



STAND DESCRIPTIONS

| OBJ | STD NO | TYPE | AC | MSD OR SIZE-CLASS | BA/AC | VOL/AC | SITE INDEX |
|------|--------|------|----------|-------------------|-----------|-----------------------------|-------------------|
| STEW | I | OT | 29.8 ac. | 9.4" | 95 sf/ac. | 1.5MBF 6.4cd(f)/5.7cd(p) | RO:49-52/WP:58-60 |

Forest Type: Scarlet Oak

Species Composition

Canopy: scarlet oak, 51%; pitch pine, 23%; white pine, 14%; white oak, 9%; black oak, 1%

Regeneration: white pine, red maple, scarlet oak, white oak, chestnut, red maple, black cherry

Invasive Species: Very low to moderate density glossy buckthorn, one multiflora rose noted along the stream

Description: This even-aged (65-70 years old) pole to small sawtimber stand is defined by extensive scarlet oak with pitch pine as the major associate and white pine and white oak as minor associates. Scarlet oak is dominant throughout, while the density of pitch pine, white pine and white oak varies. The midstory is also variable, with the most notable deviation being a dense midstory of white pine that occurs in the northwest corner and southeast along the railroad tracks. Scrub oak is present throughout the stand at relatively low densities, but is very dense along the railroad tracks in the southeast. Regeneration is dominated by white pine, with some red maple, white oak, scarlet oak, chestnut and black cherry and the notable absence of pitch pine. The site is level to gently sloping with an east to southeast aspect. An intermittent stream forms in this stand, flows south and then east through the red maple stand and then into Hop Brook. White pine and red maple dominate the stream corridor, and there is an occasional ash and elm. Soils are well drained glacial tills, loamy and loamy coarse sands (Carver and Hinkley). These dry site soils are best suited to growing white pine, which shows good growth form in the midstory.

Over two-thirds of the volume in the stand is hardwood fuelwood and softwood pulpwood. Sawtimber volume is low due to the small mean diameter of the stand, and is dominantly pitch pine (47%) with the remaining volume split between scarlet oak and white pine. Growth rates have been slow in overstory pitch pine and scarlet oak over the past 20 years (both cored trees had 20 or more years to one inch of diameter growth). Slower growth rates are related to maturity and competition for resources (sunlight and water) and do not seem to indicate overall poor health, as no notable damage or decline was evident. Access to this stand is best achieved with cooperation from abutting landowners, either the Wildlife Refuge to the west or Sudbury Valley Trustees to the south, or in cooperation with both. A stream crossing is necessary within the stand to reach the northeastern corner. Use of the trail on the Wildlife Refuge to the north would also make access possible. The stand could be reached by logging equipment from the eastern portion of the Hop Brook Marsh Conservation Land only if a much larger bridge was built to cross Hop Brook, but its installation would require significant expense for permitting and construction.

The desired future condition for most of the stand is a two-aged white pine and scarlet oak stand harvested in a manner that creates variable sized patches of early successional growth (that include white pine) surrounded by retention areas located in areas with high wildlife habitat value such as mast production or wetland features. Subsequent harvests should increase patch sizes to improve early successional habitat value. Along the southeastern edge of the property where scrub oak is more prevalent in the understory, management for the pitch pine-scrub oak type is possible. The desired future condition in this area is a young, vigorous, even-aged shrubland composed of a scattered scarlet oak and pitch pine overstory with scrub oak understory.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A STEW= stands not classified under CH61/61A
 STD= stand AC= acre MSD= mean stand diameter MBF= thousand board feet BA= basal area VOL= volume

Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

STAND DESCRIPTIONS

| OBJ | STD NO | TYPE | AC | MSD OR SIZE-CLASS | BA/AC | VOL/AC | SITE INDEX |
|------|--------------|------|----------------|-------------------|------------|--------------------|------------|
| STEW | 2a | RM | 3.2 ac. | 12.0" | 115 sf/ac. | 2.6MBF | RM:50 |
| | 2b | | 1.3 ac. | | | 12.6cd(f)/4.7cd(p) | |
| | Total | | 4.5 ac. | | | | |

Forest Type: Red Maple

Species Composition

Canopy: red maple, 74%; white pine, 17%; scarlet oak, 9%

Regeneration: red maple, white pine, white ash, white oak

Invasive Species: Moderate to high density glossy buckthorn, some multiflora rose

Description: Occurring along 2 sides of Hop Brook, these lowland pole and sawtimber stands are comprised mainly of red maple, with white pine as the chief associate and scarlet oak as a minor associate. White ash, elm and black gum were also noted but not in the plots. Wetland plants are common throughout and include skunk cabbage, jewelweed, pepperbush, nannyberry, ferns, high bush blueberry and spicebush. The sparse sunlight and heavy cover of wetland plants and shrubs limit regeneration. This site is level to gently sloping with a slight southern aspect. A stream originating in stand 1 bisects stand 2a and flows into Hop Brook. Soils are poorly drained to saturated Swansea muck, best suited to the existing overstory composition of red maple with wetland plants in the ground and shrub layer.

Hardwood fuelwood is the dominant product in the stand. 44% of the sawtimber volume is fair quality red maple, and the remainder is good quality white pine and scarlet oak. The trail system is a source of introduction and spread of invasive plants, which also thrive in moist soils. As a result, this stand is particularly susceptible to high-density coverage of invasives, which would reduce this stand's overall diversity and value as wildlife habitat. At present, the threat mainly comes from glossy buckthorn along the trails. Access to this stand would be achieved from adjacent properties to the west and south, by way of stand 1. Within the stand, access is limited by the wet and saturated soils and any equipment would be limited to frozen ground conditions.

The desired future condition is a red maple and white pine stand free from invasive species that serves as valuable wetland habitat and a healthy filter strip for Hop Brook, allowed to mature and decline naturally with limited management intervention. Achieving the desired future condition will involve invasive control to prevent the area from becoming a haven for invasive species. Some aesthetic thinning along trails may be possible in very dry or frozen ground conditions.

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Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

STAND DESCRIPTIONS

| OBJ | STD NO | TYPE | AC | MSD OR SIZE-CLASS | BA/AC | VOL/AC | SITE INDEX |
|------|--------------|------|-----------------|-------------------|------------|-----------------------------|-------------|
| STEW | 3a | WO | 6.4 ac. | 12.7" | 130 sf/ac. | 7.1MBF 7.2cd(f)/9.9cd(p) | RO:49/WP:60 |
| | 3b | | 3.8 ac. | | | | |
| | 3c | | 11.7 ac. | | | | |
| | Total | | 21.9 ac. | | | | |

Forest Type: White Pine – Oak

Species Composition

Canopy: scarlet oak, 43%; white pine, 35%; red oak, 12%; black oak, 8%; white oak, 2%

Regeneration: white pine, scarlet oak, white oak, chestnut, red maple, black cherry

Invasive Species: Low to moderate density glossy buckthorn, some oriental bittersweet in 3a

Description: This even-aged (90-100+ years old) sawtimber stand is composed of mixed oaks with white pine as the main associate. Scarlet oak in stand 3b and 3c are mature and slow-growing (the most recent inch of growth taking over 30 years), with some individuals reaching 120 years in age. White pine is generally faster growing and larger in this stand overall, and stand 3a has more rapid growth rates and larger trees in oak and white pine. The midstory and regeneration are mostly composed of white pine and red maple, with some oaks and chestnut. The stand occurs across the eastern half of the property along hillside and ridges formed of well-drained gravely till. Extensive micro-topography including small ridges and kettle holes are present, but not captured in the 3 meter contours. There are four vernal pools surrounded by red maple and wetland plants scattered through stands 3b and 3c in low spots. This stand is also adjacent to Hop Brook and the duck pond, and surrounds several shrub swamps. The site is rolling to moderately sloping hillside and ridges with varied aspects. The topography, forest cover and adjacency to water and shrub swamps make this a scenic area, which is well accessed by an excellent trail network. Soils are well-drained glacial tills (Windsor and Hinkley loamy sands) suited to growing a mix as represented in the overstory, but tending to produce better white pine than oak.

Sawtimber and white pine pulpwood are the most abundant products in this stand, and there is also significant volume in hardwood fuelwood. 45% of the sawtimber volume is in fair quality white pine, and 38% is fair quality scarlet oak. Stand health is good, with no issues noted. Glossy buckthorn poses the largest invasive threat and is present throughout the stand, particularly along trails and at the parking area. Access to stands 3a and 3c would be achieved from Dutton Road at the parking lot, and involve utilizing existing trails. Stand 3b is inaccessible because the railroad track corridor (not owned by the Town, and with the track still laid) is the only way to reach it.

The desired future condition in 3b and 3c is a scenic, even-aged oak and white pine stand free from invasive species, allowed to mature and decline naturally with limited management intervention. In stand 3a, the desired future condition is a two-aged stand harvested in a manner that creates variable sized patches of early successional growth (that include white pine) surrounded by retention areas located in areas with high wildlife habitat value such as mast production or wetland features. Subsequent harvests should increase patch sizes to improve early successional habitat value. Special attention should be paid to aesthetics in this stand due to its scenic character and heavy recreational use.

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Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

STAND DESCRIPTIONS

| OBJ | STD NO | TYPE | AC | MSD OR SIZE-CLASS | BA/AC | VOL/AC | SITE INDEX |
|------|--------------|------|-----------------|-------------------|-----------|--------------------|-------------------|
| STEW | 4a | WP | 0.8 ac. | 14.0" | 217 sf/ac | 14.5 mbf | WP:57-60,RO:47-52 |
| | 4b | | 11.1 ac. | | | 4.4cd(f)/44.2cd(p) | |
| | 4c | | 1.2 ac. | | | | |
| | Total | | 13.1 ac. | | | | |

Forest Type: White Pine

Species Composition

Canopy: white pine, 80%; scarlet oak, 8%; red maple, 6%; black oak, 3%; pitch pine, 2%; white oak, 1%

Regeneration: white pine sapling growth varies from non-existent to well established; also white oak, black oak, scarlet oak, red maple, black cherry, black gum and chestnut

Invasive Species: variable amounts of glossy buckthorn, very high around stand perimeter, Euonymus

Description: This is the most productive stand on the property consisting of a nearly pure stocking of large white pine sawtimber that transitions somewhat to white pine and oak along the northerly boundary line. The one large section (4b) and two smaller sections (4a,4c) along Hop Brook and south of the duck pond, respectively, are even-aged (about 80-90 years old). Scarlet oak is the main associate. Pitch pine is mostly found in stand 4c. Stand structure is relatively simplistic, with a main canopy, and in places thick white pine regeneration in the shrub layer or midstory. This is a heavily stocked stand with tall trees crowded closely together reflective of the absence of prior forest management. Underlying soils are primarily very deep, excessively drained glacial outwash soils (Windsor loamy fine sands and some Hinckley loamy sands), which, in spite of their droughtiness, are very productive pine sites. The site is generally gently sloping or rolling. Equipment access to this stand is very good with the exception of stand 4c which is isolated and therefore inaccessible.

In spite of the impressively high woody volume that this site has grown, the majority of this wood (69%) consists of low-grade pine pulp and a little hardwood fuelwood. The remaining volume is sawtimber of which 92% is poor to good quality white pine, with low-grade oak making up the remaining 8%. Stand health and vigor appear to be only fair as evidenced by the small crown size. White pine weevil appears to have some activity in the area just north of the duck pond, as many trees had a major defect related to forking above the first log. The growth rates of the dominant pines has been decent but declining over the last 20 years (± 8 yr./in). There are a number of invasive exotic species (see above) found here in low to severe populations. One of these species in particular, glossy buckthorn, poses a significant threat to the overall biodiversity of this forest. Unless adequate control measures are taken, buckthorn will become increasingly vigorous and begin displacing much of the native flora. As with the rest of the property, this is a very scenic stand abutting ponds and wetlands and with numerous well used hiking trails. There is a small vernal pool-like wetland (not certified) just east of the old field that should be properly buffered if a harvest is undertaken

The desired future condition in 4a and 4c is a scenic, even-aged white pine stand free from invasive species, allowed to mature and decline naturally with limited management intervention. The desired future condition of stand 4b is a scenic, two-aged softwood forest of similar species composition as currently exists but harvested in a manner that promotes improved growth of the best sawtimber while releasing areas where desirable oak and pine regeneration have become established. Over time the goal will be to create variable sized patches of early successional growth (dominated by white pine) surrounded by retention areas of mature timber located in areas with high wildlife habitat or recreational value. The desired future condition includes the control of invasive species such that the natural biodiversity of this area is preserved. Vigorous pitch pine and a percentage of the large mast producing hardwoods like white oak should be retained. Unusually large trees will be designated as "legacy trees" and retained for their scenic values. Judicial thinning of surrounding trees to accentuate their form and creation of access trails will provide great focal points for hikers.

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Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

STAND DESCRIPTIONS

| OBJ | STD NO | TYPE | AC | MSD OR SIZE-CLASS | BA/AC | VOL/AC | SITE INDEX |
|------|--------|------|---------|-------------------|-------|--------|------------|
| STEW | 5 | AF | 1.5 ac. | N/A | N/A | N/A | N/A |

Forest Type: Abandoned Field

Species Composition

Canopy: scarlet oak, white pine

Regeneration: scarlet oak, red maple, w.pine, bl. oak, cherry, gray birch

Invasive Species: glossy buckthorn

Description: This small abandoned field contains scattered mature individual white pine and scarlet oak, some small grassy and shrubby openings, and areas of young oak and mixed hardwood saplings. These glacial outwash soils are similar to stand 4 (Windsor loamy fine sands) and are best suited to growing white pine. The site is generally relatively flat and easily accessible. Invasive species such as the glossy buckthorn flourish and produce abundant seed in open conditions like those present in the stand. The desired future condition is as a maintained shrub meadow with invasive species controlled.

| | | | | | | | |
|------|---|----|---------|-----|-----|-----|-----|
| CH61 | 6 | WA | 4.0 ac. | N/A | N/A | N/A | N/A |
|------|---|----|---------|-----|-----|-----|-----|

Forest Type: Open Water

Description: This is a man-made pond with a small dam along the westerly shore. This area is important wildlife habitat that is used by waterfowl, turtles, and many other species. No management is recommended here other than to maintain wood duck boxes already installed.

| | | | | | | | |
|------|---|----|---------|-----|-----|-----|-----|
| STEW | 7 | MS | 6.4 ac. | N/A | N/A | N/A | N/A |
|------|---|----|---------|-----|-----|-----|-----|

Forest Type: Shallow Marsh

Species Composition

Canopy: shrubs

Regeneration: n/a

Invasive Species: Glossy buckthorn

Description: This area is a grass and shrub filled riparian corridor surrounding Hop Brook. Glossy buckthorn is growing along the forest edge. There is periodic beaver activity along this brook. The desired future condition of this area is a protected filter strip for water quality and productive wildlife habitat. Chemical control of invasive species should be considered.

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Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

STAND DESCRIPTIONS

| OBJ | STD NO | TYPE | AC | MSD OR SIZE-CLASS | BA/AC | VOL/AC | SITE INDEX |
|------|--------------|------|-----------------|-------------------|-------|--------|------------|
| STEW | 8a | SS | ac. | N/A | N/A | N/A | |
| | 8b | | | | | | |
| | 8c | | | | | | |
| | Total | | 13.3 ac. | | | | |

Forest Type: Shrub Swamp

Species Composition

Canopy: scattered red maple, white pine

Regeneration: n/a

Invasive Species: purple loosestrife

Description: This area is a shrub swamp comprised mainly of blueberry with scattered red maple and white pine trees. Also noted is cattail and swamp pink. It is in a lowland position with steep slopes surrounding it. Soils are very poorly drained Swansea muck. The area presents mainly as valuable habitat to swamp and shrubland species. Blueberry picking should be excellent here in the summer.

The desired future condition of this area is as productive wildlife habitat maturing and declining naturally.

Glossary

advanced regeneration - young trees that have become established in a stand before any special measures are undertaken to establish new growth.

midstory- vegetation that is shorter than the main tree canopy, but taller than 10'

basal area - a measure of stand density based on the cross sectional area of a tree at breast height.

d.b.h. - diameter at breast height (4.5' from the ground)

MBF - 1000 board feet

site index (SI) - the height of the dominant portion of a forest stand at 50 years of age (in eastern US). This is one of many indices used to measure site quality.

release cutting - freeing a young stand of desirable trees from the competition of undesirable trees that threaten to suppress them.

epicormic branches - branches that develop from dormant buds along the bole of a tree when bark is exposed to direct solar radiation.

rotation - the period of years required to grow a crop of timber to a specified condition of economic or natural maturity

early-seral forest - seedling growth stage

late-seral forest - forest that has achieved greater than 50% of its maximum expected age (generally over 150 years for trees in Massachusetts)

high-grading - the process of harvesting of the healthiest and most valuable trees on a site while leaving inferior growing stock. Also know as "taking the best and leaving the rest".

pre-commercial harvest - when the cost of layout and removal of trees in a stand exceeds the stumpage value.

Stumpage - the price paid for standing timber whereby the buyer incurs of the cost of harvesting the trees.

legacy Trees - select trees left during a harvest for the purpose of leaving a genetic, historical and species legacy on the landscape after the establishment of a new cohort of trees.

mechanical treatment - human or mechanized exertion of force to sever stems and reduce height of the shrub layer; mowing.

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Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

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 | | All Stands | Invasive Species Control | 10ac/yr | N/A | N/A | Ongoing |

Description: The control of glossy buckthorn, oriental bittersweet, multiflora rose, all upland invasive exotic species is of primary concern across the property. Purple loosestrife is a wetland invasive that is also of concern but is not necessarily impacted by the management activities described in this plan. With the exception of glossy buckthorn, the field work done in conjunction with this plan found relatively manageable densities of invasive species. In spite of droughty soils, glossy buckthorn is well established in both open and dense shade conditions and is particularly vigorous along the trail corridors, neighborhood borders and wetland edges. This species poses the most significant threat to species biodiversity on this property. Regardless of individual species populations, costs for controlling these species will quickly trend upward with declining efficacy if no action is taken. Invasive species issues should be addressed in some fashion prior to any harvesting activity as any harvesting activity at any time of the year will tend to promote further seed dispersal of these species due to soil disturbance and opening of the canopy. Winter harvests will minimize ground disturbance and reduce this negative effect.

Control measures include hand weeding for some species though any serious effort to control these species must include some type of herbicide treatment (foliar, basal bark, and cut stump applications). Follow-up treatments and minimizing impact on non-target native species are important concerns while undertaking this project. Application of herbicides should be carried out by a licensed professional. Consider developing an annual program to control these species that includes a follow-up monitoring protocol. This project will require a long-term commitment and ongoing funding for it to be successful. Outreach and collaboration with abutting landowners is highly recommended and will help insure the long-term success of control efforts. Future timber harvests can be used as a source of income for funding ongoing invasive control projects.

The general recommendation of this Stewardship Plan is to establish an invasive plant control program that will break up the property into a more manageable set of tasks. What follows are some general recommendations regarding invasive species control.

1. Think of the "minor" invasive species in the same way that you think about the light infestation areas of the property. These are easy battles to fight now and will likely develop into costly, heavy infestations if not treated.
2. Hand pulling is a suspect technique for most species with the possible exception of honeysuckle and Japanese barberry due to the high likelihood of resprouts and increased soil disturbance.
3. Carefully study current literature on treatment recommendations for all invasive species and look for opportunities to treat several species simultaneously. For instance, a foliar spray using triclopyr is effective for barberry, multiflora rose, and bittersweet and as such may make sense to treat all three species at once, especially if all are still leafed out in late fall after the natives have dropped their leaves.
4. Consider the use of the Sproutless™ brush saw attachment for cut stump applications as an efficient way of treating individual stems in high densities.
5. Do not underestimate Japanese barberry. The insidious characteristic of this plant is that it is known to invade both disturbed and undisturbed forests and possesses a wide range of soil and moisture tolerances. Even when eliminated, few plants are able to reestablish the site. The seed is dispersed by both deer and birds. It also tends to be avoided as browse by deer which might imply that it is not easily controlled by livestock.
6. The present clean zones tend to coincide with soil type characteristics in that the most well drained glacial till sites having the fewest invasives. Based on this, it would stand to reason that these types of sites would be the easiest sites to reclaim.

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

Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION

Town(s) SUDBURY

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 | | All Stands | Invasive Species Control | 10ac/yr | N/A | N/A | Ongoing |

(continued from previous page):

7. Wet soils, stream banks, trailsides and neighborhood edgestend to be the areas of highest infestation.
8. When it comes time to begin tackling the heavier infestation areas, consider going after areas of high seed production such as road and trail sides and stream and swamp edges . In areas where there is desirable advanced regeneration amidst the invasive species, it may be desirable to herbicide treat prior to harvesting in order to minimize impact on non-target native trees.
9. In areas of dense infestation, control efforts may require some type of small clearcut that removes all vegetation combined with a foliar herbicide treatment of resprouting invasives the following season. It is unclear whether or not the size of the clearing plays a role in the response of the invasive species. The larger openings are, however, more favorable for regenerating oak, a valuable wildlife species. In wetland areas where harvesting is not practical, a combination of foliar and cut stem will be necessary.
10. Generally, in areas of low density, individual plants can be treated using through a foliar spray using a hand pump backpack sprayer, while dense, larger infestations should be treated with a motorized backpack mist blower. A general cost estimate for treatment is \$200-400 per acre, varying dependent on the density of invasive plants.
11. Bittersweet is best treated in the winter, when thick, tree climbing stems can be cut and treated with herbicide. Smaller ground level plants may need to be treated in the summer.
12. Prioritizing control effort should recognize the importance of addressing dense infestations due to their seed production capacity and lighter infestations which are easily controlled with minimal cost.
13. Invasives should be treated with species specific herbicides where possible. These mixtures target the plant's weakest areas and set back its ability to recover most thoroughly. In areas of diverse and dense infestation, treatment on a species by species basis becomes cost-prohibitive. Cocktails of herbicides are often used in this case as a blanket treatment. These are effective, but less thorough in their kill than a mix created for a specific species.

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Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION

Town(s) SUDBURY

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 | OT | Seed Cut Shelterwood Brush Mowing/Prescribed Fire | 25 ac | 40 sf | 100cd(f) 75 cd.(p) | Fall 2014-2018 |
|------|---|----|--|-------|-------|-----------------------|-------------------|

Description: The long-term goals of this management are to promote early successional wildlife habitat while simultaneously promoting more valuable timber crops such as white pine. Currently the overall quality of the oak on the site is relatively low for timber production, but the oak-dominated forest has aesthetic value and oaks (especially white oak) are an important source of mast (i.e. acorn) production for wildlife. Areas where pitch pine and scrub oak are abundant have unique habitat values as well. White pine is a minor species on this site has the most timber potential in these soils. The overstory here is mature, slow growing, and unlikely to increase in value to any great extent over the next 10 years. The desired future condition for most of the stand is a two-aged stand harvested in a manner that creates variable sized patches of early successional growth (that include white pine) surrounded by retention areas located in areas with high wildlife habitat value such as mast production or wetland features. Subsequent harvests should increase patch sizes to improve early successional habitat value.

With the exception of the pitch pine management area, this harvest will focus on promoting white pine regeneration by removing about 40-50% of the basal area, taking poorly formed oak and pine firewood, pulpwood and some sawtimber while retaining trees with unique habitat values such as large mast trees (particularly white oak) or cavity trees. The harvest pattern should include small groups (< ¼ acre) to ensure that whatever regeneration is created is relatively "free to grow". This harvest pattern will also help to minimize damage to this new growth during subsequent harvesting operations. Over the long term, white pine regeneration will be released in groups gradually expanding to variable sizes of 1-4 acres. Special attention will be paid along the Hop Brook boundary and the intermittent stream, as these are areas where invasives are likely to expand their presence following a disturbance. The configuration of these removal cuts should be designed to have the dual purpose of creating significant early successional habitat and include clusters of retained trees (aggregate retention). Overall, riparian corridors will be considered retention areas receiving less heavy treatment for both aesthetic and conservation reasons.

Along the southeastern edge of the property where scrub oak is more prevalent in the understory management for the pitch pine-scrub oak type is possible. The desired future condition in this area is a young, vigorous, even-aged shrubland composed of a scattered scarlet oak and pitch pine overstory with scrub oak understory. Management will involve removing competing species, particularly white pine and midstory hardwoods followed up by treating the site mechanically and with fire to encourage development of the scrub oak component. The objective is to reduce the basal area by 50% and create more open understory conditions. Pitch pine may also be thinned in areas where it is densely stocked. Residual overstory will include widely spaced pitch pine and mature oaks with thick bark. It will be necessary to reduce the existing shrub layer during the harvesting process carrying out a prescribed burn in the following year in order to create favorable site characteristics for the increased dominance of the desired scrub oak shrub layer as well as to promote increased overall diversity of native plants. This management ideally would be carried out in cooperation with neighboring SVT and City of Marlborough across boundary lines to similar stands.

These are generally good white pine sites, but in order for either white pine or pitch pine to become further established it is generally recommended that the harvest be timed to take place while the ground is bare immediately after a good pine seed year, which generally occur every 3-5 years, the most recent being the fall of 2009. Light exposure of mineral soil is favorable to the regeneration of white pine, and may be accomplished with skidding equipment. However, it also may be required that this harvest be scheduled for winter months (December 1 to March 31) in order to comply with the seasonal equipment restriction imposed by NHESP and described in the Conservation Management Practices (CMP) for Box Turtle. A winter harvest will reduce soil compaction and ground scarification, which in turn will help minimize the dispersal of invasive plant seed. Plan on discussing harvesting plans with NHESP before tree marking is carried out. Retaining large (fallen logs) and small (branches) woody material in the forest provides an important microclimate habitat for Eastern Box Turtle.

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

Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

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 | 3a | WO | Group Shelterwood | 6 ac | 50 sf | 10 MBF | Fall |
| | | | | | | 25cd(f)/30 cd(p) | 2014-2018 |

Description: The long-term goals of this management are to promote early successional wildlife habitat while simultaneously promoting more valuable timber crops such as white pine. Currently the overall quality of the oak on the site is relatively low for timber production, but the oak-dominated forest has aesthetic value and oaks (especially white oak) are an important source of mast (i.e. acorn) production for wildlife. White pine is a minor species on this site has the most timber potential in these soils. The overstory here is mature, slow growing, and unlikely to increase in value to any great extent over the next 10 years. The desired future condition for most of the stand is a two-aged stand harvested in a manner that creates variable sized patches of early successional growth (that include white pine) surrounded by retention areas located in areas with either high wildlife habitat value (such as mast production or den trees) or high aesthetic value (such as along a trail corridor). Subsequent harvests should increase patch sizes to improve early successional habitat value.

The group shelterwood technique is designed to promote regeneration by taking into account the varying levels of advanced regeneration that exist within this stand by adjusting the harvest intensity based on the development stage of the regeneration. This is a good white pine site with established white pine regeneration (that is about 15-20 years old), but in order for white pine to become further established it will need additional sunlight. This harvest will focus on either releasing existing white pine regeneration or creating conditions for the establishment of new seedling growth. The harvest will remove about 40-50% of the basal area, taking poorly formed oak firewood and pine pulpwood and some sawtimber while retaining large mast trees (particularly white oak), a number (at least 2 per acre) of snags/den trees (potential or existing), and seed producing white pines of good form. The harvest pattern should include small groups (< ¼ acre) to ensure that whatever regeneration is created or released is relatively "free to grow". Generally, larger openings can be made in areas where it is possible to save the existing regeneration during logging while elsewhere the smaller openings will be more favorable to pine establishment. This harvest pattern will also help to minimize damage to this new growth during subsequent harvesting operations. It may be best to avoid harvesting along the northern boundary where invasives are likely to expand their presence following a disturbance. Over the long term, white pine regeneration will be released in larger groups expanding openings to variable sizes of 1-2 acres.

In order for white pine to become further established it is generally recommended that the harvest be timed to take place while the ground is bare immediately after a good pine seed year. However, it also may be required that this harvest be scheduled for winter months (December 1 to March 31) in order to comply with the seasonal equipment restriction imposed by NHESP and described in the Conservation Management Practices (CMP) for Box Turtle. A winter harvest will reduce soil compaction and ground scarification, which in turn will help minimize the dispersal of invasive plant seed. Plan on discussing harvesting plans with NHESP before tree marking is carried out. Retaining large (fallen logs) and small (branches) woody material in the forest provides an important microclimate habitat for Eastern Box Turtle. A second cut, further removing the overstory, should be considered after the seedlings have entered the period of rapid growth, usually after the first 5-10 years.

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Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

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 | 4b | WP | Group Shelterwood | 9 ac | 85 sf | 27 MBF | Fall |
| | | | | | | 20cd(f)/200 cd(p) | 2014-2018 |

Description: The management recommendation for this stand is similar to that of stand 3a in terms of creating early successional habitat while also promoting more valuable timber crops such as white pine. The main difference here is that the overstory is largely white pine. While this site has produced a high volume of wood, the lack of management over its lifetime has resulted in a stand with many low value and low vigor stems. That being said, dense pine stands like this also have a high scenic value to recreational users. The aim of this harvest will be to retain some of the aesthetic value of the stand while also beginning the process of regenerating this stand. Because the habitat benefits of creating early successional habitat is more fully realized with larger openings, subsequent harvests will aim to expand the size of these gaps to 1-3 acres.

Here again, this is a good white pine site with established white pine regeneration (that is about 15-20 years old), but in order for white pine to become further established it will need additional sunlight. This harvest will focus on either releasing existing white pine regeneration or creating conditions for the establishment of new seedling growth. The harvest will remove about 40-50% of the basal area, taking poorly formed pine pulpwood and some mature and over-mature timber while retaining large mast trees (particularly white oak), a number (at least 2 per acre) of snags/den trees (potential or existing), and seed producing white pines of good form. The harvest pattern should include small groups (< 1/4 acre) to ensure that whatever regeneration is created or released is relatively "free to grow". Generally, larger openings can be made in areas where it is possible to save the existing regeneration during logging while elsewhere the smaller openings will be more favorable to pine establishment. This harvest pattern will also help to minimize damage to this new growth during subsequent harvesting operations. It may be best to avoid harvesting along the northern boundary, around stand 5 and along the pond shoreline where invasives are likely to expand their presence following a disturbance. These areas will be the basis for the retention areas and which be expanded to include areas of high habitat value such as the vernal pools at the eastern end of the stand.

As with the stands, in order for white pine to become further established it is generally recommended that the harvest be timed to take place while the ground is bare immediately after a good pine seed year. However, it also may be required that this harvest be scheduled for winter months (December 1 to March 31) in order to comply with the seasonal equipment restriction imposed by NHESP and described in the Conservation Management Practices (CMP) for Box Turtle. A winter harvest will reduce soil compaction and ground scarification, which in turn will help minimize the dispersal of invasive plant seed. Plan on discussing harvesting plans with NHESP before tree marking is carried out. Retaining large (fallen logs) and small (branches) woody material in the forest provides an important microclimate habitat for Eastern Box Turtle. A second cut, further removing the overstory, should be considered after the seedlings have entered the period of rapid growth, usually after the first 5-10 years.

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Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

MANAGEMENT PRACTICES
to be done within next 10 years

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

MANAGEMENT SUMMARY

As mentioned, much of the harvesting recommended in this plan should be postponed until an invasive control program is in place. Once there has been a reasonable degree of success in maintaining and expanding clean zones, the planned harvesting can be considered.

While it may be possible to carry out harvesting recommendations on the entire property at once, several constraints make it more feasible to separate management activities into two sales divided by Hop Brook. This separation of sales will reduce recreation interruption and allow time to address invasive species issues and access constraints present in the eastern section. The western side has droughtier soils and lower incidence of invasive species, making it possible to cut sooner. The two sides of the Brook also differ in terms of the type of harvesting equipment recommended to achieve the harvest goals. The use of a cut-to-length harvesting system may be more suitable to the area east of Hop Brook due to its ability to utilize a small landing and greater ability to avoid damage to pine regeneration. The west side of the Hop Brook might benefit from having a whole tree harvest as this system would be beneficial in carrying out the pitch pine-scrub oak management goals. It is also recommended that the harvest on this area west of the brook be coordinated with the SVT harvest which has similar management recommendations in order to reduce costs and potentially attract a higher bid. The nature of the harvesting in both sections is such that they will be break even or at cost sales, otherwise described as "pre-commercial". The following are the combined estimated volumes for this sale:

1. Eastern Sale on Stands 3a, 4b (17 acres):
Est. Volumes: 37 mbf sawtimber, 45 cd. firewood, and 225 cd. softwood pulp
2. Western Sale on Stand 1 (25 acres):
Est. Volumes: 100 cd. firewood, and 75 cd. of pulp

GENERAL MANAGEMENT ACTIVITIES

Boundaries: All boundaries should be blazed and painted within the first 2 years of this plan. Repaint in 7-10 years. Town property tags can also be installed every 150-200' along these lines. If there are access restrictions (e.g. for ORV use) then these should be clearly posted at all access points.

Roads/Access: Vehicular access across the property is currently limited by an unsuitable crossing of Hop Brook. This crossing may not be necessary to achieve harvesting objectives in the west if access can be gained through the abutting Federal Refuge land. Lay out main skid trails prior to logging with consideration given to minimizing grade change as well as their future use as hiking trails. Recreational trails should be well marked with bright flagging to make them obvious to harvesters. No slash should be left within 50' of trails, and thinning along trails should consider aesthetic impacts.

Tree Farm: Consider applying to become a certified Tree Farm as a way of demonstrating that high standards of forest stewardship are being practiced. In addition, an educational board explaining the goals and objectives of the harvest should accompany all harvesting operations.

Education/Trails: No new hiking trails are recommended. Monitor existing trails for erosion issues that seem to be developing due to horseback riding. Relocate trails on steep grades in order to minimize erosion. Avoid wetlands except where crossing is necessary.

Habitat: Silviculturally, the timing of these harvests should take place during the fall of a good white pine seed year. Seek advice from NHESP in determining if there are ways to carry out a fall harvest without negatively impacting box turtle populations. During harvesting practices, leave approximately 6-10 cavity trees or potential cavity trees per acre.

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Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

Signature Page Please check each box that applies. _____

CH. 61/61A Management Plan I attest that I am familiar with and will be bound by all applicable Federal, State, and Local environmental laws and /or rules and regulations of the Department of Conservation and Recreation. I further understand that in the event that I convey all or any portion of this land during the period of classification, I am under obligation to notify the grantee(s) of all obligations of this plan which become his/hers to perform and will notify the Department of Conservation and Recreation of said change of ownership.

Forest Stewardship Plan. When undertaking management activities, I pledge to abide by the management provisions of this Stewardship Management Plan during the ten year period following approval. I understand that in the event that I convey all or a portion of the land described in this plan during the period of the plan, I will notify the Department of Conservation and Recreation of this change in ownership.

Green Certification. I pledge to abide by the FSC Northeast Regional Standards and MA private lands group certification for a period of five years. To be eligible for Green Certification you must also check the box below.

Tax considerations. I attest that I am the registered owner of this property and have paid any and all applicable taxes, including outstanding balances, on this property.

Signed under the pains of perjury:

Owner(s) *[Signature]* Date June 29, 2010

Owner(s) *[Signature]* Date June 29th, 2010
(on behalf of the Conservation Commission)

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

Plan Preparer *[Signature]* Date June 29, 2010
Broad Arrow Forestry

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

Approved, Service Forester _____ Date _____

Approved, Regional Supervisor _____ Date _____

In the event of a change of ownership of all or part of the property, the new owner must file an amended Ch. 61/61A plan within 90 days from the transfer of title to insure continuation of Ch. 61/61A classification.

Owner(s) TOWN OF SUDBURY CONSERVATION COMMISSION Town(s) SUDBURY

TOPOGRAPHIC BASE MAP
Property of
The Town of Sudbury Conservation Commission
HOP BROOK MARSH CONSERVATION AREA
Dutton Road, Sudbury, MA

Scale: 1"=528' (8 chains)

Area = +/- 93.28 acres

51.5

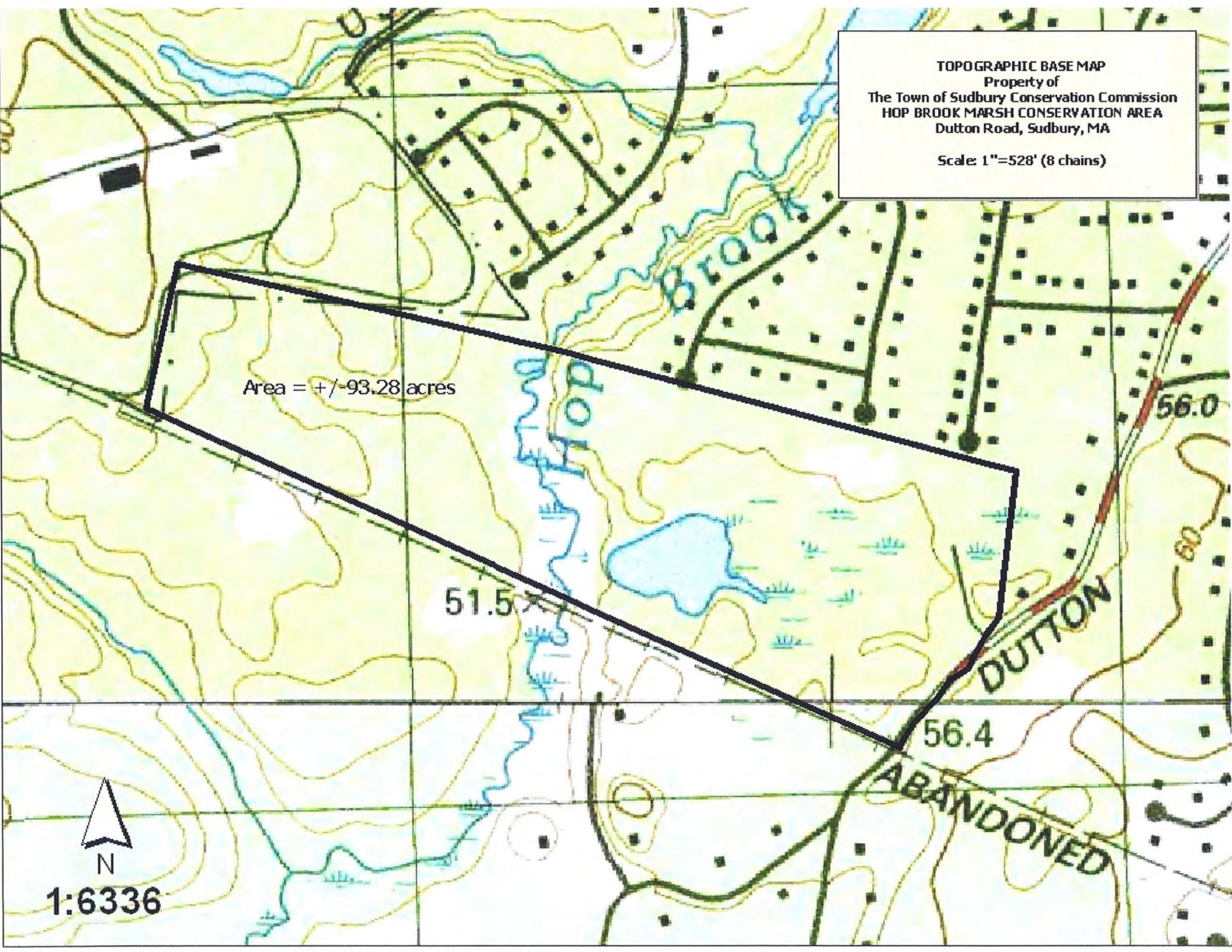
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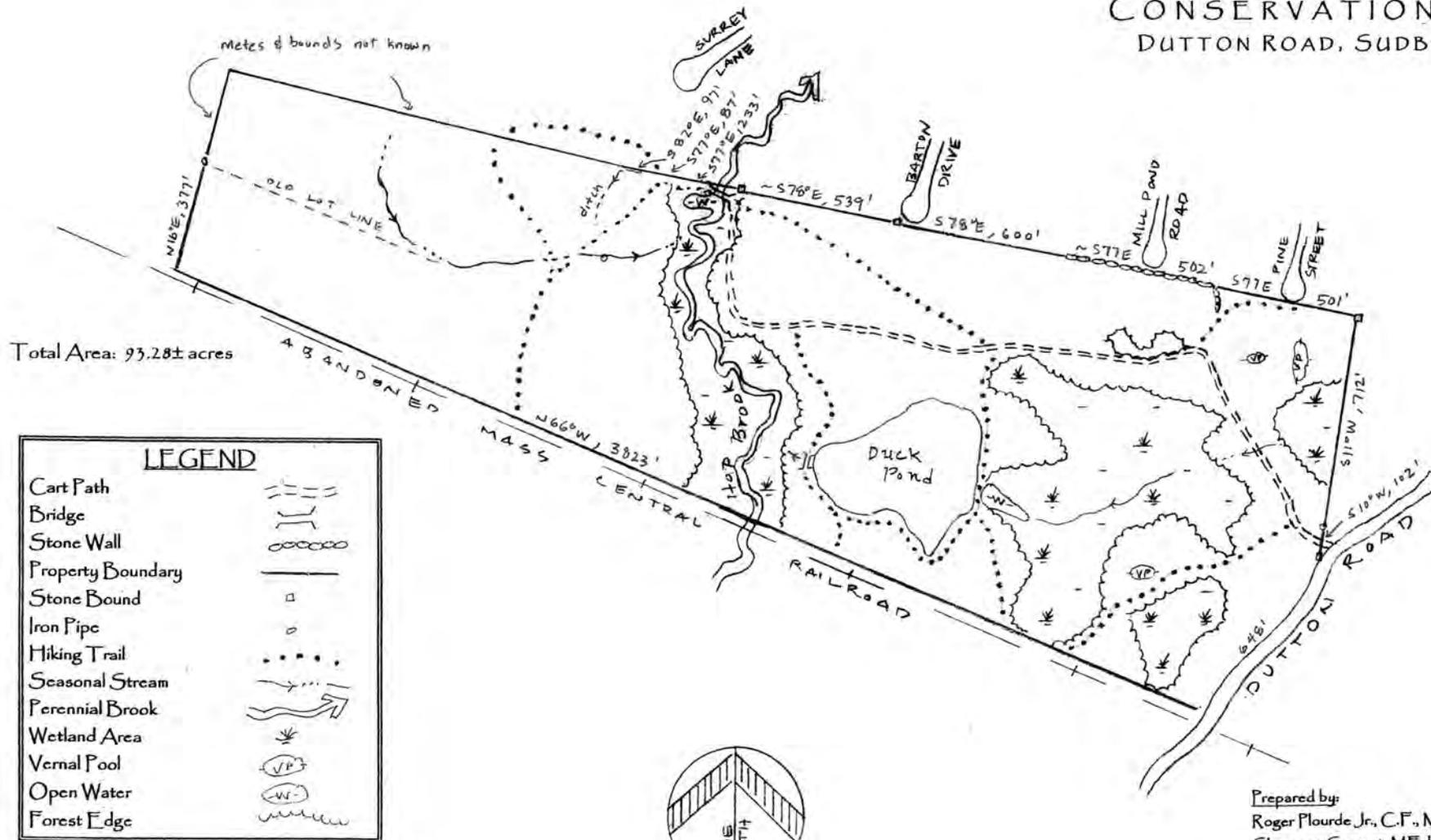
ABANDONED



1:6336



BOUNDARY &
PHYSICAL FEATURE MAP
PROPERTY OF
THE TOWN OF SUDBURY
CONSERVATION COMMISSION
HOP BROOK MARSH
CONSERVATION AREA
DUTTON ROAD, SUDBURY, MA



Source:
Aerial photos
6/10 forest inventory
1946 Pettigrew Survey Plan

Prepared by:
Roger Flourde Jr., C.F., MA Lic. #192
Shavonne Sargent, ME Lic. # F13543
June, 2010

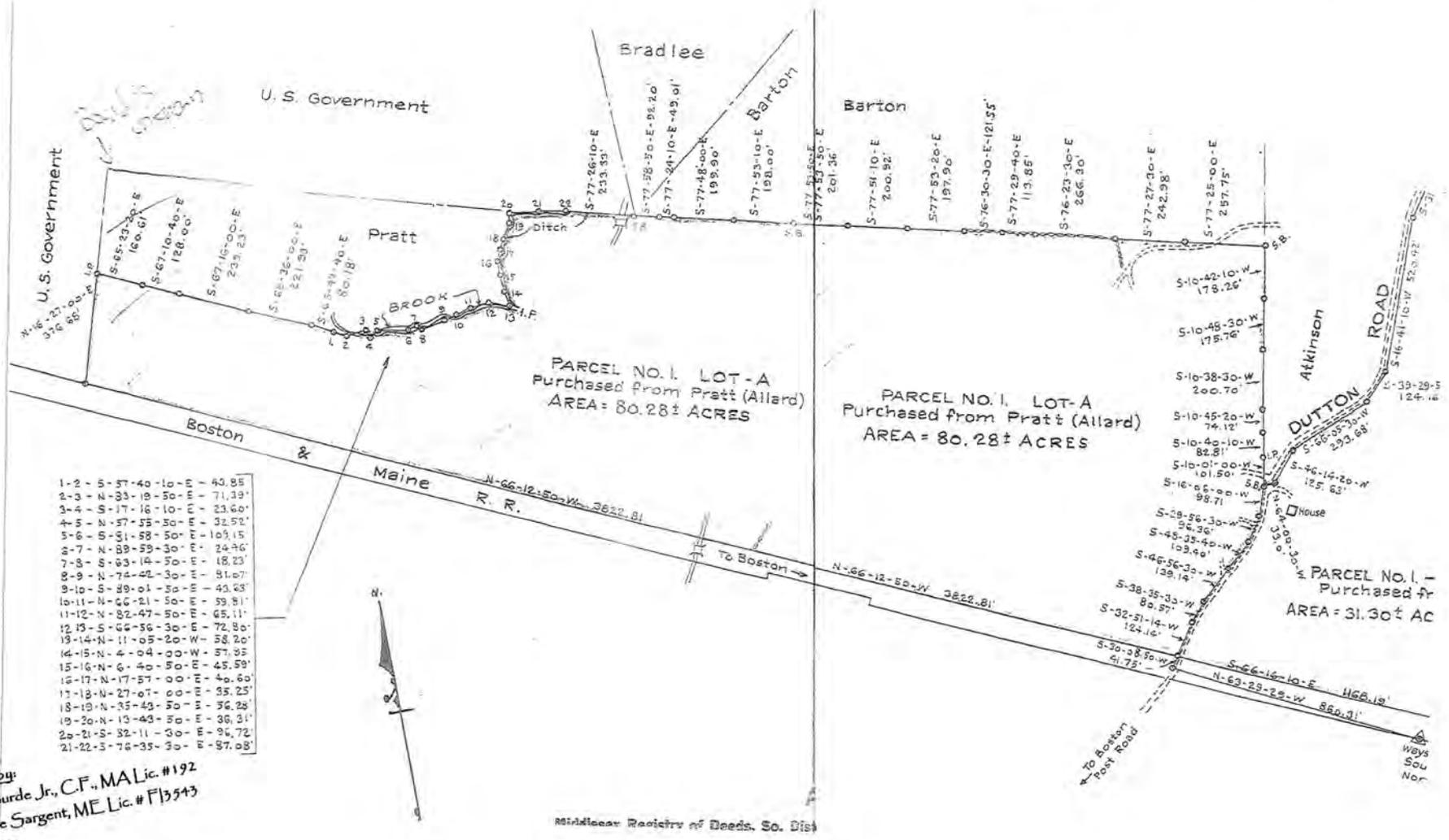


BROAD ARROW FORESTRY
Post Office Box 20062
Worcester, MA 01602
508.792.2414

BOUNDARY & PHYSICAL FEATURE MAP

PROPERTY OF
THE TOWN OF SUDBURY
CONSERVATION COMMISSION
HOP BROOK MARSH
CONSERVATION AREA
DUTTON ROAD, SUDBURY, MA

Total Area: 93.28± acres



Prepared by:
Roger Plourde Jr., C.F., MA Lic. #192
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June, 2010

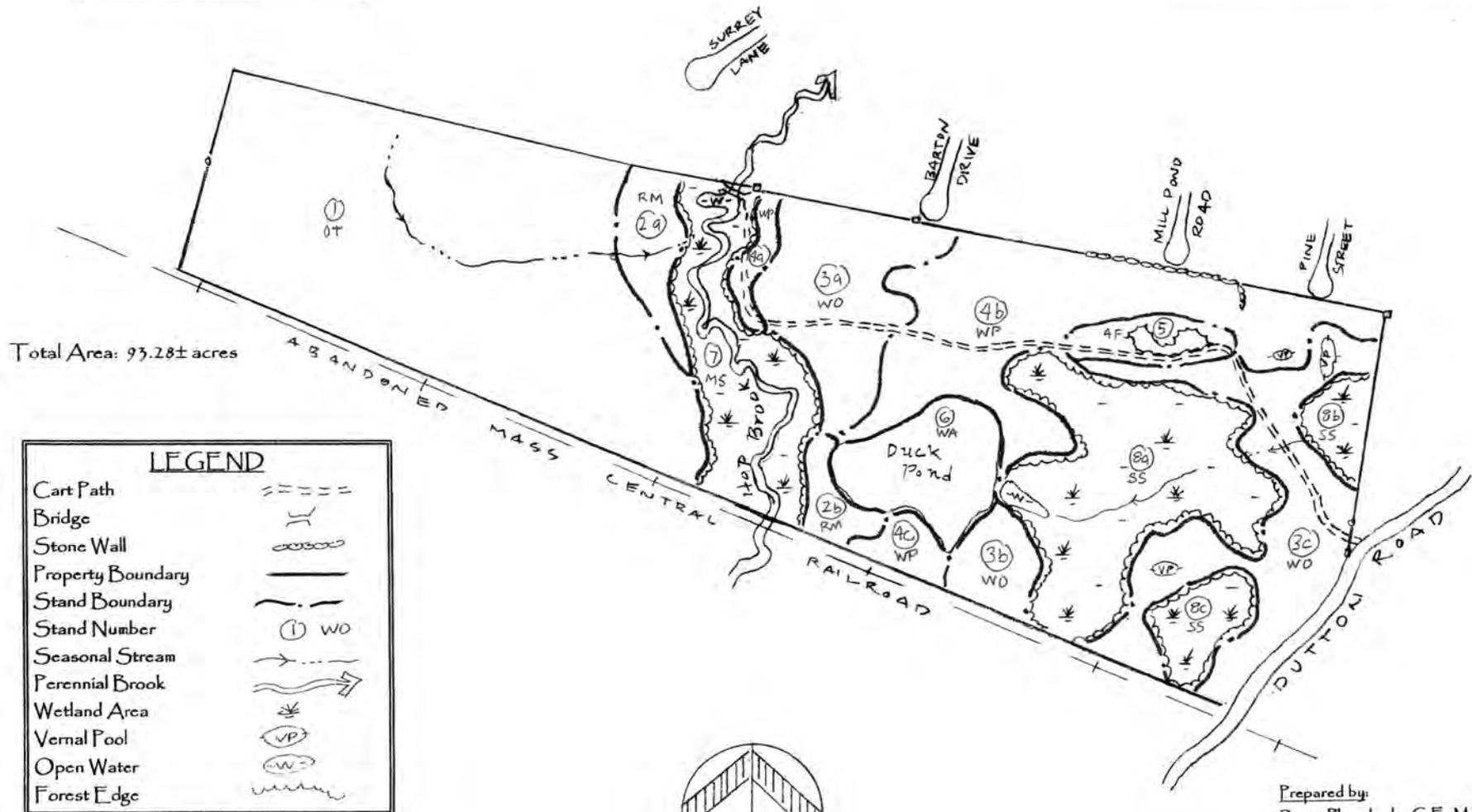
Source:
Aerial photos
6/10 forest inventory
1946 Pettigrew Survey Plan

 **BROAD ARROW FORESTRY**
Post Office Box 20062
Worcester, MA 01602
508.792.2414

FOREST STAND MAP

PROPERTY OF
 THE TOWN OF SUDBURY
 CONSERVATION COMMISSION
 HOP BROOK MARSH
 CONSERVATION AREA
 DUTTON ROAD, SUDBURY, MA

| Stand Types | |
|-------------|-----------------|
| OT | Scarlet Oak |
| WP | White Pine |
| WO | White Pine-Oak |
| RM | Red Maple |
| | Swamp Hardwoods |
| MS | Shallow Marsh |
| WA | Open Water/Pond |
| AF | Abandoned Field |
| SS | Shrub Swamp |



Total Area: 93.28± acres

Prepared by:
 Roger Plourde Jr., C.F., MA Lic. #192
 Shavonne Sargent, ME Lic. # F13343
 June, 2010



BROAD ARROW FORESTRY
 Post Office Box 20062
 Worcester, MA 01602
 508.792.2414

Source:
 Aerial photos
 1/10 Forest inventory
 1946 Pettigrew Survey Plan

FOREST STAND MAP
PROPERTY OF
THE TOWN OF SUDBURY
CONSERVATION COMMISSION
HOP BROOK MARSH
CONSERVATION AREA
DUTTON ROAD, SUDBURY, MA

Total Area: 93.28± acres



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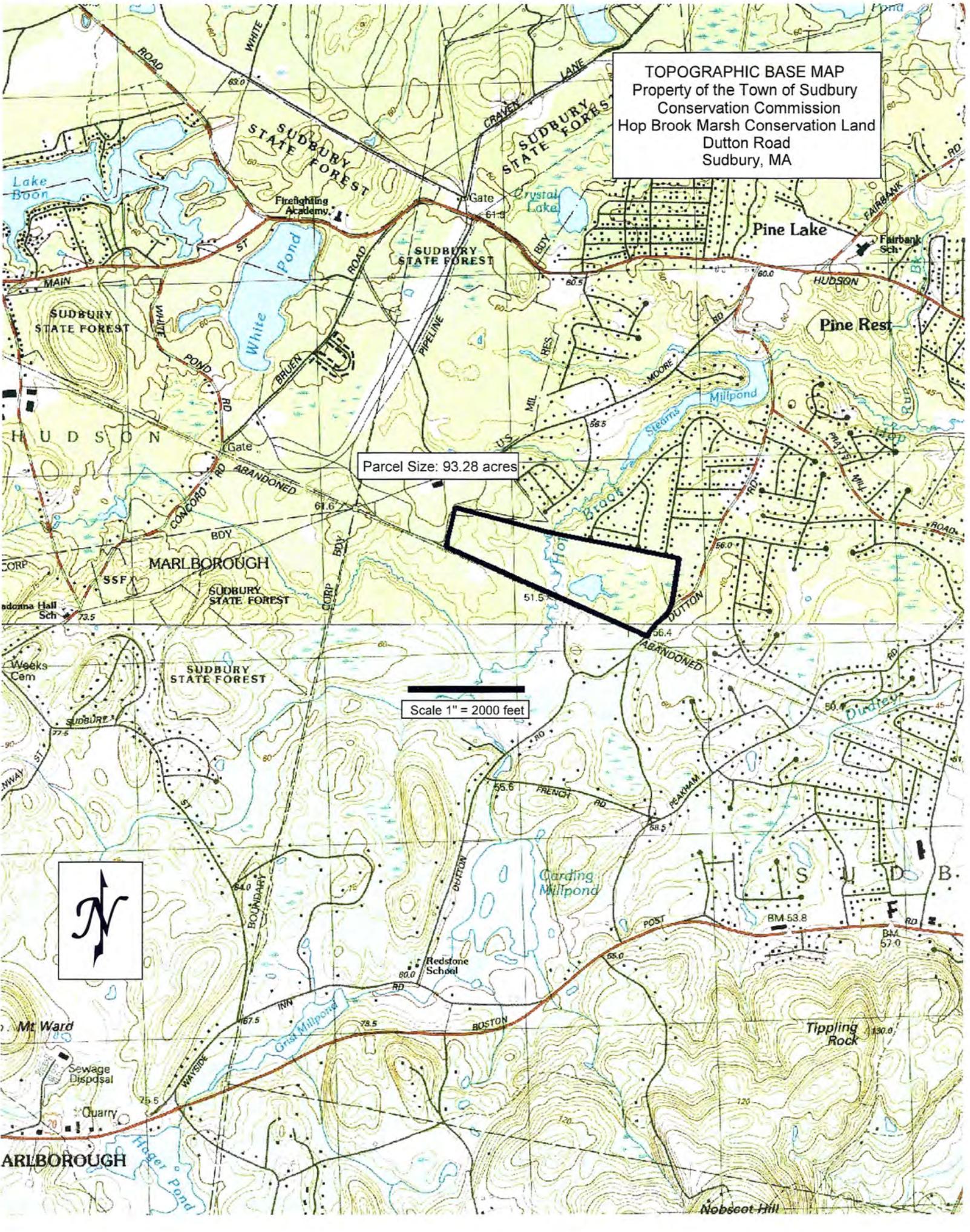
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June, 2010

Source:
Aerial photos
6/10 forest inventory
1946 Pettigrew Survey Plan

TOPOGRAPHIC BASE MAP
Property of the Town of Sudbury
Conservation Commission
Hop Brook Marsh Conservation Land
Dutton Road
Sudbury, MA

Parcel Size: 93.28 acres

Scale 1" = 2000 feet



MARLBOROUGH

Nobscot Hill