

Mount Toby Demonstration Forest Management Plan

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PREFACE

This management plan has been written as a replacement for the existing plan for Mt. Toby Demonstration Forest, written by Dennis Morin, Gary D. Kronrad, and Ellen Roller in March of 1980. Some material from the original plan has been included in this version, although much has been changed. For more information on the original plan or historical management of Mt. Toby Demonstration Forest, please refer to the original plan in the University Forest Archives (Morin et al 1980).

EXECUTIVE SUMMARY

This management plan provides the framework for managing the Mt. Toby Demonstration Forest, owned by the University of Massachusetts and managed by the Department of Natural Resources Conservation. The 755 acre forest is located in the towns of Sunderland and Leverett and is an important source of regional biodiversity as well as a popular area for recreation.

This plan aims to satisfy the requirements of the trustee's policies as well as to give due consideration to the views of the stakeholders who will be affected by the management actions of the plan. It uses a values-based approach to the land, identifying key values and purpose so that these assets may be protected and enhanced. Generally, the forest will be used by the University for instruction, research and demonstration, with the conservation of regional biodiversity being a high priority.

The plan includes information on the historical background of the property as well as the current conditions of the resources that exist there. Management objectives for the forest are outlined along with the management actions required to achieve these objectives. A plan for monitoring progress and a schedule of activities have also been included to facilitate implementation of the plan and so that activities can be evaluated for further follow-up action. Financial considerations have been addressed to aid in the future drafting of a budget for the entire University forests holdings.

STATEMENT OF AUTHORITY

According to the Trustees Policy for the Management and Use of the University Forests (see Appendix A), the Chancellor of the University is responsible for the overall management of

the University forest holdings, as well as the enforcement of established rules and regulations. The day-to-day management activities on the forests; however, are coordinated by the Department of Natural Resources Conservation in the College of Natural Resources and the Environment. Within this department, forest management is the province of the University Forests Committee. This committee, as well as its contracted agents, holds the ultimate authority and responsibility for the implementation of this plan.

FOREST HISTORY

Adapted from “History of the University of Massachusetts’ Mount Toby Demonstration Forest” By Bill Wilson:

The Mount Toby Demonstration Forest lies, for the most part, in the Town of Sunderland in Massachusetts’ Connecticut Valley. Established in 1647 but not settled until 1714, Sunderland was divided initially by giving each proprietor a home lot along the main street forming a town center. Additional lots of meadow and plow land south of the town center were given to the proprietors to farm. Low priority was given to developing the hilly area northeast of the town center. This area, occupying the Mount Toby massif, was left as common land until the 1730s, when it was given to proprietors in 20-to 50-acre lots.

Early deeds refer to “the bare nole of Tobie” and to Cranberry Pond, which is on the present Forest, but there is not enough information to locate lots on the ground. Normally in the hills of New England, some old boundaries are still marked by stone walls, however on the 755-acre Mount Toby Forest, there are no stone walls.

The Forest is topographically diverse. To the south are three hills, the highest being Mount Toby (1269 feet). The rocky tops of these hills were called “oak ridges” in the early days. Slopes are steep with small cliffs and ledges to the east and west. There is a deep valley between two of the hills – Roaring Mountain to the south and Ox Hill to the north - with a brook that drops in a waterfall near the eastern border of the Forest. This hilly area is too rugged to have been cultivated. Most, but not all of it, has been logged more than once, but some areas are so inaccessible that they were never logged. At least one area on the forest was used for maple sugaring.

The northern half of the Forest is much less rugged. Cranberry Pond, the lowest point at 357 feet, is surrounded by sandy and gravelly soils of a glacial outwash plain. Early deeds refer to “Cranberry Pond meadows,” suggesting that wet meadows were present even before settlement by Europeans. To the west of Cranberry Pond is a low ridge rising to about 700 feet.

The only farm on the Forest was along the road that marks the present northern boundary. In 1777, the farm lay on both sides of what is now Reservation Road, . In 1846, the farm was divided in half and a second house and barn were built south of the road. It remains today as the “Toby House”. Mount Toby’s small farm of about 130 acres was more typical of those of the “hill country” than of the rich farms along the Connecticut River. In the 1868 tax valuation it had only two horses, a yoke of oxen, three cows, seven young cattle, five swine and four sheep.

In 1866, the New London & Northern Railroad ran its first train along the east side of Mount Toby, passing near the base of the waterfall and dramatically changing the use of the

land. In 1871, a lumberman named Rector Goss saw the potential of developing Mount Toby as a mountain house resort.. Mount Toby had a beautiful view, an attractive forest, and a waterfall at the foot of a dramatic valley, all now easily accessible by railroad.

[quote]

“In the thick woods which envelop Mount Toby upon every side are found charming cascades and glens, and many inviting spots, which have been improved by the hand of art, and which have given the region thereabout the name of Sunderland Park.”

Goss bought 206 acres of land on Mount Toby and built a railroad station near the base of the falls, a two-mile road to the top , and a six-story enclosed tower and stables on the summit. Visitors traveled by train to Mount Toby Station, and then by carriage or foot around the falls and up the steep valley to the top of the mountain.

Rector Goss died in 1875, and John L. Graves, who held the mortgage on most of the land, bought it back at auction. He envisioned buying more land, damming Cranberry Pond to make a lake with a floating bandstand, and building a hotel on the top of Mount Toby next to the tower. In 1882, he built the hotel, but little is known of it, because just as it was finished the tower, hotel and stables burned to the ground. The structures were never rebuilt; the lake was never created.

While Mount Toby stayed undeveloped, the Massachusetts Agricultural College (later to become the University of Massachusetts), eight miles to the south in Amherst, had become interested in forestry education. In 1894 Bernhard E. Fernow gave a series of 12 lectures at the College. By 1914, the Massachusetts Legislature had appointed a Forestry Commission to acquire waste land for state forests at an average price of less than five dollars per acre. A trustee of the College had already written to John L. Graves about acquiring the land at Mount Toby “as a field basis for practical instruction in forestry and the care and economic management of woodland, as adapted to New England needs and conditions.” Graves was amenable, but as a businessman, he expected to be adequately compensated.

“I fear that if we should try to ‘instruct’ the local representatives of the legislature in regard to the value of the forest land, we should get ourselves into medium hot water. I am pretty sure that \$30,000 is all that they are willing to stand back of, and that is more than the appraisal of the gentlemen who went over the matter at your suggestion some weeks ago, I am afraid we cannot face the legislature with any larger amount, ” wrote the President of the College regarding negotiations to purchase Mount Toby.

The price of \$30,000 was \$40 per acre. In view of the \$5 per acre cap set by the legislature for acquiring State Forests, it is not surprising that the legislature was not eager to finance the purchase of Mount Toby and did not act. John Graves died in 1915. Timber on the forest went uncut during Graves’ tenure as owner:

[quote]

“My desire for 50 years has been to have it developed into a large forest park, and for that reason have refused to allow the forest to be cut.” John L. Graves, shortly before his death.

In 1916 Graves’ desires were realized. The Massachusetts Legislature passed the Mount Toby State Demonstration Forest Bill authorizing the expenditure of \$30,000. Graves’ part of

“Sunderland Park” was placed under control of the College as a demonstration, teaching, and research forest.

About this time, the chestnut blight reached Sunderland. The U.S. Forest Service, in cooperation with the College, set up several permanent monitoring plots to study what would replace the chestnut. Permanent sample plots have since been established throughout the Forest. These allow long-term monitoring of the forest’s condition. In the early years, the forests were managed intensively, but the 1938 hurricane damaged many of the mature stands, and with the advent of World War II, management activities declined. Today, the University students and faculty use the forest for teaching, field exercises, and forestry research activities. Timber cutting which takes place is in support of approved research and teaching projects. Mount Toby is used heavily by the general public for a variety of recreational activities. These are allowed so long as they conform with the University Trustees guidelines for use of the Forest and do not interfere with teaching and research activities.

CURRENT CONDITIONS

Topography

The topography of Mount Toby Forest can be divided into two main physiographic areas (see Appendix B - Figures 1-3). The northern half of the forests sits on a glacial outwash plain characterized by low slopes and shallow, well-drained, soils. This outwash plain includes the lowest point of the Mount Toby area, the surface of Cranberry Pond, at an altitude of 352 feet above sea level. As one proceeds southward, the slopes become steeper and the elevation increases sharply. The summit of Mount Toby boasts the highest elevation of 1269 feet above sea level, although the peaks of Roaring Mountain and Ox hill are also distinctive vertical features. To the east and west, the slopes are steep with small cliffs and ledges.

Landscape Context

Mt. Toby Demonstration Forest is located in the Pioneer Valley (a section of the Connecticut River Valley in west-central Massachusetts), less than 2 miles southwest of the Connecticut River. The university property encompasses about half of the region known as Mt. Toby, including the peak of Mt. Toby itself. The predominant land use in the surrounding landscape is forested open land, with small pockets of agriculture and light residential making up the remainder of the acreage (see Appendix B – Figure 4).

Although the heavily forested landscape is not strongly fragmented by land cover type, it is markedly parcelized by land ownership (see Appendix C – Figure 5). A mixture of land owners, including private residents, municipalities, other state agencies, and NGOs, can be found immediately adjacent to, as well as surrounding, the university holdings at Mt. Toby. The large number and variety of landowners, each with their own objectives, resources, and constraints, means that the future of the Mt. Toby landscape is far from certain. Whether or not it remains a coherent, ecologically-functioning landscape or becomes a decentralized jumble of development projects and land uses depends largely on the future economic and political climate, as well as the independent decisions of dozens of different land owners.

Climate

From (Morin et al. 1980):

The temperate climate of Massachusetts offers 184 frost free days (April 25 – October 25). The moist climate of the region supplies an average of 40 inches of precipitation per year, which is ample moisture for tree growth. There is adequate moisture for seed germination and regeneration on most sites.

Geology

From (Morin et al. 1980):

The soils of Mount Toby Forest are of glacial origin, and exist very much as deposited by the ice, or as reworked by water. The ice sheet overrode the entire area and left a mantle of till of rather uniform composition over the uplands, except for a few small areas where the area was too steep or where, on the northern slopes, glaciation was so severe as to remove most of the soil mantle. The till on the southern slopes contains a greater proportion of conglomerate fragments than does that on the northern slopes, as might be expected from the direction of movement of the glacier.

The rock fragments found in the till are for the most part sharp and angular, less worn, and not as large as are found in much of the till of other sections of Massachusetts. Crystalline rocks, including granites, syenites, diorite, diabase, quartzite, felsite, gneisses, and shists, predominate, but sedimentary rocks, particularly Triassic sandstones and conglomerates are found, and it is to the latter that the characteristic reddish color of the soils is due. Bedrock

outcroppings of these conglomerates, or ‘puddingstones’, are a common and interesting geological feature on the forest.

Soils

The predominant soil on the forest is Hollis extremely rocky fine sandy loam. It is the primary soil found on the mid-slopes as well as the steep upper slopes of Mt. Toby, Ox Hill, and Roaring Mountain (See Appendix B – Figure 6). In all, this soil underlies approximately 600 acres – nearly 80% of the 755 acre forest. According to the US Soil Survey, this series “consists of shallow, well drained and somewhat excessively drained soils formed in a thin mantle of till derived mainly from gneiss, schist, and granite. They are nearly level to very steep upland soils on bedrock-controlled hills and ridges. Slope ranges from 0 to 60 percent. Permeability is moderate or moderately rapid. Depth to hard bedrock ranges from 10 to 20 inches” (USDA-NRCS 2006).

On the glacial outwash plain, the soils are predominantly composed of Merrimac sandy loam and Merrimac fine sandy loam. This soil series “consists of very deep, somewhat excessively drained soils formed in glacial outwash. They are nearly level to very steep soils on outwash terraces and plains and other glaciofluvial landforms. Slope ranges from 0 to 35 percent” (USDA-NRCS 2006). There is also a small 4 acre segment of Merrimac sandy loam in the west-central portion of the forest, in the vicinity of a vernal pool (See Appendix B – Figures 6 and 7).

Others soils found on the forest are Charlton extremely stony fine sandy loam (in the southwestern corners of the property), Scituate very stony fine sandy loam, Ridgebury very stony and extremely stony fine sandy loams, and Scarboro fine sandy loam (brownish subsoil variant) (See Appendix B – Figure 6). These last two soils are hydric soils associated with poorly drained portions of the forest, such as the wetland complex feeding Cranberry Pond (See the section on hydrology, below).

Hydrology

The most prominent water feature on the forest is the 26 acre Cranberry Pond. This pond is about one half mile long by a quarter mile broad, with an average depth of 5 feet and a maximum depth of 25 feet. The pond is primarily fed by a stream and wetland complex

originating beyond the property boundary and composed of a rich mosaic of forested swamp, emergent marshlands, and open water. The main outlet is a stream which drains the pond on the northern edge, flowing over a small dam before crossing the forest boundary.

The forest has a variety of small streams and watercourses flowing down from the peaks of Mt. Toby, Ox Hill, and Roaring Mountain (see Appendix B - Figure 7). Although most of these are intermittent, exceptions are the stream which feeds Cranberry Pond and Roaring Brook, a watercourse which flows from west to east in the valley between Ox Hill and Roaring Mountain before falling off to a waterfall near the eastern edge of the forest.

Mt. Toby Forest also contains several vernal pools. These vernal pools are currently not certified and are therefore not protected under the Massachusetts Wetlands Protection Act Regulations.

Overstory Vegetation

The rugged topography of Mount Toby is marked by a rapid change in elevation, slope, and aspect as one moves across the forest. This topographic patchiness, along with a patchy soil distribution and a variable management history, has resulted in an intricate mosaic of diverse stands (See Appendix B – Figure 8). Some of these stands have an uneven-aged distribution, although the majority of the stands are even-aged. Of these, many date from the 1938 hurricane, with the remainder spread across a wide variety of age classes. Despite this fine-scaled diversity, there are general patterns of overstory vegetation to be found on the forest.

Eastern white pine (*Pinus strobus*) dominates the glacial outwash plain in the northern end of the forest, growing on the abandoned fields of the old Toby farm. These stands are densely stocked, with a low average DBH and an acceptable stem form. From a timber perspective, these stands are on the low end of being merchantable. Mixed in with the pine are pockets of mixed hardwoods and remnants of exotic plantations, including stands of red pine (*Pinus resinosa*), Norway spruce (*Picea abies*), and European larch (*Larix decidua*). On the eastern shore of Cranberry Pond, across the railway tracks, there are two mixed stands of white pine and planted exotics, including, surprisingly, a fair amount of advance growth of exotic spruce and red pine. Although eastern hemlock (*Tsuga canadensis*) is an uncommon overstory tree on the lower flats, it is a very common component of the seedling and sapling strata there. In the absence of disturbance, it is likely that hemlock will continue to increase in dominance in this

portion of the forest. There are also some stands of mature hemlock on the raised uplands along the northwestern boundary.

In the central portion of the forest, south of the glacial outwash plain and higher in elevation, is a wide belt consisting primarily of mixed hardwood stands. Northern hardwoods, especially black birch (*Betula lenta*) and sugar maple (*Acer saccharum*) figure prominently here, although mixed oaks (*Quercus* spp.) are also quite common. Also scattered throughout this mid-elevation belt are small pockets of white pine, mixed pine hardwood, and hemlock. In the wetland complex feeding Cranberry Pond can be found mixed hardwood stands of oaks, sugar maple, birch and ash (*Fraxinus* spp.). Age and diameter distributions, along with timber quality, vary widely across this area.

The southern portion of the forest is dominated by the peaks and slopes of the mountain itself. The droughty ridges, peaks and exposed heights are characterized by oak-hickory forest, including species adapted to dry sites, such as scarlet oak (*Quercus coccinea*), bear oak (*Quercus ilicifolia*), and mockernut hickory (*Carya tomentosa*). The lower slopes and occasional flat bench maintain enough moisture to support a rich mesic forest, a mixture of stands containing oak, northern hardwoods, and hemlock. In the moist soils south of Roaring Brook, in the Arnold Rhodes Natural Area, is an impressive stand of massive, old-growth hemlock. Although some of the timber in the lower elevations is of a merchantable size, the oak-hickory forest on the higher elevations consists of low value trees, with a low average DBH and poor stem form.

Wildlife and Species of Special Concern

According to the Massachusetts Natural Heritage Program, the state agency responsible for protecting regional biodiversity, priority habitat for at least 16 species of special concern are found within the forest (See Appendix C). The majority of these species, including understory herbs, are concentrated in the rich mesic forest covering the slopes of the mountain. As far back as the mid 19th century, these slopes were known to professional and amateur botanists as a prime location for rare and sought-after plants.

Of the 16 species, only two reptiles, the eastern box turtle, *Terrapene carolina*, and the wood turtle, *Clemmys insculpta*, may be found in a location where habitat damage could result as a consequence of active forest management. Because of this risk, forest management will need to

specifically address the habitat needs of these two species. (For more information, refer to the detailed descriptions of the management zones in the following sections).

Trails and Infrastructure

There is an extensive trail and road system throughout the forest (see Appendix B – Figure 9). Many of the trails are concentrated in the northern part of the property. The most well known trail is the Robert Frost trail which runs in a north-south direction on the western side of the UMass property. The Appalachian Mountain Club has traditionally been responsible for maintaining this trail through volunteer work. Tower Road, which passes along the western side of Cranberry Pond and up to the summit of Mt. Toby, is the main road for both vehicular and pedestrian traffic. This road has been severely damaged by water run off, to the point that sections of the road are inaccessible to vehicle traffic. In addition to these official trails and roads, there is also a variety of unofficial trails, skid trails, and old logging roads throughout the forest, some of which see extensive recreational use by the public.

Several buildings and structures also exist on the property. There is a fire tower on the summit of Mt. Toby, along with associated power lines running from the Reservation Road to the summit. Also found on this road is the Mount Toby House, the original farmhouse from the 19th century farm on the northern end of the property. This building is in an advanced state of deterioration. Barring a complete refurbishment, this building is in danger of collapse – a potential public danger. It is also an inviting target for vandals or arsonists.

Another potential hazard is the dam at the outlet to Cranberry Pond. This structure is in very poor condition, with significant structural damage and numerous leaks. In its current state, dam failure is a definite possibility.

A number of informational signs can be found all across the forest. Many of these signs are weathered or damaged, often to the point of being unreadable. Others contain information that is obsolete or misleading. A large informational kiosk can be found by the main gate on Reservation Road. This kiosk contains a map as well as space for posting notices. A similar kiosk once stood in the parking lot by Cranberry Pond before repeated vandalism necessitated its removal.

MANAGEMENT OBJECTIVES

A series of interviews were conducted with faculty members within the Department of Natural Resources Conservation to assess their overall goals for Mt. Toby Forest, as well as discuss potential teaching, research, and outreach activities for this property. Based on these interviews, four broad objectives were developed for directing the nature and extent of management efforts at Mt. Toby Forest. The primary objective is to provide high quality resources and opportunities for research, teaching, and demonstration. By stressing these values, we hope to fulfill the directives found in the trustees and mission statements for Mt. Toby. Secondly, the forest will be sustainably harvested to provide educational opportunities to contribute to the operating budget for Mt. Toby and the other University forests. As a third objective, management actions on the forest will be conducted to complement the conservation of regional biodiversity. As a final objective, we wish to operate in harmony with the widespread recreational use at Mt. Toby.

Note: For the purpose of satisfying the third objective, state-drafted Conservation Management Practices (CMPs) have been incorporated into this plan. These guidelines have been drafted by the Natural Heritage Program to reduce or eliminate risks to rare species (Mass.Nat.Her. 2006). Where university management actions could conflict with state CMPs, we have chosen to defer to the CMPs within this plan. (For specific applications of these CMPs, refer to the detailed descriptions of management zones in the following sections).

THIRD PARTY USAGE FOR RESEARCH, TEACHING, AND DEMONSTRATION

In order to satisfy the primary management objective, the forest will be made available to students, researchers, faculty and staff for research projects, teaching, public outreach and demonstration. In order to efficiently coordinate resources among a variety of users, good recordkeeping will be an essential component of forest management at Mt. Toby.

Before any research or demonstration project begins, an application to the University Forests Committee is required. If the application is granted, a description of the project must be filed. This description must include the nature of the project, the names of those involved, the equipment or markings being used, and the period of time for which the project will last. This document serves two functions - first, it allows forest managers to keep track of authorized uses and secondly, it protects project managers from conflicting activities and the premature removal

of equipment, flagging, pins, etc. University forest managers reserve the right to remove equipment, markings, vegetation, etc. for any unauthorized project as well as any authorized project whose term has expired.

DATA ARCHIVE AND WEBSITE

An archive containing management history, maps, publications, and other pieces of information relating to Mt. Toby, as well as records pertaining to past and current projects, will be developed and maintained within the DNRC to facilitate teaching, research, and outreach activities. This archive will inform potential researchers of the resources available and allow them to easily locate a suitable site for their research project (or public demonstration or class fieldtrip, etc.). Digital data, including GIS layers, will be stored in a secure and accessible location on the departmental computer network in Holdsworth Hall. This format will allow quick access for faculty, staff, and students as well as a convenient way for forest managers to update and append new information.

For off-campus access and public outreach, a selection of the most informative documents will be posted on a website. Along with serving as a portal to the management archive, this website will provide the main venue for public extension and demonstration on the forest. Maps and trail guides will be available via this website, along with documents describing management activities on the forest and relating them to the unique opportunities and problems facing private landowners and land trusts in New England. By reading these documents and visiting the forest, landowners will be able to learn more about forest management that is applicable on their own properties. An effort will be made to provide information on all aspects of the land management process, including economic considerations.

For example, during a white pine harvest on Mt. Toby, a document can be posted which will include information on even-aged pine silviculture, wildlife considerations, recreational considerations, and aesthetics. Furthermore, the document can relate actual timber revenue figures to the annual taxes of a similar piece of private property, providing an estimate of the profitability of this endeavor for a landowner. After reading these documents and touring the site (with the aid of a downloaded map), the landowner will be in a position to decide whether this type of forest management is desirable on his property.

The maintenance of the digital archive and the website, as well as the log of authorized projects, will be the ultimate responsibility of the University Forests Committee, as well as any students, employees or other agents contracted by the committee for that purpose. An early draft of the website, including information on the individual University forests, can be found at http://www.umass.edu/nrc/Forest/university_forest_home_page.html

INFRASTRUCTURE AND RECREATION

Many of the roads and trails on the forest are in need of some amount of repair and maintenance. The tower road, especially, is in need of major structural repairs, culvert replacement, and additional gravel. Although an exact estimate of the cost of repair is not available at this time, it is certain that the forests committee does not have the requisite funds. Before anything can be accomplished, it is critical that a knowledgeable committee be formed for the purpose of undertaking a detailed survey of the road/trail system and attempting to find or raise the necessary funds for needed repairs.

Likewise, a decision on what to do with the Toby House cannot be made until the available options have been fully restored. Without additional funds, refurbishment is not an option. On the other hand, historic concerns preclude a hasty demolition. A committee consisting of faculty members, local citizens, knowledgeable consultants, and university administrators needs to be formed to discuss the situation.

Upkeep of signs and postings is an ongoing responsibility of forest managers. Outdated and obsolete signs should be removed; current signs should be maintained in a presentable and legible condition. All management activities, including harvest operations, should be explained to the public in clearly posted signs and notices. The kiosk by the main gate should be kept in good condition and posted notices should be kept current – unauthorized notices should be removed in a timely fashion. A new kiosk is being planned for the top of Mt. Toby – it should be maintained like the existing kiosk.

A number of local citizens and groups derive recreational value from Mt. Toby. All of these groups impact the forest in a myriad of ways, by contributing to wear and tear on the trails and roads, increased traffic at the gates, and removal of fish and game – to name a few. Some of these groups, such as the Appalachian Mountain Club, improve the forest by voluntary trail maintenance. To organize and inform these individual users, the authors visualize a “Friends of

Mt. Toby” organization. This stakeholder organization would act as a liaison between the university and the many users of Mt. Toby, mutually benefiting both parties. For the university, the existence of such an organization would greatly facilitate planning public outreach events, organizing volunteer groups to brush trails and collect litter, and reaching potential donors. For the public, this group could serve as a meetinghouse for people interested in outdoor recreation, as well as a way of keeping forest users apprised of upcoming events. An increase in communication between stakeholders and forest managers would also serve to increase the number of eyes and ears on the forest, improving safety and security for everybody. In order to make “Friends of Mt. Toby” a reality, a committee, comprised of both faculty and the public, needs to be formed to contact potential members and begin organizing the group.

MANAGEMENT ZONES / MANAGEMENT ACTIVITIES

To achieve our four primary management objectives, Mt. Toby Forest was delineated into 5 management zones based upon forest cover type, topography, wildlife habitat, infrastructure, and management history (See Appendix B - Figure 10). The two active management areas, for white pine and hemlock/northern hardwoods, are located on the glacial outwash plain and midslope regions in the northern portion of the forest. The riparian/wetland special management area includes Cranberry Pond and the surrounding wetland complex. A special management area encompasses the peak of Mt. Toby, Ox Hill, and surrounding slopes in the central portion of the forest. Finally, at the southern end of the property, is the Research Natural Area, an expansion upon the existing Arnold Rhodes Natural Area. Descriptions of each of these zones, as well as associated management practices and regulations, are found in the following sections.

Riparian/Wetland Special Management Area

This management zone consists of one stand of 55 acres, 29 of which are covered by the surface of Cranberry Pond itself. The remaining 26 acres include a mixture of emergent marshes, stream and pond banks, and variety of forest types, including a red maple swamp, as well as mixed hardwood and hemlock forests. The primary objective for this zone is to maintain water quality by minimizing soil erosion and preserving riparian vegetation. This will be accomplished by excluding active management and other soil disturbances from those areas immediately adjacent to wetlands or water bodies.

A secondary objective of this zone is the conservation and protection of rare species, especially the wood turtle. This management zone falls within a priority habitat zone for the wood turtle as delineated by the Massachusetts Natural Heritage Program. Consequently, this plan will adopt the CMPs established by Natural Heritage for this species. Specifically, this calls for the exclusion of active management within 50' of the pond and 600' of the stream and marsh (Mass.Nat.Her. 2006). This effectively excludes active forest management, as well as accompanying soil disturbance, from almost the entirety of this zone. As well as protecting wood turtles, these standards will reduce soil erosion, protect stream and pond banks, increase the input of woody debris, and increase habitat value for other species, such as beavers.

There are also two additional management issues relating to Cranberry Pond, a recreational fishery and an aging and declining dam. The pond is stocked annually by Mass Wildlife and used heavily by fishers and boaters. At this time, this plan does not include any provisions or actions for the management of the fishery. Research into appropriate management of the fishery and the development of an amendment to this plan needs to be carried out within the next ten years.

An aging and declining dam exists at the north end of Cranberry Pond and is responsible for maintaining the water level on the pond. While this structure is in need of major repair, lack of funds precludes taking any action in the immediate future. Within the next ten years, the university forests committee is to designate a sub-committee of knowledgeable individuals to conduct a full dam inspection and prepare a report containing a detailed description of the problem associated with this dam as well as a selection of possible solutions. This report will be used as the basis for making a final decision as to the actions to be taken.

Special Management Area

Covering more than 300 acres (nearly 40% of the total land area), the Special Management Area is the largest management zone described in this plan. This zone includes the central, mountainous region of the forest surrounding the peak of Mt. Toby and Ox Hill. The slopes of these landforms are forested in a variety of cover types, including oak-hickory ridges and pockets of rich mesic forest (northern hardwoods and hemlock). The landforms themselves are geologically interesting, being composed of an unusual puddingstone conglomerate.

The entirety of the Special Management Area overlaps a Natural Heritage Priority Habitat area for nearly all of the 16 species of special concern on the forest (See Appendix C). Furthermore, almost the entire acreage of this zone is situated on slopes greater than 30% - making forest management with heavy equipment a risky endeavor. For these two reasons, activity within the Special Management Area will be restricted to special projects, notably research or demonstration projects of special merit. By keeping management actions and projects at a minimum, we hope to protect rare species habitat, reduce soil erosion, and stabilize steep slopes.

All applications for projects within this zone will be scrutinized carefully, taking into account all of the above factors, before permission to work in this area will be granted. Special consideration will be given to projects designed to augment the ecological functioning of this unique area or to restore habitat for species of special concern. One such project might be the restoration of grassy balds to the peaks and ridges found within this zone.

Research Natural Area

The Research Natural Area encompasses 170 acres and is located in the southern portion of Mt. Toby. This area was designated as a research natural area for several reasons, including expanding upon the existing Arnold Rhodes Natural Area, ensuring representation of forest types within the region, and maximizing connectivity of the Mt. Toby landscape with the adjacent forested matrix. Unique natural features within the Research Natural Area include the best example of old-growth hemlock forests in the Pioneer Valley, as well as examples of natural windthrow disturbance.

No management is allowed within the Research Natural Area, including salvage logging. In cases in which down trees cross recreation trails within the Research Natural Area, removal of the obstructing portion of wood will be permitted.

Active Management Areas

Active Management Areas consists of two management zones, totaling 270 acres in the center and northern end of the forest. The northernmost zone is situated on the flat, glacial outwash plain and is dominated primarily by white pine, with a small hemlock/hardwood component. The second Active Management Area is found on the lower slopes of Mt. Toby, in

the center of the forest. It consists of a mixture of hemlock and mixed northern hardwood forests. These areas will be sustainably managed primarily for teaching, demonstration, and research opportunities.

Some areas within the active management zones on the forest occur within a priority habitat polygon for the eastern box turtle. In order to protect the turtle, all forest harvesting activity will conform to the CMP for this species. To that end, all harvests in this zone will take place during the winter and ground scarification will be kept to a minimum. Scarification is allowable in small patches where it is absolutely necessary to achieve desired regeneration (Mass.Nat.Her. 2006). In addition, several vernal pools exist within the active management zones. Harvesting is prohibited from the areas surrounding these vernal pools and permanent retention of trees in harvested areas will be planned to ensure continuous forest cover between vernal pools.

The management guidelines and harvest levels for the active management areas are based on the 20-year standing volume and growth estimates determined for 1984-2004 (Appendix D). Based on these estimates, the Annual Allowable Cut (AAC) is 450 MBF for a ten-year period. Using these estimates, a harvest schedule was developed to provide for (1) teaching and demonstration needs by having a harvest in the planning or implementation stage at all times and (2) creating a diversity of stand structures.

The harvesting levels outlined in Appendix D will be met by having one regeneration harvest and one thinning every two years, thus having active management going on at all times, a resource for class exercises and demonstrations. These harvests will provide 90 MBF per 10-year period resulting in a scheduled harvest rate that is 20% of the AAC. At this time, Stands 3 and Stands 6 should be made top priorities for silvicultural treatment. Stand 6 is composed primarily of white pine, with pockets of hemlock and mixed pine-hardwoods – it should be given a moderate crown thinning to improve existing trees. Stand 3 is the remnant of an exotic plantation, composed primarily of Norway spruce and red pine. The understory is heavily stocked with advance growth of white pine saplings. The first stage of a three stage shelterwood designed to release the white pine would be an appropriate first step in shifting the stage from an exotic plantation to a pine stand.

MONITORING

Established continuous forest inventory points (CFI) are measured every ten years to monitor forest vegetation within Mt. Toby Forest. A plan should be developed to expand the monitoring efforts at Mt. Toby to include vernal pools, wildlife species of special concern, and fisheries within Cranberry Pond. Ideally, these monitoring efforts will utilize undergraduate and graduate course to accomplish much of this monitoring. Inspections of forest infrastructure, including culverts, gates, stream crossings, and road grades, will be conducted annually by a student forest manager, faculty member, member of the University Forests Committee or an agent thereof.

BUDGET

Currently, no funds exist for managing Mt. Toby forest; however, planned timber harvests between 2005-2015 are expected to generate approximately \$9,000. Alternate sources of funds, such as grants and donations, need to be pursued in order to address other costly management issues such as repair of Tower Road and the dam on Cranberry Pond.

SCHEDULE

This plan has been written with an intended shelf life of 10 years (2006-2016), at which point it should be updated by appropriate faculty, students, and staff contracted for this purpose by the forests committee. Within this 10 year period, separate committees composed of knowledgeable individuals should be formed to research and propose solutions for the aging dam, the management of the pond fishery, the refurbishment of the road system on the forest, Toby House and the creation of the online archive. Also during this period, efforts should be made to involve recreationalists, citizens, conservation groups and other interested parties in the creation of a “Friends of Mount Toby” organization.

Harvest operations can be conducted throughout during the decade, as long as there is support for a student forest manager or faculty member to select appropriate stands, plan the harvest, and oversee the process. Within the next 10 years, 90 MBF should be harvested, starting with timber-improvement thinnings in stands 5 and 7 and the first thinning of a three stage shelterwood in stand 3.

In 2013, the next data collection on the continuous monitoring plots needs to be made by a faculty member, student employee, or committee member.

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Appendix A – Trustee Policy

TRUSTEE POLICY RELATIVE TO THE MANAGEMENT AND USE OF UNIVERSITY FORESTS

I. Management of University Forests

The Chancellor of the University of Massachusetts Amherst shall be responsible for the overall management of the University forests. The day-to-day management responsibilities shall rest with the Department of Natural Resources Conservation within the College of Natural Resources and the Environment.

II. Use of University Forests

A. Primary Use. The university forests shall be maintained and used primarily for instruction, research and demonstration in the fields of forestry, wildlife biology, fisheries biology, and wildland ecology.

B. Recreational Use. Recreational use of University forests shall be limited to the following: hiking, picnicking, horseback riding, boating (without motors), fishing and/or hunting (consistent with all of the licensing and seasonal restrictions of the Commonwealth), skating, snowshoeing and skiing.

The Chancellor, in consultation with the Department of Natural Resources Conservation, shall determine which areas of the University forests shall be available for the above stated recreational activities and at what times or seasons said activities may be allowed. The Department of Natural Resources Conservation, subject to direction of the chancellor, shall provide adequate posting so as to inform the University Community and the public which areas of the University forests are available for recreational activities and the activity permitted within said area.

C. Special Activities. The Department of Natural Resources Conservation may upon the application of any person, group or organization allow said person, group or organization use of the University forests for special activities, provided said activity (1) does not impair the value of these forests and their primary use; and (2) is logically associated with forest land use and compatible with the preservation of environmental quality.

III. Prohibited Acts

The following are prohibited acts within the University forests and the commission of the any one or more of the following acts shall subject the violator to ejection from the University forests:

- (a) building of fires;
- (b) use of internal combustion engines;
- (c) removal, destruction or damaging of plant and animal life;
- (d) removal, destruction, damaging, or defacement of signs, boundary and experimental plot markers, tree tags, survey stakes, scientific instruments, equipment, buildings, forest products, or other property concerned with research programs and management of the forests;
- (e) littering or the pollution of springs, streams and ponds;
- (f) swimming;
- (g) loud or boisterous conduct which interferes with the use of the University forests by others.

Nothing contained herein shall be construed as prohibited or otherwise interfering with the Department of Natural Resource Conservation in conducting or allowing the conduction of research programs or activities consistent with the primary purpose of the University forests. Nor shall the provisions of paragraph (c) be applied to individuals hunting or fishing within those areas of the University forests where said activity is permitted, provided the licensing and seasonal restrictions of the Commonwealth have been satisfied.

IV. Special Provisions

A. University forests may be closed in the interests of protection against fire either by proclamation of the Commonwealth or by direction of the Chancellor, on his own, or at the request of the Department of Natural Resources Conservation.

B. The Chancellor on his own initiative or at the request of the Department of Natural Resources Conservation may exclude the public, for as long as necessary, from all or any part of the University forests for reasons of public safety, environment protection, or in furtherance of a research or management project being undertaken in the closed area.

C. For purposes of this policy the following parcels of land constitute the University forests:

- (1) the Mt. Toby Demonstration Forest, situated in Sunderland and Leverett and comprised of approximately 755.27 acres.
- (2) the Cadwell Memorial Forest, situated in Pelham, and comprised of approximately 1170.8 acres.
- (3) the Adams Brook Forest, formerly used for R.O.T.C. training, situated in Amherst and comprised of approximately 47.11 acres.
- (4) the Savage Hill Forest, situated in Princeton, and comprised of approximately 234 acres.
- (5) the Knight-Sabin Forest, situated on the Pelham-Belchertown line, and comprised of approximately 50 acres.
- (6) the Ross Forest, situated in Windsor and Plainfield, and comprised of approximately 120 acres.

Appendix B – Maps

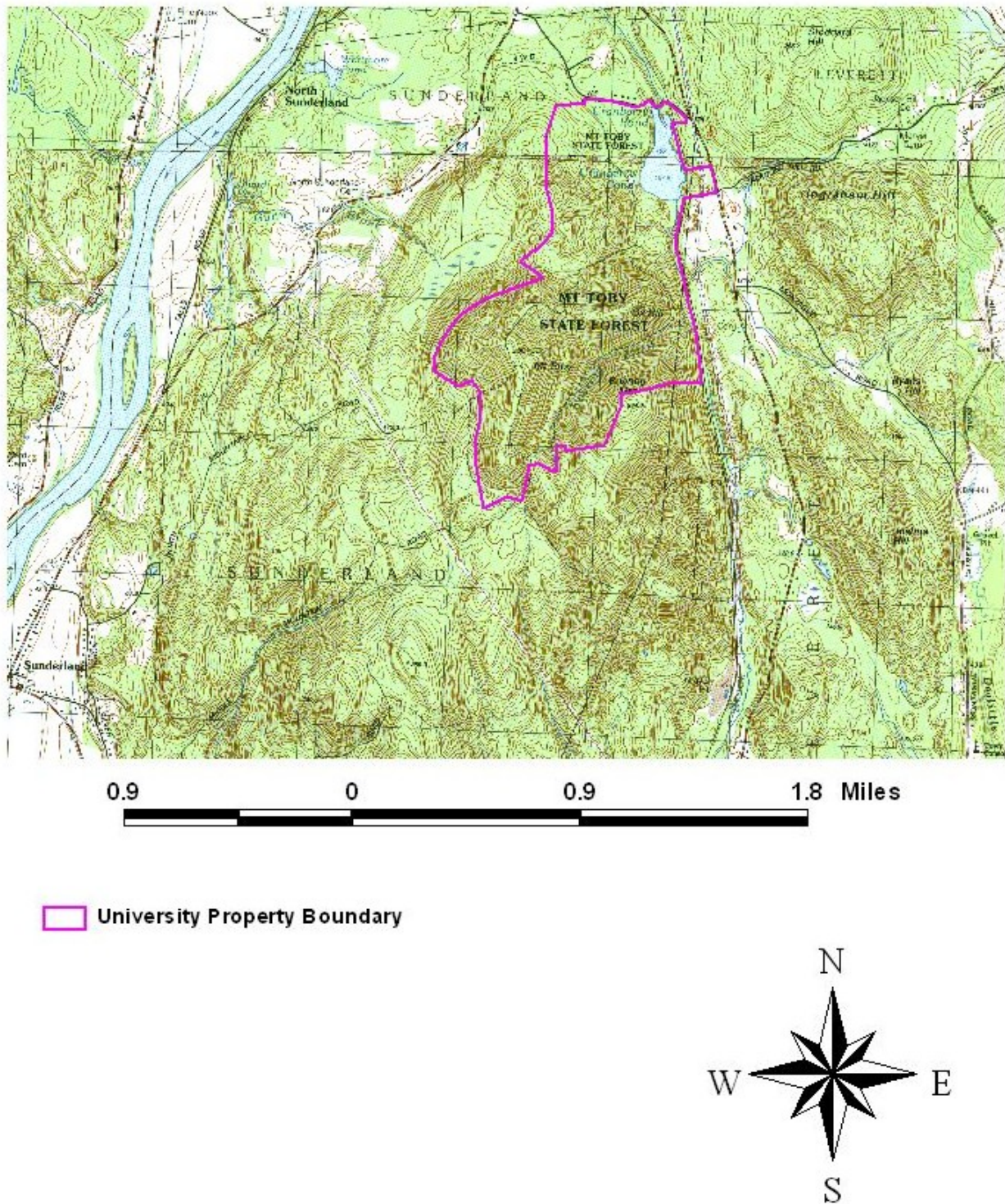


Figure 1 – USGS map of Mount Toby Demonstration Forest, Sunderland, MA.



 University Property Boundary

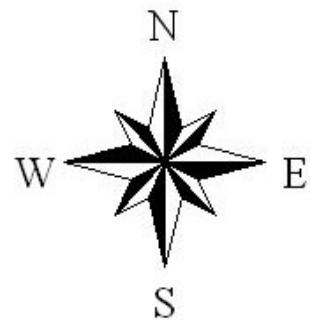
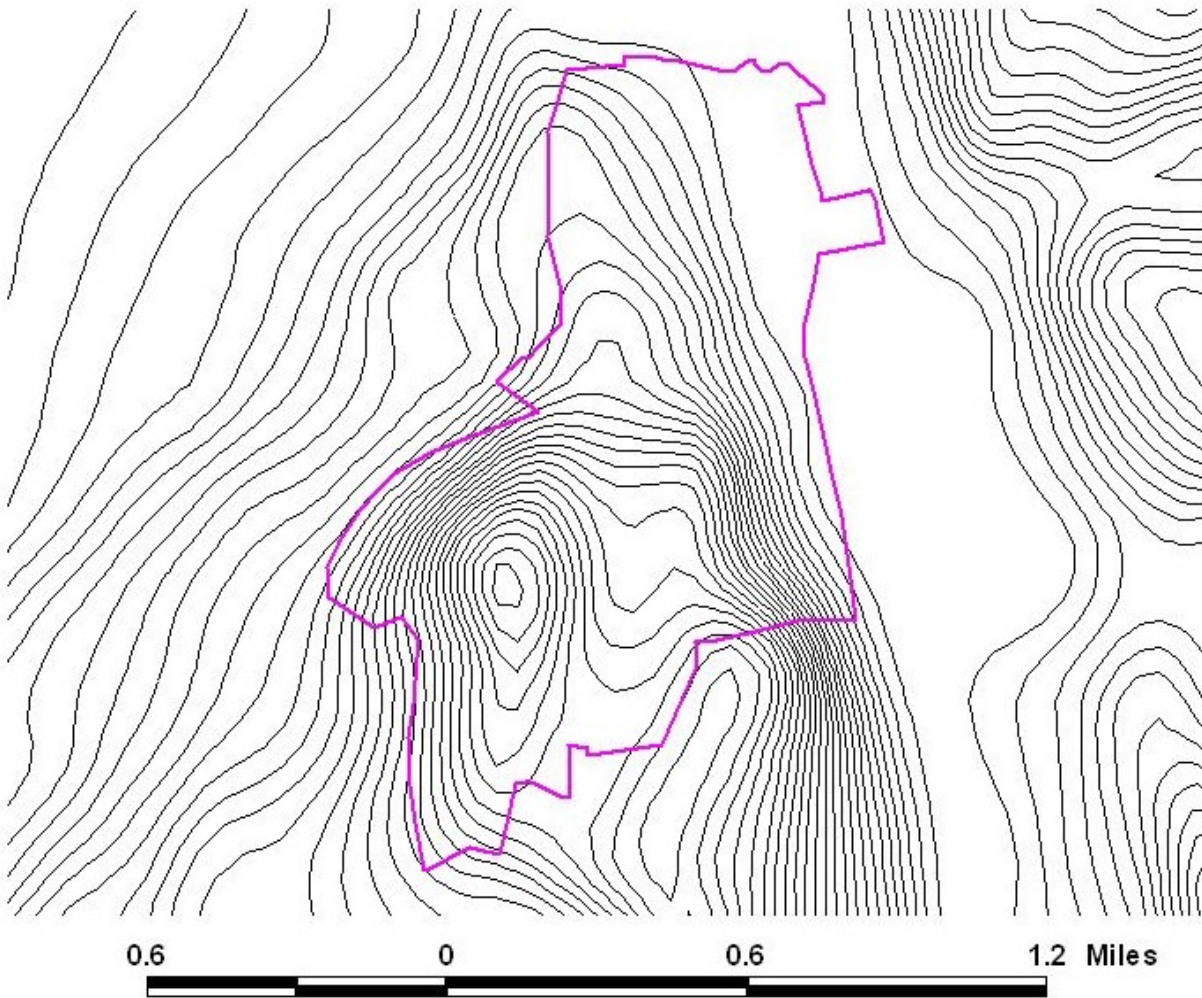




Figure 2 – Aerial photo of Mount Toby Demonstration Forest, Sunderland, MA.



 **University Property Boundary**
 **Topography (30' contours)**

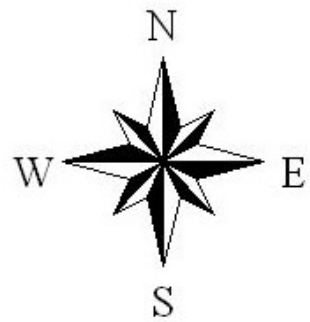


Figure 3 – Topographic contours. Mount Toby Demonstration Forest, Sunderland, MA.

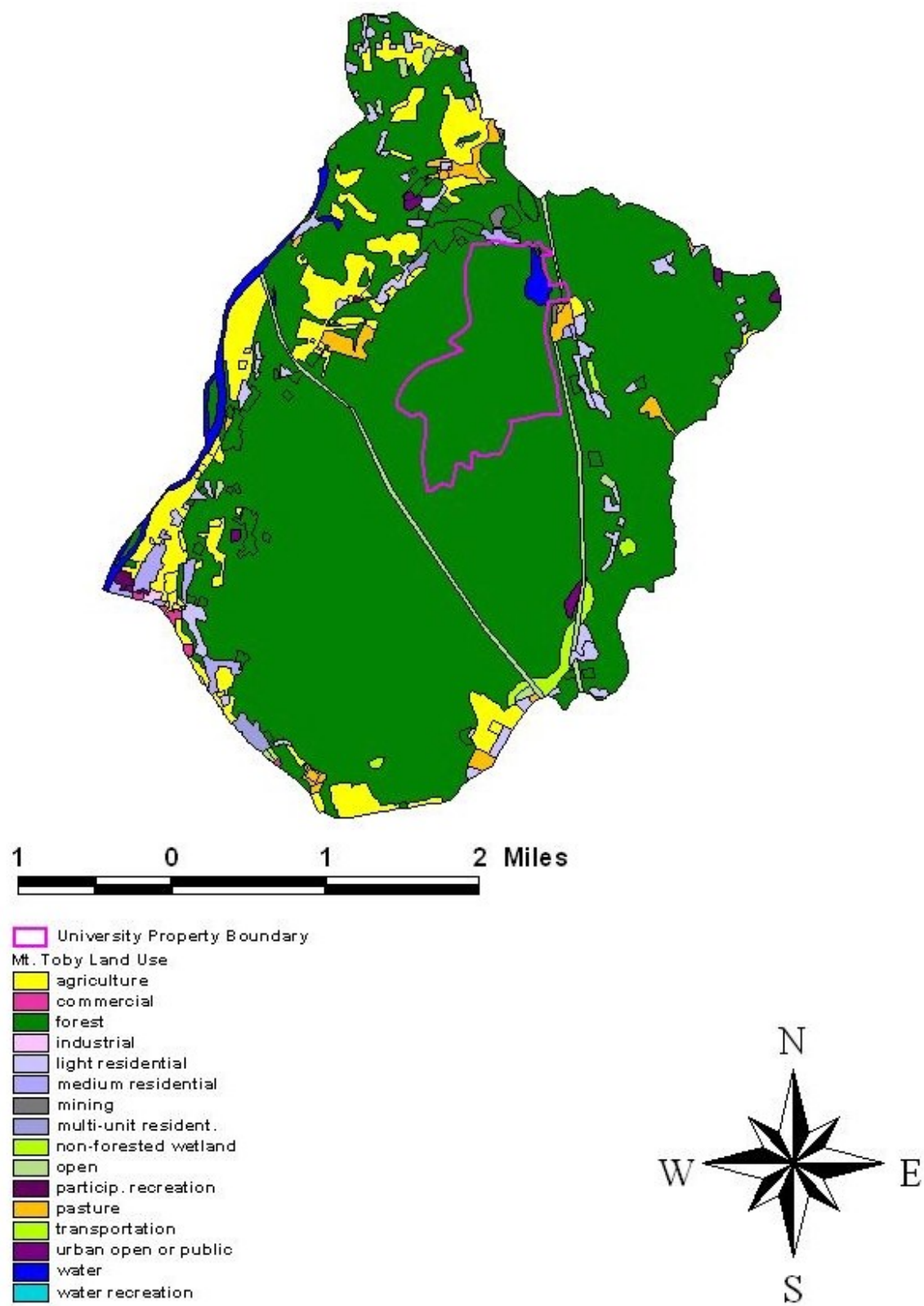


Figure 4 – Land use. Mount Toby, MA.

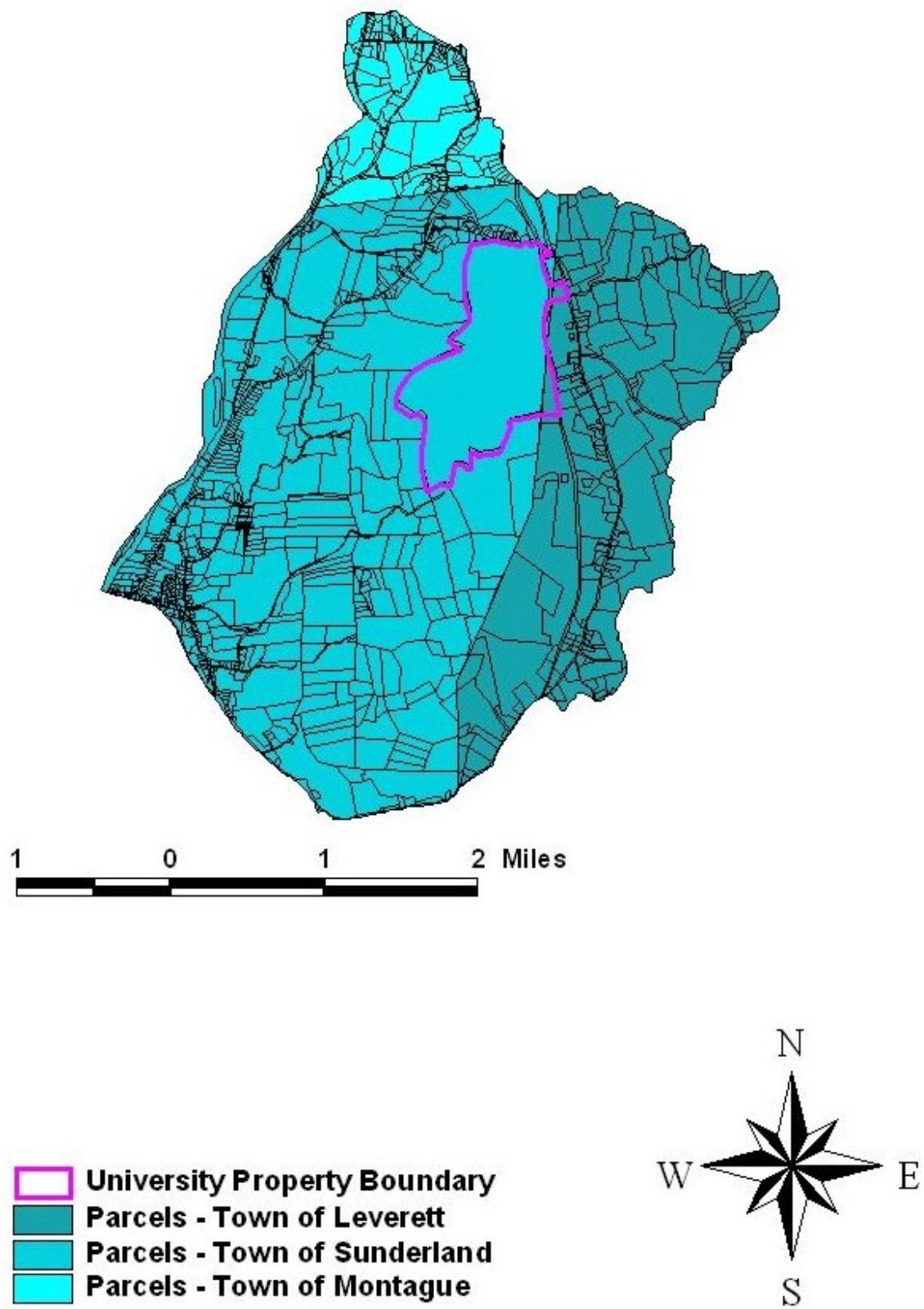


Figure 5 – Land ownership. Mount Toby, MA.

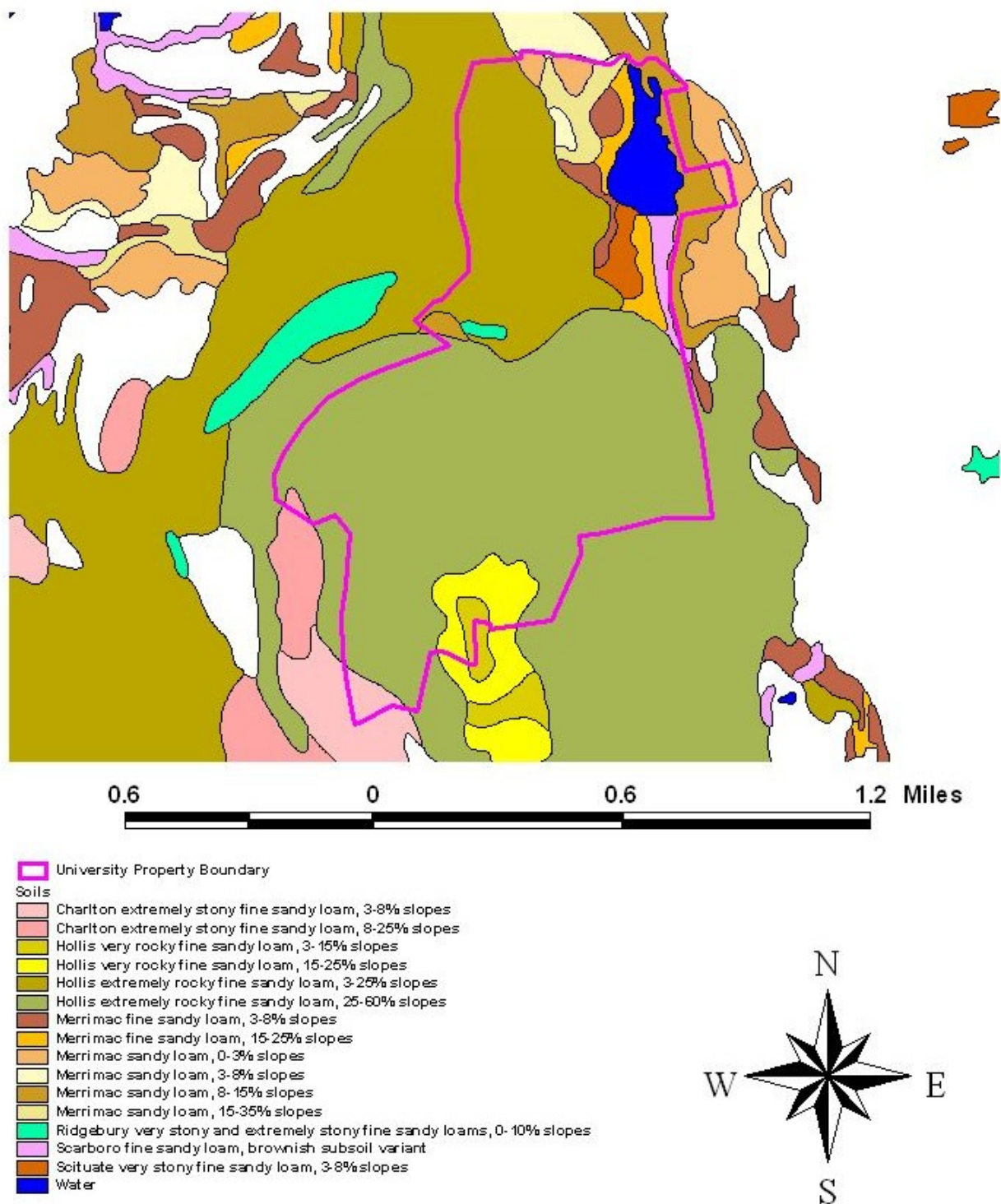


Figure 6 – Soils at Mount Toby Demonstration Forest, Sunderland, MA.

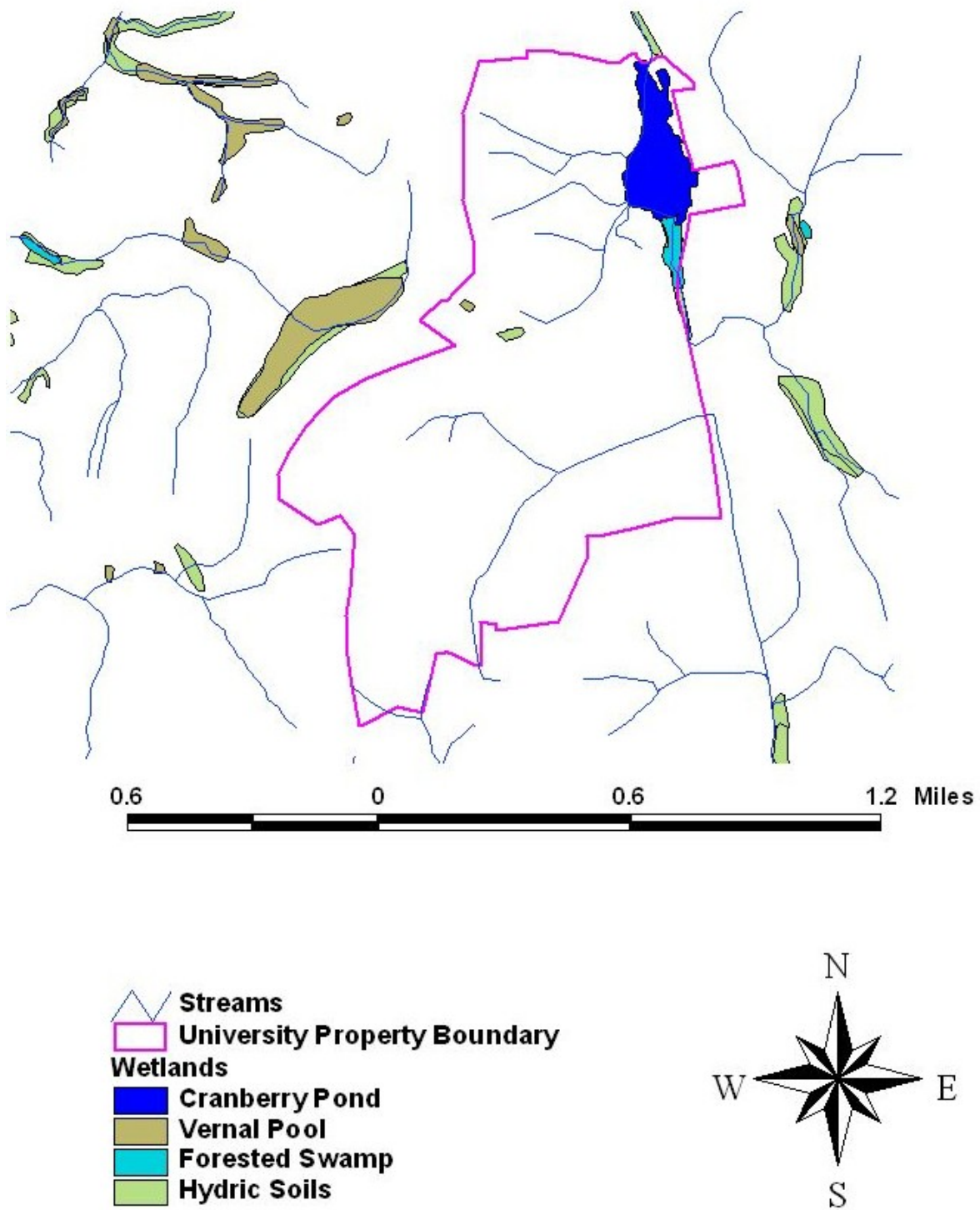
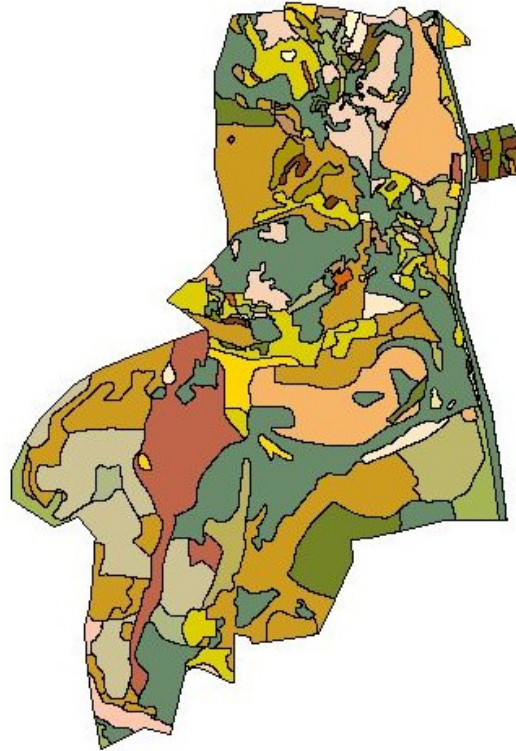


Figure 7 – Hydrology of Mount Toby Demonstration Forest, Sunderland, MA.

Vegetation Types

- AP/B
- Adm
- H-Hd-MxC/A-B
- H-Hd/A
- H-Hd/A-C
- H-Hd/U
- H-WP-Hd/A-C
- H-WP/A
- H-WP/A-B
- H-WP/U
- H/U
- Hd/A
- L/A
- MxC-Hd/B
- MxC/A
- MxHd/A-B
- MxHd/B
- MxHd/C
- MxHd/D
- MxHd/U
- NS/A
- NS/B
- O-Hd/A+D
- O-Hd/U
- O/A+D
- O/A-C
- O/B
- O/B-C
- O/C
- O/D
- O/U
- OF
- OSw
- RP/A
- RP/B
- RP/S
- Road/RR
- ScP/B
- Unknown
- WP-Hd/A
- WP-Hd/A-B
- WP-Hd/B
- WP-Hd/U
- WP-L/A
- WP-NS/A
- WP-NS/B
- WP-RP/B
- WP/A
- WP/B
- WP/C
- WP/D
- WP/U
- WS/A
- Water



0.4 0 0.4 0.8 Miles

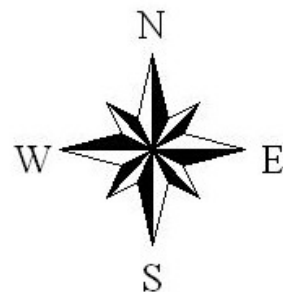


Figure 8 – Forest types at Mount Toby Demonstration Forest, Sunderland, MA.

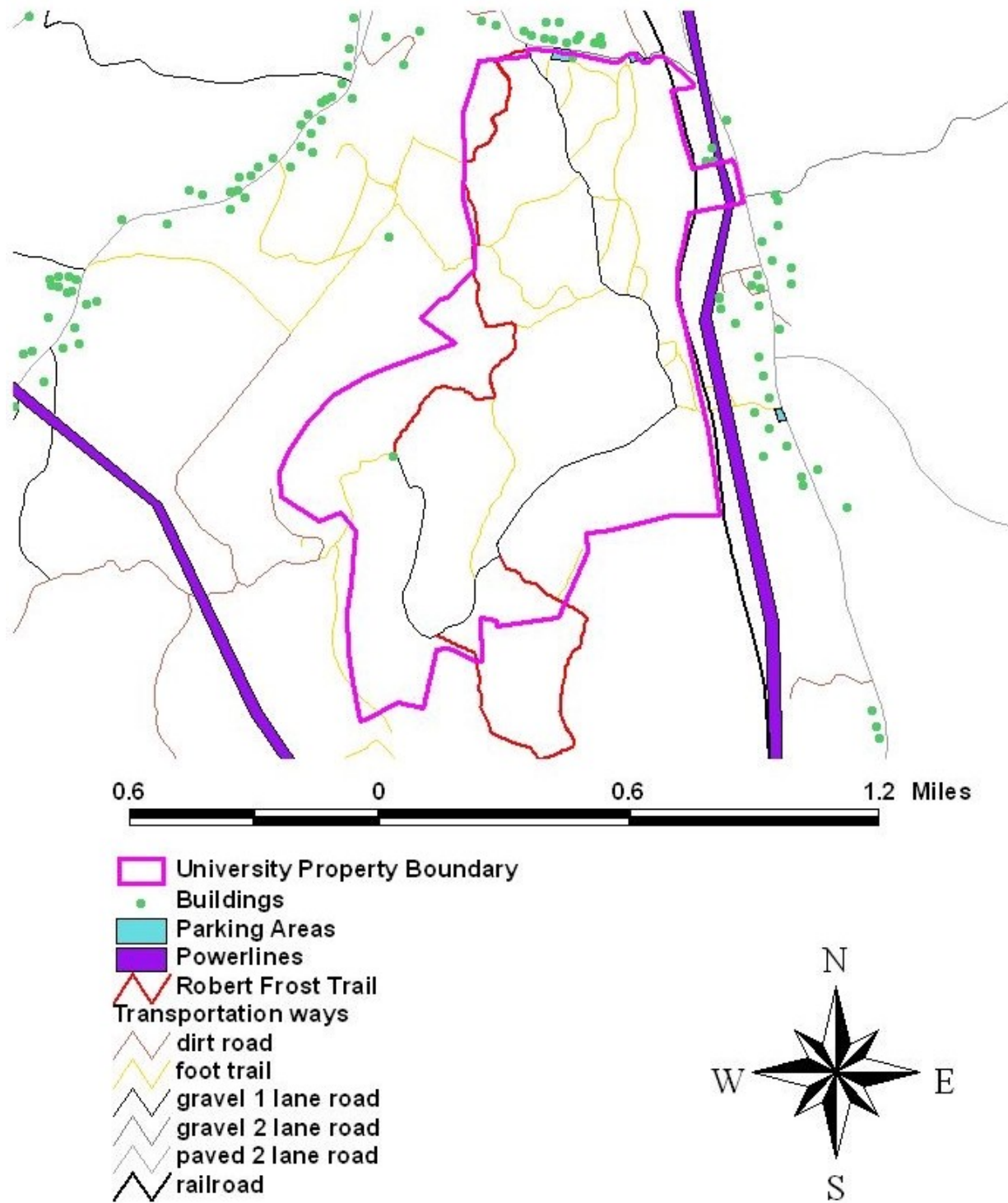


Figure 9 – Infrastructure on Mount Toby Demonstration Forest, Sunderland, MA.

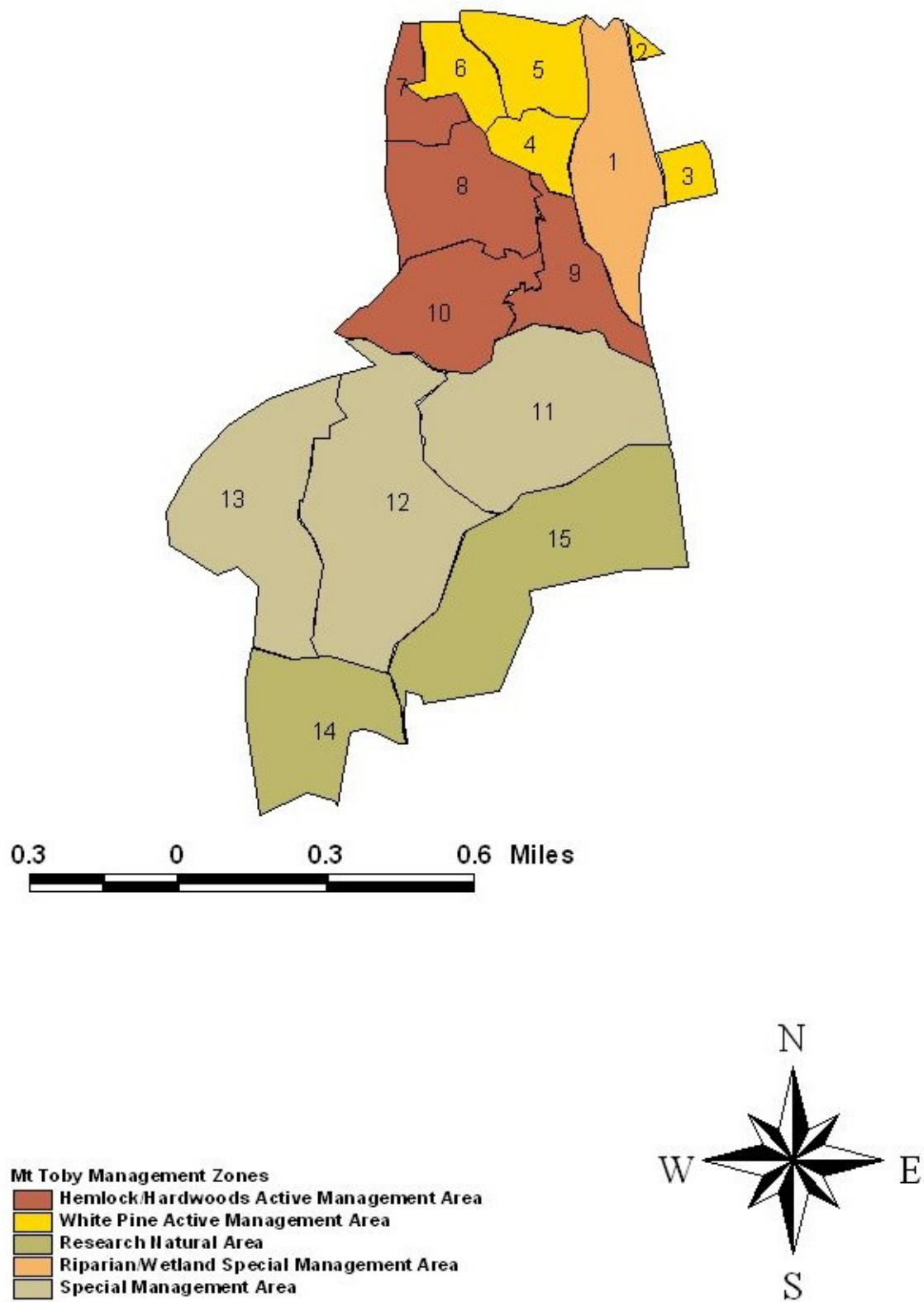


Figure 10 – Stand and management zone delineation. Mount Toby Demonstration Forest, Sunderland, MA.

Appendix C – Natural Heritage Species of Special Concern

Table 1 – Massachusetts Natural Heritage Species which may be found in the vicinity of Mount Toby Demonstration Forest, Sunderland, MA.

Plants	
<i>Adlumia fungosa</i>	Climbing Fumitory
<i>Clematis occidentalis</i>	Purple Clematis
<i>Cynoglossum virginianum</i> var. <i>boreale</i> (Historic)	Northern Wild Comfrey
<i>Desmodium cuspidatum</i>	Toothed Tick-trefoil
<i>Platanthera dilatata</i>	Leafy White Orchis
<i>Poa languida</i>	Drooping Speargrass
<i>Sanicula odorata</i>	Long-styled Sanicle
<i>Scleria triglomerata</i>	Tall Nut-sedge
Vertebrates	
<i>Ambystoma jeffersonianum</i>	Jefferson Salamander
<i>Terrapene carolina</i>	Eastern Box Turtle
<i>Glyptemys insculpta</i>	Wood turtle
<i>Elaphe obsoleta</i>	Rat Snake
<i>Falco peregrinus</i>	Peregrine Falcon
<i>Haliaeetus leucocephalus</i>	Bald Eagle
<i>Oporornis philadelphia</i>	Mourning Warbler
Invertebrates	
<i>Cicindela purpurea</i>	Purple Tiger Beetle

Appendix D – Forest Management Projections, Active Management Zone,
Mount Toby Demonstration Forest

Table 1. Mt. Toby Forest volume and growth estimates—Total Forest Area (755 acres). Based on the Continuous Forest Inventory System (millions of board feet). *Standing volume includes new inventory conducted in stands 2 and 3. These data were not included in average net increase estimations.

Species	Standing Volume 1984	Standing Volume 1994	Standing Volume 2004	Average Net Increase
Oak	0.91	1.09	1.43	0.26
Pine	1.07	1.41	1.83 [*]	0.23
Hemlock	2.13	2.78	3.10 [*]	0.48
Other Hardwood	1.01	1.02	1.07	0.03
TOTAL	5.14	6.29	7.43	1.00

Table 2. Mt. Toby Forest volume and growth estimates for the Active Forest Management Area (260 acres). Based on the Continuous Forest Inventory System (millions of board feet). *Standing volume includes new inventory conducted in stands 2 and 3. These data were not included in average net increase estimations.

Species	Standing Volume 1984	Standing Volume 1994	Standing Volume 2004	Average Net Increase
Oak	0.11	0.16	0.29	0.09
Pine	1.02	1.28	1.66 [*]	0.18
Hemlock	0.80	1.02	1.14 [*]	0.16
Other Hardwood	0.28	0.29	0.31	0.02
TOTAL	2.21	2.75	3.40	0.45

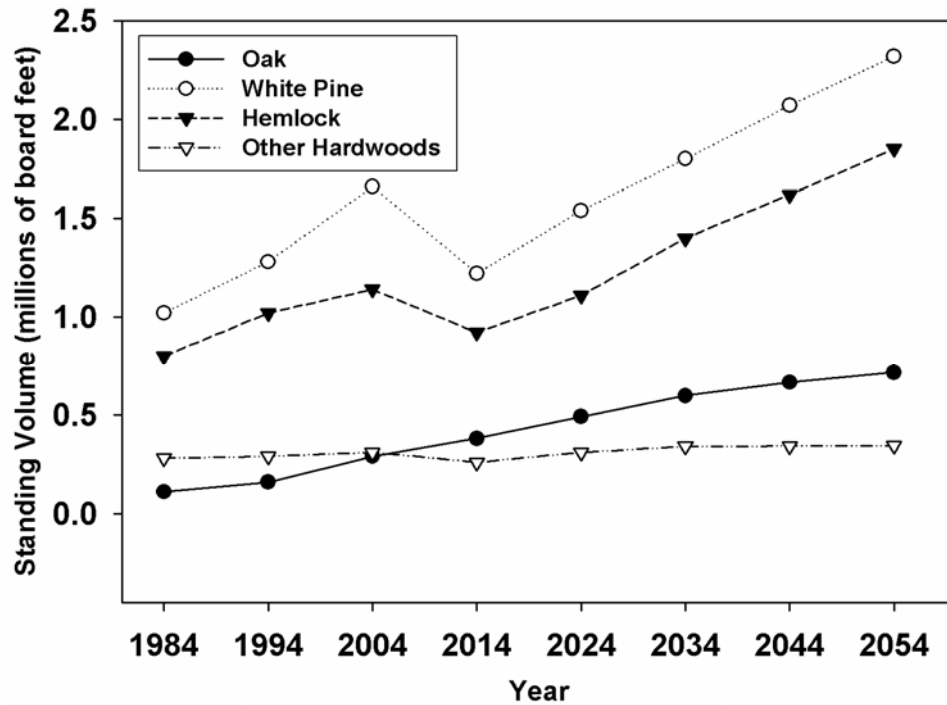


Figure 1. Standing volume estimates for the Active Management Area based upon continuous forest inventory data (1984, 1994, and 2004) and growth projections using the Landscape Management System (2014, 2024, 2034, 2044, and 2054). Volume estimates for 2014 do not include harvest volumes removed during 2004-2014.

Table 3. Ten year (2006-2016) timber harvest schedule for Active Management Areas in Mt. Toby Forest.

Treatment Type	Stands	Volume Harvested (MBF)
Thinning (commercial or precommercial)	3, 5, 7	40
Selection cuts (group or patch)	4, 6, 8, 9, 10	50