

Weir Hill Management Plan

2006

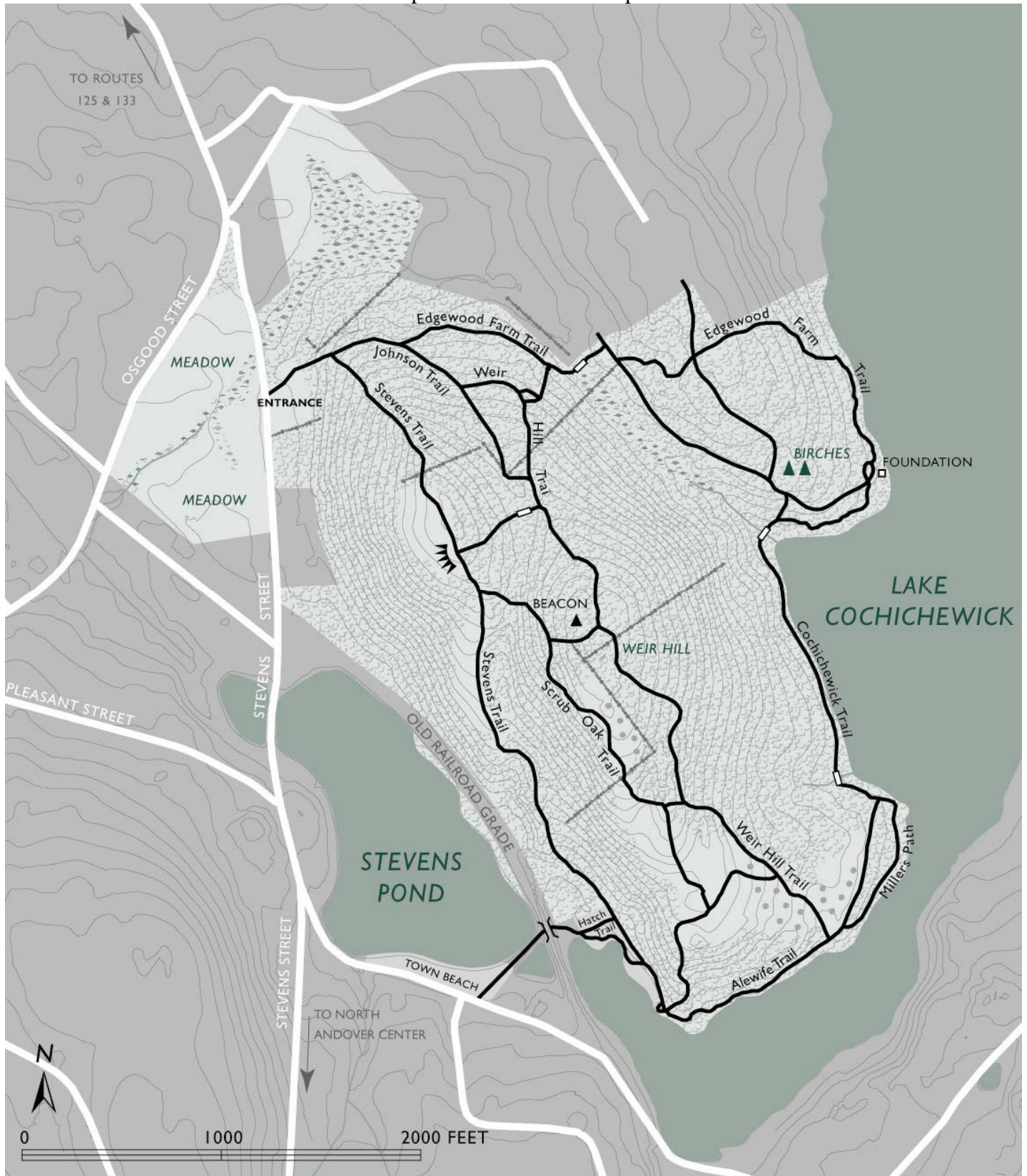


The Trustees of Reservations
Doyle Conservation Center
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Map 1: Weir Hill Base Map



On the Cover:

*View from the top of Weir Hill looking south through the “barrens” in fall.
Photo by R. Hopping*

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<u>Figure</u>	<u>Photographer</u>
1	Unknown – pg. 3-12
2	Unknown – pg. 3-14
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4	R. Hopping – pg. 6-7
5	R. Hopping – pg. 6-9

Maps:

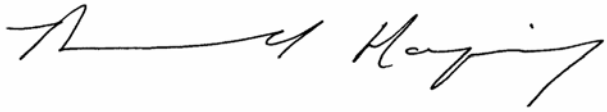



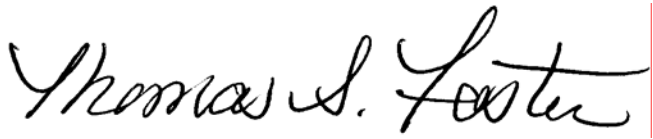
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About the Maps Included in the Plan:

Unless otherwise noted, all maps are produced by The Trustees of Reservations’ Geographic Information System. Production of these maps is made possible, in part, by generous donations from the Stratford Foundation, Environmental Systems Research Institute, Inc., Data General Corporation, and Hewlett Packard.

Source data obtained from 1:24,000 scale USGS topographic maps, field surveys, Global Positioning Systems, and the Massachusetts Executive Office of Environmental Affairs, Mass GIS. Feature boundaries and locations are approximate.

In accordance with The Trustees of Reservation's management planning process, this plan has been reviewed and accepted by the following staff and/or committees on the dates noted:

 Russell Hopping Plan Project Manager, on behalf of the Management Planning Committee	4-14-06
 Bob Murray Property Superintendent	5-4-06
 Wayne Mitton Regional Director	5-1-06
 Lisa Vernegaard Director of Planning and Stewardship	7-10-06
 Tom Foster Director of Field Operations	7-20-06

Section 1: Introduction

1.1 Overview of the Planning Process

Since 1891, The Trustees of Reservations has worked to protect special places in Massachusetts and maintain them to the highest standards. To ensure these standards are met, a program of careful planning and sound management is essential. While management of Weir Hill is well-established, The Trustees felt it was important to affirm the outstanding characteristics of the property and to review and update our management practices so that they reflected both newly understood resource protection principles and updated organizational initiatives. Thus, The Trustees embarked on a process to develop a comprehensive management plan for Weir Hill early in 2005. The planning process included:

- Forming a planning committee made up of staff and volunteer members from North Andover and surrounding communities.¹
- Describing in detail the site's natural, scenic, cultural, and historical resources and identifying management issues related to the protection of those resources.
- Conducting a visitor survey to understand better visitor activities and attitudes.
- Developing a list of management recommendations and a schedule for implementing the actions.

In order to ensure that the planning process and resulting management recommendations advances The Trustees' mission, an established framework is applied to guide the planning process for each Trustees' reservation. This framework includes several factors and guiding principles that will guide the management of the property:

First, The Trustees' mission, as set forth by founder Charles Eliot in 1891:

The Trustees of Reservations preserves, for public use and enjoyment, properties of exceptional scenic, historic, and ecological value throughout Massachusetts and protects special places across the state.

Second, management will support initiatives outlined in The Trustees' Department of Field Operations 2003 strategic plan, *Conservation in Action!* This plan highlights several initiatives, including the following:

- *Be a leader in the conservation field through the exemplary stewardship of the scenic, historic, and ecological features of each property entrusted to our care.*

¹ It is worthwhile noting that we sought input from the City of Lawrence, but for a variety of reasons, this did not prove successful.

- *Expand our education and interpretation program to turn visitors into the future stewards of the Massachusetts landscape.*
- *Provide meaningful opportunities for volunteers to participate in hands-on management.*
- *Protect our plants and animals and their habitats, including controlling exotic invasive species.*
- *Eliminate deferred maintenance (i.e., repair and then properly maintain structural features that have failed and no longer serve their intended function properly).*

Third, several principles will guide The Trustees' work at Weir Hill. These guiding principles reflect the general rules that will be applied when carrying out work at all Trustees' properties. They are value statements that may also provide a source of criteria for determining goals and recommended actions.

1. The Trustees will continue to adapt its management based on experience, newly gained knowledge, and available human and financial resources.
2. We consider resource protection to be The Trustees' fundamental responsibility. Only by protecting the significant resource features of our properties can we attain our visitor experience goals – a good visitor experience is derived from our reservations being in excellent condition.
3. We will apply the best available management practices to preserve the property's outstanding features and to ensure a high quality experience for all visitors.
4. Successful management of the property relies on sound financial management. To be the best possible stewards of our precious financial and human resources, we nurture a culture of innovation, financial discipline, and thriftiness.
5. The Trustees is committed to providing a diversity of visitors a wide range of opportunities to experience the property. We consider the property as one of our 95 classrooms where visitors can participate in a variety of enjoyable activities and life-long learning. By engaging a diversity of constituencies, we will mobilize broad-based support for land and resource protection in Massachusetts.
6. Through good communication and collaboration, The Trustees will develop and strengthen its partnership with the local community, members, volunteers, and other conservation partners to achieve its long-term goals for the property. We view ourselves as a community partner, investing in creative initiatives to build shared values, perspectives and skills among a diverse constituency.
7. The Trustees will employ “green practices” to minimize the impact of its management on the environment.

8. Because the surrounding landscape may impact our resource protection efforts and/or visitor services, we will evaluate and address management issues and opportunities beyond the boundary of Weir Hill.

1.2 Acknowledgments

Many people have contributed their valuable time, shared their expertise, and offered advice and counsel during this process. Led by The Trustees' project manager Russ Hopping, the Weir Hill Management Plan Committee worked to develop a comprehensive plan that highlights and protects what is important about this property. This committee consisted of Trustees' members and staff. They are:

Volunteers:

Tommy Gunn
Jeffrey Hermanson
Erica Holthausen
Bradford Wakeman

Staff:

Russ Hopping, Ecology Program Manager; Project Manager
Franz Ingelfinger, Regional Ecologist
Bob Murray, Superintendent, Andover/N. Andover Mgmt. Unit

In turn, the committee drew upon the wisdom and experience of several other staff members. Electa Kane Tritsch, Research Historian, researched and produced the land use history and provided analysis of the cultural resources; Vin Antil, The Trustees' GIS Manager, and Rob Daniels, GIS Specialist, prepared the maps included in the report; and Suzan Bellincampi, Director of Training and Program Development, provided guidance on the future of education and interpretation.

Thanks to the thoughtful participation of these individuals and their many hours of work on behalf of the project, Weir Hill will remain a special place for generations to come.

1.3 About the Poems in this Plan

A poem by Robert Frost precedes each section of this plan. These poems were chosen because they reflect some sentiment of the focus of each section and/or describe the setting and visitor experience at Weir Hill. Furthermore, Robert Frost's connection to the Greater Lawrence area is significant. He spent his formative years, between the ages of eleven and twenty, living in the city of Lawrence which is the prominent feature visible from the hilltop vista at Weir Hill.

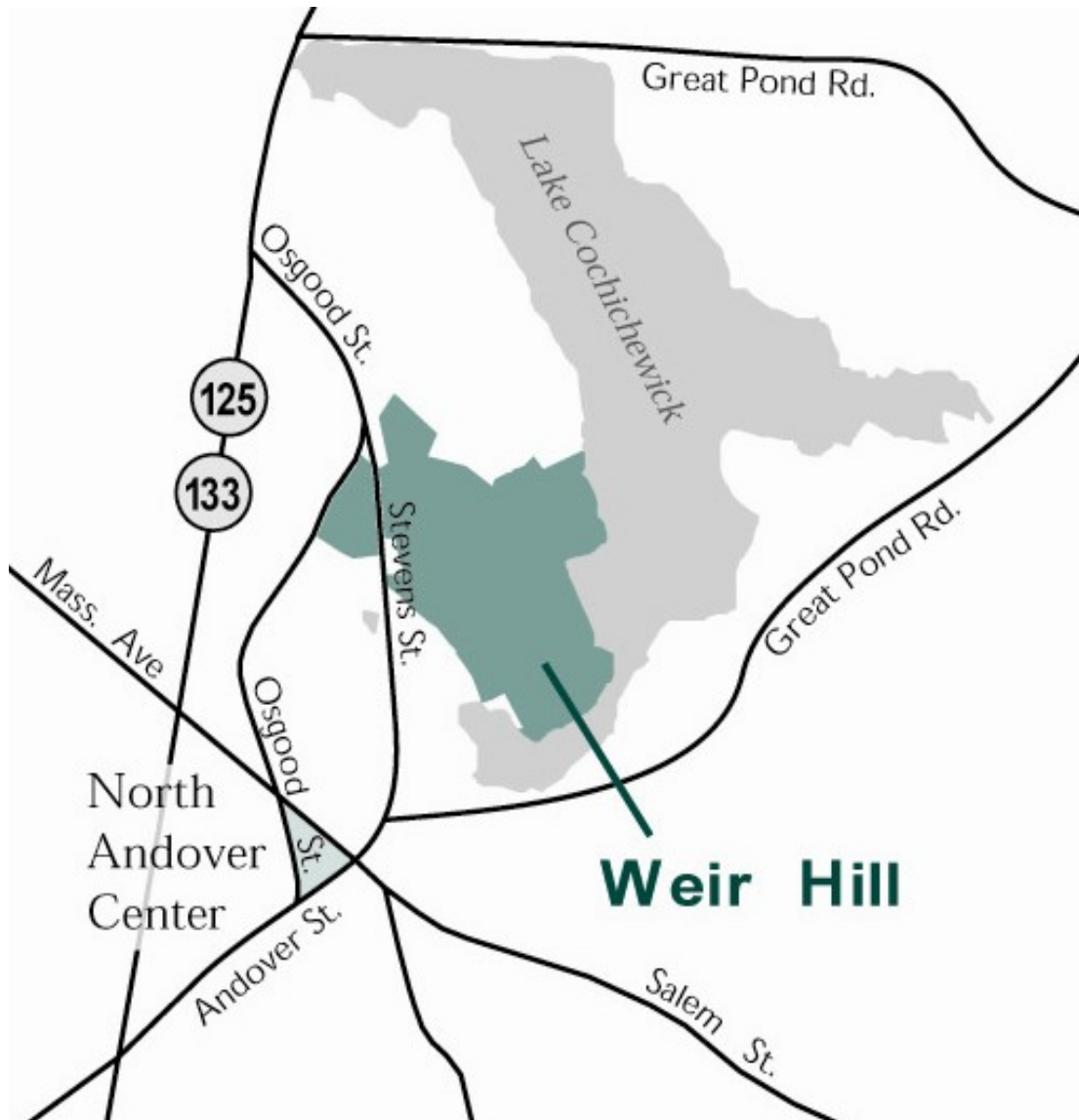
June, 2006

Section 2 - Executive Summary

2.1 The Significance of Weir Hill

At first glance, Weir Hill, a modest property in terms of size at 194 acres, seems like an average tract of open space off the beaten path. In reality, Weir Hill is an unusual landscape located near North Andover center and easily accessible from the busy routes 125 and 133. The reservation contains many significant historical, ecological and scenic resources that provide visitors with a rich and enjoyable experience. Educational opportunities associated with these resources are significant.

Map 2: Locus



Natural Resource Highlights

- Weir Hill supports an 80-acre fire-influenced community that is one of the regions better examples of a fire-influenced landscape. The site hosts a diversity of fire dependant plants, many which are rare or uncommon elsewhere. The presence of at least two state-listed Lepidoptera (i.e., butterflies and moths) provides evidence that the site functions to support a plant and invertebrate community uncommon to the region.
- A nine-acre wet meadow supports another uncommon plant community with state-listed rare species including an orchid that represents the only record for Essex County.
- The diversity of butterflies found throughout Weir Hill has attracted the attention of local Lepidopterists. This diversity is significant and serves as an indicator that Weir Hill is important for invertebrates and biodiversity.
- Protected from development and with over one-mile of lake frontage, Weir Hill contributes significantly to the protection of Lake Cochichewick's water quality and North Andover's primary water supply.

Historic and Cultural Resource Highlights

- Evidence that Weir Hill has been used by people for more than 8,000 years. Weir Hill was likely an important area for Native Americans due to the abundant natural resources associated with Lake Cochichewick and the Merrimack Valley. The name Weir Hill comes from the anadromous fish run that historically ran up Cochichewick Brook into the lake.
- Weir Hill served as common grazing land throughout the early settlement of Andover and continued as agricultural land (under the Steven's family private ownership) until the late 19th century.
- The single predominant cultural landscape feature on Weir Hill is its extensive network of stone walls, defining historic parcel boundaries and, in some cases, land use.
- Weir Hill's cultural resources are significant at the local and regional levels. The Reservation is a rare, historical and undeveloped agricultural landscape survival that has potential eligibility for listing as a heritage landscape on the National Register of Historic Places.

Scenic and Aesthetic Highlights

- Weir Hill has significant scenic and aesthetic elements. Foremost among these is the view from the top of the northern drumlin. This view includes the historic buildings and agricultural fields of the Kittredge Farm, the old textile mills of Lawrence, and more of the Merrimack River Valley beyond. On the horizon, the profiles of Mount Wachusett, Mount Watatic, and Mount Monadnock can be distinguished on clear days. This vista is a primary visitor destination.

- Weir Hill has over a mile of shoreline on the 500-acre Lake Cochichewick. The trails that follow the shore offer a variety of views and scenes out across the lake. Indeed, the shoreline trails are the most popular with visitors due to the attraction the lake has for people.
- Many visitors to Weir Hill have commented on its distinct natural feel and wild look. This appearance is in direct contrast to other nearby protected green spaces including the Stevens Coolidge Reservation and the North Andover Common which have formal gardens and lawns. It is also striking against the backdrop of the City of Lawrence, adjacent housing developments and nearby route 495 which can all be seen from the hilltop vista.

Visitor Highlights

- Weir Hill is a popular destination and visitation has increased significantly in recent years. The great majority of visitors live locally but few visitors seem to be from Lawrence despite its close proximity. Of the more than 100 visitors surveyed 65% were from North Andover and only 4% lived in Lawrence despite its close proximity.
- Although most visitors regularly visit Weir Hill (72% of the survey respondents had visited Weir Hill more than 10 times in the last year), fewer than 30% are members of The Trustees of Reservations.
- Walking, especially dog walking, is the most popular visitor activity at Weir Hill.
- While visitors general feel The Trustees are doing an excellent job with property stewardship, a few visitors identified poorly marked and maintained trails, dogs being off leash and too much dog waste, litter, and not enough property information as concerns.

2.2 Major Management Issues and Challenges

- Soil erosion and compaction is significant along major trails, the shoreline of Lake Cochichewick and at the main entrance and threatens ecological resources and aesthetics of the reservation. This pattern is expected to continue due to Weir Hill's increased popularity.
- Management and restoration of the barrens community requires significant additional resources including staff time and new dollars. While grants can help off set much of the restoration costs, additional resources will be necessary to meet ongoing maintenance needs.
- Invasive plants are common and threaten significant natural resources including rare species habitat.
- Despite its growing popularity, many visitors do not recognize Weir Hill as a Trustees' property, a fact reflected by the low membership of visitors.
- Dog walking is a popular activity but many visitors have identified poorly behaved dogs, dogs of leash and dog waste as a problem. An additional concern is the contamination of Lake Cochichewick, North Andover's drinking water supply, from dog waste.

- Weir Hill currently receives only 8% of the Management Unit’s time and has a very small operating budget. Building stewardship capacity to address the above needs and the prescribed routine management will require additional resources, including volunteers.

2.3 The Vision for Weir Hill’s Future

Based on the planning framework described in the preceding chapter, as well as a comprehensive study of Weir Hill’s significant features, the following vision for the reservation emerged. In ten years, Weir Hill will be:

- A landscape whose history, ecology and stewardship is well understood, documented, and interpreted to visitors in ways that intrigue and deepen appreciation.
- A natural landscape whose capacity to support biodiversity is protected and enhanced by supporting:
 - A restored and viable barrens habitat covering approximately 80 acres
 - A landscape where invasive plants are controlled
 - Viable grassland/wet meadow habitat managed for rare wildlife
 - A healthy and thriving lakeshore community
 - A functioning vernal pool with obligate species
- Enthusiastically supported by numerous volunteers (i.e., stewards) of all ages from the surrounding communities and beyond who are engaged in a wide range of activities that benefit Weir Hill and dovetail well with volunteers’ varied schedules, skills, interests, and time availability.
- Enjoyed by visitors who come to Weir Hill for many varied reasons and leave having had a pleasant and refreshing experience and a newfound passion for the property, The Trustees and conservation in general.
- A welcoming destination where visitors have a clear sense of arrival and where they can navigate the property easily and safely.
- Actively serving as an outstanding model for other conservation lands in its effective integration of ecological principles at all levels of property management.
- A recreational destination that is connected to important nearby conservation lands by way of trails.
- Managed to minimize or eliminate negative impacts to the water quality of Lake Cochichewick.
- A property where management and interpretation emphasizes the agricultural landscape and its history.
- A property whose management includes an active partnership with community and volunteers.

It is important to note that many elements of the vision have already been realized at Weir Hill. The task before The Trustees and the community that supports the reservation is to restore, refine, and augment Weir Hill’s many strengths in order to help it to live up to its greatest potential.

In addition to a prescribed routine management program, Section 9 of this plan details 53 recommendations that have been developed to achieve this vision for Weir Hill. As the implementation of this management plan unfolds over the next 10 years, much new information will emerge that can be incorporated to refine the specifics laid out here. What we learn will also help prepare us for future planning efforts that will guide us beyond the next 10 years. With the healthy beginning set out in this Management Plan, The Trustees look forward to a dynamic implementation process, to be carried out in active partnership with the community.

Section 3: Land Use History

*There's a place called Faraway Meadow
We never shall mow in again,
Or such is the talk at the farmhouse:
The meadow is finished with men.
Then now is the chance for the flowers
That can't stand mowers and plowers.*

Robert Frost, The Last Mowing

3.1 Introduction and Sources

Weir Hill is a double drumlin that defines the west side of North Andover's Lake Cochichewick. When viewed from the east, across the water, it rises gently from south to north, and appears to be dense, old woodland. When viewed from the west, across Cochichewick Brook and Stevens Pond, the woodland has gaps, revealing fields that are reminders of the land's agriculture past.

Woods, fields and water are the three habitat elements that dictated Weir Hill's human use in the past as much as they do today. The following section explores what is known – and may be guessed – about man's use of these elements over time, and the ways in which the uses have altered the landscape, either for the short term or in more permanent ways.

Sources of information are scattered, and vary considerably in value. A long run of North Andover newspaper articles, for instance, may only offer a single glimpse of activity on the hill, while one town meeting warrant item elucidates a whole range of actions and attitudes. Tax records, family histories, old maps, archeological reports, census data all add bits of information to form a patchwork stitched together by field survey observations.

The assistance provided by a number of highly knowledgeable people who have spent years learning and understanding North Andover's past was vital to the present research on Weir Hill. Carol Majahad (North Andover Historical Society); Julie Mofford (Andover Historical Society); Bob Murray (The Trustees of Reservations), Bill Hmurciak (North Andover Water Department); Eugene Winter (R.S. Peabody Museum of Archaeology) are the experts whose knowledge is behind this report.

3.2 Timeline of Prehistory: Andover Region and Lake Cochichewickⁱ

500,000,000 Before Present (BP) Paleozoic

- Formation of Andover Granite, Merrimack Quartzite

15,000 – 13,000 BP Pleistocene

- End of ice age; formation of drumlins

11,000 – 9000 BP Paleo Period

- Tundra-like environment; projectile points found indicate Native American presence in Andover area and as far north as headwaters of Merrimack; food resources associated with large migratory animals such as mammoths and mastodons.

9000 – 8000 BP Early Archaic

- Research suggests warming trend, introduction of oak to region; groups subsisted by foraging, hunting ruminants such as deer.

8000 – 6000 BP Middle Archaic

- Mixed conifer-hardwood forest; rivers approximate current locations; small Native American camps oriented toward seasonally abundant resources. *Lake Cochichewick*: first evidence of Indian use and occupation of shore, including a gouge (woodworking) and a spear point (game hunting or fishing).

6000 – 2500 BP (BC 4000 – 450) Late Archaic

- Establishment of modern coastline, with coastal shellfish beds and probable increase of anadromous fish populations. Climatic cooling trend and more rainfall; more shrubs and ‘edge’ trees and less oak/hemlock. Substantial archeological evidence from this period including evidence of heavy woodworking (as in shaping of dugout canoes). Sites tend to be base camps for foraging populations. Activities include hunting, fishing with nets and weirs, collecting and processing of animal and plant materials, and tool production. *Lake Cochichewick*: range of artifacts including two styles of net weights (fishing), assortment of projectile points (hunting), steatite (soapstone) bowl fragment; use of local lithic resources.

2500 – 350 BP (BC 450 – AD 1600) Woodland

- Shift in settlement toward coastal locations for base camps with continued use of inland resources. Substantial archeological information exists from this period in the Andover area, indicating tendency to group site occupation (i.e., a number of families, not whole ‘town’), specialized camp sites, exploitation of riverine resources, as well as beginning of natural resource management (in modern terms) such as controlled burning and horticulture. Use of ceramics and bow & arrow. **1160 AD** earliest radiocarbon date for plant cultivars found in New England. *Lake Cochichewick*: small projectile points (wildfowl hunting); collection of mixed stone flakes (tool manufacture/reworking).

Climate, flora and fauna can all be considered essentially modern [by Late Woodland Period] in New England. Pollen profiles indicate some evidence for progressive forest clearing [Thorbahn 1982] and by the time Europeans arrived in the area broad meadows existed in many areas and the underbrush was kept cleared out by regular burning.ⁱⁱ

1600 – 1750 AD Contact Period

- Native American groups made regular seasonal changes of residence, toward the coast in summer and inland in winter; settlement size varied by season. There were active regional and long-distance trade networks among Indians, as well as between Indian and Englishmen. A sizable population of Pawtucket Indians still lived in the Essex County area in 1631. They were

described by Governor Thomas Dudley in a contemporary letter: *Upon the river Merrimack is seated Sagamore Passaconaway, having under his command four or five hundred men.*ⁱⁱⁱ This suggests a regional population of something like 2500 people.

Research at the Shattuck Farm site in western Andover, and collecting activities around the shore of Lake Cochichewick, offer evidence of two different local landscapes that were attractive camp locations to Native American people over a long, 5,000 year time span. The Shattuck site (now completely destroyed for industrial development) was a series of alluvial terraces situated on the Merrimack River shore. The site was convenient for fishing, with a small fall nearby, and for river transportation at least as far as the Pawtucket falls. Luedtke summarizes:

Shattuck Farm apparently owes its continuous substantial occupation by prehistoric people to its level sandy soils [good camp sites] and its location adjacent to both falls [fishing] and wetlands [small mammals, wild fowl, herbaceous plants], along a major transportation route. No single factor sets this location apart from many others in the region, but it has a great many different attractions, and would have been productive in nearly every season of the year.^{iv}

The shores of Lake Cochichewick, while offering less level camping ground, is generally equally well-drained. The anadromous fish run that gave Weir Hill its name is evidence of what may have been an even better fishing situation than the Merrimack shore (see discussion below). The Lake's nearest transport route was an overland trail that the earliest English settlers designated the *way to Haverhill*. The Cochichewick shoreline likely included areas of deep mixed oak and hemlock woodland, especially along the steeper slopes of the damp west side, that would invite ruminants such as deer, as well as turkeys. In other places, the shoreline was shallow, providing animals easy access to water, while numerous springs and seeps provided the preferred fresh drinking water for humans. A final consideration, which may go some way toward explaining the scattering of prehistoric sites around the lake's circumference, is the effect of prevailing wind direction. In summer, wind blowing across the water from the west would cool south- and east-shore camp sites. During colder months, wind from the east and sun low in the south would encourage sheltered camp sites toward the north end of the lake.¹

1633 smallpox eradicates most of remaining native population.

Continued native presence in 17th century Andover is documented in the General Court papers that convey that tract from Indian to English ownership. Cutshamakin, a relative of Passaconaway, described as *sagamore of ye Massachusetts*, confirms the transfer of land,

provided that ye Indian called Roger and his company may have liberty to take alewives in Cochichawicke River, for their own eating; but if they either

¹ It should be emphasized that much of this locational thinking is speculative, based on comparison with preferred camp sites elsewhere in the region. While a number of sites have been generically identified around Lake Cochichewick, very little scholarly research or professional excavation and recording has taken place in the vicinity, due to its extensively protected shoreline. Site *purpose*, *size*, and *seasonal association* are all unknown except by the slimmest of evidence, such as the presence of a fish net weight.

spoyle or steale any corne or other fruit to any considerable value of ye inhabitants there, this liberty of taking fish shall forever cease, and ye said Roger is to enjoy four acres of ground where he now plants.^v

According to English law Roger, as a planter of crops, was considered to hold a specific right of ownership to that land he had “improved,” and that land could not be taken from him as long as he lived within the (English) law. Similarly, fishing on a particular stream or at a particular place was also a legal right, literally passed down from generation to generation in the Old World. Hence, Roger’s fishing “privilege” on Cochichewick Brook was considered an inherited right.

1646 Andover founded, an area six miles on a side west of the earlier (1640) town of Rowley, with Merrimack River as its northern border. Its other bounds bordered on Salem (1639), Woburn(1642), and Cambridge (1636).

3.2 Husbanding Resources: the Colonial Period

With the coming of English settlement, the defining features of Weir Hill Reservation – Great Pond, Cochichewick Brook, and Weir Hill – all went through interrelated transformations, although each was differently affected by public and private decisions. In order to understand the land use decisions that shaped Weir Hill Reservation, it is useful to begin by looking at the landscape features individually.

At the time of English settlement the village of Andover nestled up against Weir Hill which was, in turn, bounded on the east by a colony Great Pond which would continue to be called simply “Great Pond” through the 19th century. Did the Indian, Roger, and his company catch alewives here? If they did, they would have used nets or fish weirs, which are normally located at a point along a waterway where migrating fish are (1) forced to bunch up in a narrow channel, (2) slowed down or forced to rest before ascending a fall, or (preferably) both of the above.

Along the full length of Cochichewick Brook, which falls nearly a hundred feet before entering the Merrimack, there are six plausible weir sites, most associated with later mills. Mill dams still define the falls or cascades historically associated with Suttons Mills, Kittredge’s Mills (later Osgood Mill), Osgood’s Mill (later Davis & Furber) and Stevens Mill. A fifth, earlier small sawmill dam mentioned in town histories may have been between the two lowest mill sites or where the 19th century “Hatch” was built, on a sluiceway still maintained by the Town of Andover.^{vi} Conceivably, the brook derived its name from this series of falls, since the word *cochichewick* or *cochituate*, as it is variably spelled, is said to mean “place of the great cascade.”²

The sixth plausible weir site on Cochichewick is not by a dam, but it might have been the most useful site to Native American fishermen. At the outlet of Great Pond is a stretch of brook about

² This Algonkian term may have been borrowed from a larger, Merrimack River context. Alternatively, the word may have had ‘great *number* of cascades’ implications, which would explain its association with Lake Cochituate in Natick, as well as North Andover. Neither location has a dramatic waterfall directly associated with it. Word definition thanks to Carol Majahad, North Andover Historical Society.

500' long where the water is forced into a narrow channel between the southern end of the Weir Hill drumlin and a steep slope less than 300' away across the brook. Here, at The Narrows, it would be a simple matter to erect weirs across the channel, hauling the fish onto the Weir Hill shore. Avocational collectors and archeologists have found evidence of Indian presence on both shores of the brook in this vicinity, but the data is so limited that it is impossible to pin down either location or era of prehistoric land and brook use.

There is little question that someone, whether Indian or Englishman, was harvesting the anadromous fish from the upper end of Cochichewick Brook. Andover's streams were the site where most of the spring fish run catch took place, and this was the communal right of all the town's citizens. Andover took the importance of this natural resource very seriously, passing both environmental and fishing regulations.

Great Ponds and Legal Rights

Great Pond or, more recently, Lake Cochichewick, is the largest natural body of fresh water in Essex County. Since the founding of Massachusetts Bay Colony, rivers and *great ponds* – a legal term describing any pond of more than ten acres – unlike streams and small ponds within the boundaries of a town, have been under control of the state or commonwealth government. The shores and waters of a great pond are public property, available to anyone for the purposes of fishing, boating, hunting and swimming. Twentieth century amendments to the colonial law restrict access to a pond, such as Lake Cochichewick, used as public water supply. In the 17th and 18th centuries, however, Andover's Great Pond was public property, no matter who owned the land adjacent to it.^{vii}

In contrast, streams could effectively be “owned” by private individuals under supervision by the town. Thus an early colonial mill owner, granted land on which to construct a mill, was also granted *riparian rights* to control the stream's flow for the benefit of his mill. These rights would be conveyed with the real estate when the mill changed hands. A fragile, symbiotic relationship existed between weir and mill dam. The same locations on a waterway that were suitable for fish weirs – at the base of falls or rapids in the stream – were also optimal sites for waterpowered mills and their dams. Colonial Andover needed to protect the interests both of its early grist and saw mills and of the weirs on Cochichewick Brook. Frequently, the town would specify that dams be built or operated so as not to damage the arable land or fresh meadow upstream. Also, frequently, the mill owner was required to build and maintain a fish ladder so as not to impede the spring migration of fish upstream. In 1710 Joseph Parker, second owner of the town's gristmill located at the later Stevens Mill fall, was *empowered by the Selectmen to keep the course [of the brook] clear for the run of the fish.*^{viii} This clearing, which continued to be approved yearly through the colonial period, was done *for the preservation and the increase of the fish called “alewives,”* both on the Cochichewick and the Shawsheen.

Beginning in the early 19th century, this system of natural resource protection began to fall apart, as officials and legislators came to view the products of industry *on* the stream as more important than what might be *in* or adjacent to the stream. The anadromous fishery was still important to Andover's economy, with loads being packed off to Haverhill, and 40,000 a year donated to the town's poor.^{ix} Nevertheless, over the thirty year period from the 1840s through the 1860s,

virtually every river and stream in Massachusetts became blocked to migrating shad, alewives, trout and other anadromous species. Records indicate that fish ladders installed in factory dams were ineffectual, at best. In some cases, dams built during this turbulent industrial explosion lacked any form of fishway at all, state and local regulations notwithstanding.

It was not until 1868, and the appointment of a state Commission on Inland Fisheries³ that steps were taken to mitigate the situation, by which time the pollution level, especially in larger rivers, had become another form of deterrent to migrating fish populations. Today Andover's Great Pond – now its reservoir – shows no remnant effect from the pollution that undoubtedly sullied Stevens Pond – now the town swim pond – just downstream. Nevertheless, local fishermen and water officials have never heard of alewives in Cochichewick Brook, extolling instead the size of bass, pickerel and perch found in the ponds, all natural enemies of the herring family.

Weir Hill

In the 17th century pages of Andover's land grant records, we learn that Joseph Parker's mill was up and running, with a mill pond, since Parker received an assortment of grants around it. John Osgood, one of the town's wealthiest and most respected proprietors, took only six acres of his 20-acre initial grant in the vicinity of his actual house. The other fourteen acres were *laid out to him on the side of the mill river adjoining to his meadow*.^x The Osgood family would continue to own and accumulate land between Weir Hill and the Merrimack through the 19th century. Parker's heirs would sell out to Samuel Johnson in the mid-1700s, and Johnsons would hold onto the farm, if not the mill, until 1968.

Eventually, the Andover proprietors' records indicate that some of the town's public, or common land was to be granted to individuals in what was known as the "Third Division." The record goes on to define the areas to be privatized as *on the out Skirts of our Township and not to come above one mile inwards from the lines* – but to also include *the common lands next to the town*.^{xi} Unfortunately, there is no date associated with this entry, although recent scholars theorize that it must have taken place before 1670.^{xii} In 1687, however, the town chose to exempt a portion of the hill from the preceding land division:

Voted and passed that the hill called Ware Hill beginning on the north with the land of Stephen Barker and Stephen Parker and going southerly to the land of Henry Ingalls S^r and the lands and meadows already laid out and westerly with land already laid out said hill to remain for[illegible] sheep pasture forever the wood and timber for the inhabitants.^{xiii 4}

This entry and others suggest that the actual ownership scheme of the hill was complex. While the Barker / Parker land may have marked the northern end of Weir Hill, reference to the Ingalls

³ Theodore Lyman, better known to The Trustees as creator of the Red Brook Reserve in Wareham, was among the first commissioners. The legislation they succeeded in getting passed included Ch.131:48: *No riparian proprietor...shall enclose the waters thereof...unless he furnishes a suitable passage for all anadromous fish naturally frequenting such waters to spawn.*

⁴ The "illegible" – the transcript actually says 'torn' is frustrating – was it part of a word or a whole phrase? Something as simple as *common*, or a more descriptive *cattle and ...*, for instance?

property and other *lands and meadows already laid out* imply that some Andover townsmen, following earlier common land divisions, had taken parcels along the southern and western sides of the hill as private property.

Another entry in the town records, some time after the 1687 common-sheep-pasture vote, indicates that the town is thinking of changing its collective mind again.

Granted liberty to John Farnum sen^r & Timo Osgood to improve ten acres land on the north side of the Mill river between Thomas Abbotts and John Osgoods land so as it may not interrupt the Road of the catell to that part of ye comon and to use it seaven years, that is seven crops, and then to leave it sowed well with english seed grass and to fence it with the timber and wood that grows on said ground, & not to take any fencing stuff off the common.^{xiv}

Here are the mill river, a livestock path to common land, and the presence of Osgood and Abbott, names both associated with the north end of Weir Hill. This entry is rich in land use information. The ten-acre lease describes ungranted acreage – commonly held land – apparently suitable for crops but not yet (completely) cleared. Farnum and Osgood are directed to take fence material only from this lot, thus protecting the young timber growing on the remaining common land.⁵ At the same time they are “improving” – in the traditional sense – this parcel. Improvement of land was legally, as well as traditionally, defined as clearing, fencing, and putting to crops or other agricultural use. Finally, Farnum and Osgood are directed to leave their lot planted to hay. This stipulation may have been intended to increase the lot’s future lease or land grant value, or simply to result in an extra ten acres of common grazing land for the town’s growing herds.

What we can conclude about Weir Hill, circa 1700, is that some portion of the hill was partially open grazing land for sheep, and possibly cattle and pigs, who traveled a ‘catell [= livestock]⁶ road’ to get there from the village. Other areas were both wooded, even on the west side, and privately owned. Owners of crop land were expected to fence livestock *out* of cultivated areas, as Farnum and Osgood were directed to do, because grazing was a common right in the town. (Only pigs were restrained, being ‘yoked and ringed’ before they could wander.)

Finally in 1715 the proprietors abandoned the notion of preserving Weir Hill as common land: *voatted and passed to Lay out the Land that was called the Sheep Commons in Divisions as they Lay out the other Commons.^{xv}* Most, if not all of Weir Hill was subdivided into private parcels of varying sizes and types. Later maps put names on many of the lots – likely indicators of traditional, as well as then-current land use. The uses were largely dictated by natural soil and drainage conditions. Any cultural preference was limited to the basic decision to use this land to its best economic advantage, rather than let it go fallow. A Historic Resources Map accompanying this report (see Section 5, Map 8) includes these lot labels. Most of the land is

⁵ This is food for ecological thought. Does the fact that there is small caliper ‘fencing stuff’ on this parcel indicate the land had previously been cleared or burned, resulting in a successional growth of species such as cedar, which is good fencing material? Or are the town fathers simply referring to a naturally-occurring open woodlot, from which Farnum and Osgood will clear the *timber and wood* to prepare for planting?

⁶ The Oxford English Dictionary offers an appropriate example of the use of “cattle” as a generic term for livestock. It cites Dryden, writing in 1697: *Is Wool thy Care? Let not thy Cattle go ... where Burs and Thistles grow.* [OED 1971, p. 190]

pasture (Hill Pasture, Weir Hill Pasture, Sutton Pasture, Wire Hill Pasture, Pond Pasture). One notable exception is the 38 acre Bailey Wood Lot which includes the steep southern end of Weir Hill down to the level shoreline. Similarly, the 1890s site of the North Andover Country Club is simply called the 'Pond Piece' or the 'Pond Lot,' being generally too wet or too steep for decent grazing land. Each parcel was carefully bounded by stone walls, nearly all of which remain intact today.

At the northwest corner of today's Weir Hill Reservation are four parcels that made up most of the Johnson Farm – an Andover landmark since the 18th century. As of 1882, the farm's components included a 27 acre Hill Pasture (Johnson's Pond Pasture is outside Reservation bounds) plus a 13.5 acre House Field, a 5.5 acre Front Field, and the 2-acre parcel that is today the Reservation entrance, but was, in 1882, already labeled the 'Old' Orchard. No fruit trees have survived to the present.

Johnson's farm and the abutting land that belonged to the Farnham family (Edgewood Farm) mark the edge of the droughty soil and dry conditions that characterize the Weir Hill drumlin (Map 5). While the soils are still classified as sandy loams as on top of the hill, fewer areas are "very stony", as the hillsides are, and the slope had gentled to a cultivable landscape. On the Johnson farm, a wetland draining into Cochichewick Brook is evidence of the moisture commonly found near the base of drumlins (found in the form of seeps on the east slope), which could provide nourishment for crops and trees in the surrounding fields.

3.4 Timeline of Change into the Twentieth Century

A traditional system of rural land use was well-established between Andover village and Weir Hill by the end of the 17th century. Fields and pastures were cleared, orchards planted, herdwalks and driftways (cattle paths) defined, woodlots and millstream put to use, fishing rights protected. It is unlikely that much changed during the 18th & 19th centuries in this part of town.

The one exception to this traditional stability was Parker's mill on Cochichewick Brook. It was a focus for change in the vicinity, which would eventually affect Weir Hill and Great Pond itself. The story of nineteenth century change on the brook and the hill is essentially the story of Stevens and Osgood families, their investments, and their changing self-image.

Joseph Parker's gristmill was situated, in accordance with long tradition, at a small (manageable) fall in a brook that had some water-retentive swamp immediately upstream (what would become Stevens Pond) and that was reasonably close to the village grain barns. An earthen dam was built at the falls, with a "gutter" for alewife migration. The dam was wide enough for a cart to cross it, bringing grain to the mill. In Andover, it may also have been the route by which livestock crossed the brook on their way to Weir Hill: A 1783 Stevens deed refers to *the road leading over Cochachwick Brook to Ware Hill*.^{xvi}

This low-key accommodation of fish, grain, and herd at the same narrow point in the brook continued to the mid-1700s when third generation Parkers sold the property to Johnsons, who owned the farm next door. Johnson's mill must have been unable to keep up with the

competition from other grist mills in town, for a 1795 Andover town map shows no grist mill in operation on Cochichewick Brook.

1784: Samuel Johnson (Esquire, Andover) sells to Timothy Johnson (Andover yeoman) for ‘parental regard’: *the Gristmill I purchased of James Parker 3d of Andover standing on Cochechawicks brook ...* [ED143:20]

1795: Timothy Johnson (Middleton) sells to Jonathan Stevens and cousin Bimsley Stevens (Andover) about 2/3 acre with a dwelling house, grist mill and privileges. [ED159:99] Later, Bimsley Stevens’ half is bought by Dr. Joseph Kittredge, Andover’s physician, who already owns an imposing farm on Academy Road that extended down to the brook. There are indications that the original road from the village to the mill actually cut through Kittredge’s farm.^{xvii}

1813: Jonathan Stevens (Andover yeoman) sells to Nathaniel Stevens (Andover Gentleman – Jonathan’s son) for \$800, his half of the above property, *lying on the north side of Chochechawick brook opposite the old mill pond ... also one undivided half of a Grist mill standing on Chochechique brook with the privileges....* [ED 215: 272]

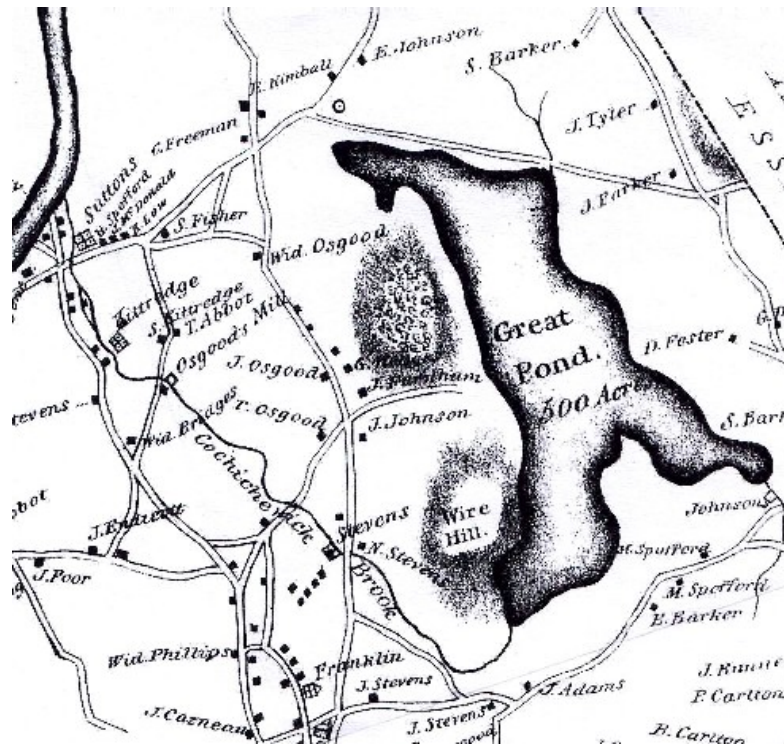
1813 & 1814: Nathaniel Stevens and Dr. Kittredge enter into partnership with Josiah Munroe (Andover Gentleman) thereby capitalizing their company with \$600.00 of new money. Property description includes references to the *old mill pond* and the *old Grist mill* which lies on the *east side of Chochechique Brook*. [ED205: 269 and 270]

The capital was needed to pay for renovations and conversion of the mill to manufacturing ¾ - yard-wide woolen broadcloth. (Manufacture would soon shift to wool flannel, which remained the company’s major product for over a century.) By 1815 Nathaniel, married to Harriet Hale, was living in the house on the mill property.

1829-30: A larger water wheel was installed at the woolen mill to run new machinery – but this in turn required more flow. The new dam flooded land upstream from Stevens’ mill, and raised the level of Great Pond. Shore owners sued for damages, finally signing over “right of flowage” to their inundated shoreline in **1837**. Terms of the settlement provided mill owners downstream with the right to raise the level of the pond to the highest point it had reached during the previous season. The “right of flowage” was *above the level to which it was raised by the old Dam at the Outlet of said Pond*. [ED504:236]. A neck of sand and gravel stretching across The Narrows at the pond’s outlet may be a remnant of this old dam.

This 1830 dam and sluiceway became known as “The Hatch,” probably when the railroad line was built over it in 1848. Construction of the dam and sluice gate at the Hatch resulted in another, reserve pond above Stevens’ primary mill pond. While the additional capacity has not been calculated, it is safe to say that a significant volume of water was added to the controlled flow of Cochichewick Brook between Great Pond and the brook’s final outflow into the Merrimack past Suttons Mills, 99 feet below.

A plan of Andover printed in 1830, shows the Stevens mill and others on Cochichewick Brook (Map 3).



Map 3: 1830 map of Andover

It also names “Wire” Hill and shows it as cleared land, while just to the north, Osgood Hill is unnamed and indicated as one of only two thickly forested spots in the entire town.

1847-1848 Serious drought lowered water so much that Stevens could not run all his machinery. He installed a steam boiler, thus engaging a supplemental source of power. At the same time, Stevens convinced the new Essex Railroad, running between Salem and Lawrence, to run a railroad siding to Stevens mill, for delivery of the coal and wood required by the boilers.

1851 In another effort to improve water power capability, an agreement was reached with abutters that allowed the mill owners to flood the land upstream to a height three feet higher than it had been previously. That height is approximately the level of Lake Cochichewick today.^{xviii}

1850s Stevens sons Moses T., George, and Horace entered the business. Moses T. married neighbor Charlotte Emmeline Osgood, daughter of Gayton P. Osgood and descendant of first generation John Osgood. The family farm lay north of Weir Hill.

1857 M. T. and Charlotte built a house at 120 Stevens Street, which is still standing – an Italianate villa/farmhouse with sizable barn/carriage house behind.

1861 Gayton Osgood (Charlotte’s father) died; his estate, including large tracts on Weir and

Osgood Hills, was divided among heirs.

1865 According to the Stevens family biographer: *in October and November 1865, the present dam was built holding back the waters of Lake Cochichewick.*^{xix} To reiterate (see 1830), it is not clear whether this was a completely new dam at the outlet of Stevens Pond, or a reconfiguration of The Hatch.

1862-1887 Moses and Charlotte Stevens bought back most of the Gayton Osgood land from other heirs, plus additional acreage just north of Weir Hill including part of Edgewood Farm [ED 776: 58]. A town tax valuation done late in this period lists Moses Stevens as private owner of 320 acres of land in North Andover, while his father's estate, in which he held a share, included another 188 acres and the factory property contributed 6 1/2 more – an impressive total of over 400 acres next to Great Pond as well as acreage elsewhere in the town..^{xx}

1884-86 The Stevens' built a new house on Osgood Hill (the present brick and brownstone Stevens Estate mansion off Osgood Street). Stephen Roper comments:

Moses T. Stevens's Osgood Hill, encompassing the mansion, Nathaniel's house, the stables, the greenhouse, the gate lodge, and the Edgewood Farm buildings as well as the entire two hundred-plus acres⁷ on which all these structures stood, represented the most successful attempt by any one individual to create a coherent country seat in nineteenth-century North Andover.^{xxi8}

1887- 1905 Moses Stevens completed consolidation of west shore ownership by purchasing the acreage that was originally Timothy Osgood's farm, embracing the north end of Weir Hill [1887 NED 92:83] and the "Bailey Wood Lot" that had been part of the Phillips family land [1904 NED 214:429] (Map 8 - Historic Resources). The Stevens' had already purchased Eben Sutton's pasture land at the south end of the hill [1884, NED 79:246-250], as well as other land Sutton owned across the Narrows in the vicinity of the later North Andover pumping station [1888 NED 94:405].

The impacts of this consolidation were numerous.

- Retrieving – in fact enlarging – the historic Osgood family tract returned the Stevens name to its early colonial status in the first rank of Andover proprietors.
- Immediate economic impact: Moses Stevens controlled both sides of the outlet of Great Pond, strengthening his position among the mill owners who regulated the water flow through The Hatch.

⁷ See above for actual acreage.

⁸ Such great estates surrounding a naturally scenic body of water almost begged for more elegant nomenclature than *Great Pond*. An 1884 history of Essex County referred to "*Great Pond or Lake Cochicewick*." as if the name was a source of debate.[Wheatland 1884, p. 344] Maps from 1905 to the present all label the pond *Lake Cochichewick*, and Great Pond was relegated to the Commonwealth statute books.

- Long-term economic impact: control over development potential of Weir Hill. It allowed the Stevens' to preserve the rural surroundings, rustic woods roads and riding trails, and a variety of beautiful viewsapes that accorded with the elegant and gracious country estate they had worked so hard to create.
- Social benefit: the Stevens' shoreline was an idyllic setting for a lakeside "camp."

1897 The new North Andover Country Club, of which Stevens was a charter member, either erected or moved into a recently constructed building named "The Bulrushes": a sizable one-story shingled cottage on the shore of Stevens' "Pond Piece" (Figure 1). The building extended out onto the water, on a massive platform framed with fieldstone and concrete masonry. "The Bulrushes" was still standing in the 1930s, but was gone before World War II.^{xxii} Few hints of the Weir Hill clubhouse remain today except broken remnants of the fieldstone terrace wall, the base of a brick chimney, and the eroded slope of the boat ramp. Up the hill, the abandoned tennis court is nursery for a young birch stand that will likely replace the stand of old birches slowly dying a few hundred yards to the south.⁹



Figure 1: "The Bulrushes", Home of North Andover Country Club 1897-1909

⁹ The stand offers a minor example of the connection between land use history and the present landscape: the tennis courts seem to have been either clay or grass surfaced. When they were abandoned, the rectangular patch of open ground provided perfect nursery conditions for white birch, which need fine soil and sunlight to germinate and grow.

1899 North Andover took control of Great Pond for its public water supply.¹⁰ While fishing and boating were still permitted – as they are today on Lake Cochichewick – swimming was no longer allowed. Country Club members were also finding it inconvenient to be ferried between the golf course, on the pond’s south shore, and the clubhouse on Weir Hill.

1907 Moses T. Stevens died. The country club moved its venue from the Bulrushes camp to another at 800 Great Pond Road, eventually purchasing the Foss farm for its headquarters.

1939 A *Land Utilization Map* (Map 4) prepared for North Andover by the Works Progress Administration (WPA) stylizes land cover on Weir Hill into four broad categories. The map provides a historic snapshot of land use on Weir Hill sixty-five years ago.

- The east side of the drumlin from its ridge to the lakeshore is all classified as MO: open cover (less than 20% forested) of *potentially merchantable mixed timber* species.
- The northeast corner of Reservation land – the former Country Club lot – is *brushland*, here interpreted to mean successional shrubby growth, filling in or untended around the Bulrushes camp.



Map 4: Land use on west side of Lake Cochichewick, ca. 1939

¹⁰ According to Bill Hmurciak, Director of the North Andover Water Department, the process had been under way since 1892, when a special committee began meeting to consider the town’s options. Enabling legislation was passed in 1893 but site preparation and engineering for the waterworks continued over the next 6 years. [Hmurciak personal communication, July 29, 2004]

- A north-south running swathe on the west slope of Weir Hill, was classified as *woodland pasture*. This is the arid, droughty section of the drumlin that supports numerous fire-adapted plant species. It includes much of the area called “pasture” in earlier maps and deeds.
- Near the base of the western slope and extending across the brook, is a zone classified as *plowable pasture*. This includes Captain Nat’s ‘Wire Hill Pasture’ plus the fields that border Stevens Street, including the Johnson Farm. A photo (Figure 2) of M.T. Stevens’ villa at 120 Stevens Street shows the fertile, cleared aspect of this landscape seventy years earlier, as well as the steep grassland of the hill pastures.
- Finally, the wetlands between Weir and Osgood Hills show as western limit of the brushland bordering the lake from the country club lot northward, encompassing much of Edgewood Farm. Stevens family members, still living at Osgood Hill, may have maintained some farming operations on the Edgewood Farm parcels, but the WPA’s brushland descriptor suggests that Edgewood, like most of North Andover’s gentlemen’s farms, collapsed with the economy during the 1930s.



Figure 2: 120 Stevens Street from Weir Hill, ca. 1870 (photo from Roper). Note the open conditions on Weir Hill in the foreground.

1954 Stevens family donates the buildings and surrounding acreage at Osgood Hill to Boston University for use as a conference center. **1994** The Town of North Andover purchases the property with the buildings to be managed as a meeting and conference center and the grounds to

be preserved as conservation land.

1964 Aircraft navigation hazard beacon for Lawrence airport erected on west side of Weir Hill. The airport is given an easement *to cut and remove and keep clear from said premises any trees, shrubs and overhanging branches which may interfere with the use of [the beacon].*^{xxiii}

1968 In two separate transactions, The Trustees of Reservations acquired approximately 189 acres of land on and abutting Weir Hill to form its 50th reservation (Map 8 - Historic Resources). The Stevens family contributed \$65,000 to establish an endowment for the property.

- [NED 1122:55] Center Realty Trust under the will of Catherine Johnson, to The Trustees of Reservations: 13.45 acres (the Johnson Farm “House Field”)
- [NED 1122:57] Trustees under the will of Abbot Stevens, to The Trustees of Reservations: approximately 175 acres – the whole southern end of Weir Hill south of Edgewood Farm and Johnson Way (aka “the lane to Pond Pasture”).

1970 75-acre fire on Weir Hill recorded in North Andover Fire Dept. log book. The fire spread from Stevens Mill all the way over the hill to Lake Cochichewick, an unusual range, most fires being localized to one slope. This was the first significant fire of a number that have affected the Reservation since its inception. The fires occurred almost without exception in the spring

Other major fires on the Reservation included: May 1973 (10 acres); April 1979 (15 acres, directly behind The Hatch); July 1979 (another 16.5 acres in 5 separate areas burned in a fire described as *incendiary*; blazes took two days to put down); May-June 1980 (50 acres in series of 5 fires attributed to children); April 1986 (25 acres woodland starting on southern shore of Weir Hill); May 1995 (60 acres).

A majority of the fires were attributed to children bent on mischief. Not unexpectedly therefore, those with locations identified in the fire log started in easily accessible spots. The logs note *hatch area, across from beach, off Stevens Street, rear side near lake.*^{xxiv}

early 1970s Stevens Mill closed and complex sold to developer, who demolished the buildings and constructed a luxury townhouse complex.

1975-1983 The Trustees acquired 9.6 additional acres including the Johnson Farm “Front Field” [NED 1267:405] in the triangle of land between Stevens and Osgood Streets. (An additional 1.6 acres was set off for two private house lots.)

1985 A Trustees quarterly report highlighted a management issue that was becoming universal. Reservations from the Berkshires to World’s End were reporting similar problems.

Weir Hill Reservation has long been a popular night time drinking spot for local young people. In the past few years this type of activity has become more common and destructive....[The North Andover] Selectmen voted to approve the installation of [‘no parking sunset to sunrise’] signs near the

entrance to the Reservation and to instruct the ...police to patrol the area to ensure that violators would be ticketed.

1986-88 One of the few ‘political’ clashes of the Trustees’ period on Weir Hill was thrashed out between management and the Stevens-Rogers family, over the family’s wish to develop an assisted living facility on Edgewood Farm land, abutting the reservation’s northern border. While the problem was settled amicably in 1988, some of the ideas expressed in interim communications are worth revisiting. Mr. Rogers wrote in 1986:

Five or six years ago, Horace and I discussed at some length with [Director Gordon] Abbott the feasibility of giving the entire farm to the Trustees. You could not accept it if a condition was to keep some sort of farm operation going.

A Trustees quarterly report included the following committee opinion: *The Committee agreed that The Trustees should not in any way appear to encourage any such development unless there is a clear and significant benefit to our land conservation goals in doing so.*

In this case, the bargaining chip was the “lane to Pond Pasture,” a right of way held jointly by The Trustees and Edgewood Farm. The report continues:

Mr. Rogers has been asked specifically to grant a conservation restriction over his remaining open land as a quid pro quo before The Trustees releases control over its share of the right of way.

This was, eventually, what occurred. The long-range benefit of The Trustees’ resistance is apparent 15 years later. Today, Weir Hill Reservation totals 194 acres. But land protection on the west shore of Lake Cochichewick extends well beyond Trustees-owned land. When the assisted living facility was built on Edgewood Farm, a buffer zone was left undeveloped between the buildings and the lake shore. The Trustees hold a conservation restriction on that land, as well as on two additional parcels north of it. Moses Stevens’ Osgood Hill estate, now owned by the Town of North Andover, is also under a conservation restriction held by The Trustees. The entire western side of Lake Cochichewick, Essex County’s greatest pond – nearly two and a half miles of shoreline from the historic Osgood farm to Nathaniel Stevens’ mill dam – are permanently protected for the immediate good of North Andover citizens and the enjoyment of all who come to Weir Hill.

ENDNOTES

- ⁱ Much of the following information is derived from Barbara Luedtke's summary tour-de-force, *The Camp at the Bend in the River* (1985) and contemporary work by Mahlstedt. Invaluable additions to that information, especially about Lake Cochichewick, were provided by Eugene Winter, of the R.S.Peabody Museum of Archaeology (Andover). His knowledge of the area's prehistory and his understanding of the largely uncatalogued Forbes Rockwell and J. Wallace Smith collections were invaluable.
- ⁱⁱ Wood 1977:38, quoted in Luedtke, p. 302.
- ⁱⁱⁱ quoted in Bailey (1880) p. 164.
- ^{iv} Luedtke, p. 31.
- ^v quoted in Bailey p 27.
- ^{vi} cf. Bailey, p. 574. Bailey does not cite a particular location.
- ^{vii} Information provided by Anne Monnelly, Massachusetts Department of Conservation & Recreation; also Mass Environmental Law Handbook, Ch. 131:45 ff.
- ^{viii} Town Meeting Records (hereafter TMRec), frame 5128.
- ^{ix} C. A. Abbott, undated *Andover Townsman* article in "Andover" clippings book at the Dedham Historical Society.
- ^x See TMRec, frame 0268, 0269; also 0260.
- ^{xi} Proprietors Record Book I, p. 40.
- ^{xii} Another problem brought on by destruction of the town records. The town's vote to *approve* a land division was not contemporaneous with the *laying out* of individual lots – a process which went on for years, apparently as each land owner decided where he wanted to take up his land.
- ^{xiii} TMRec March 7, 1686/7, frame 0374.
- ^{xiv} TMRec, frame 0385.
- ^{xv} TMRec, p. 10.
- ^{xvi} Essex Deeds 141:199. A historic reconstruction map of Andover in 1692 also indicates a brook crossing south of Osgood property.
- ^{xvii} Kathleen Szyska, North Andover Historical Commission, July 2004 personal communication.
- ^{xviii} Andover Water Department Records, courtesy of Bill Hmurciak, July 2004.
- ^{xix} Stevens 1946, np.
- ^{xx} partial tax valuation booklet, cover with date missing, in NAHC archives.
- ^{xxi} Roper, p. 202.
- ^{xxii} North Andover Historical Society files: notes by Thos Rockwell, April 14, 2000.
- ^{xxiii} The Trustees Headquarters files.
- ^{xxiv} information from Hier (2002) and Headquarters files.

Section 4: Natural Resources

*Here's first a gloveless hand warm from my pocket,
A perch and resting place 'twixt wood and wood,
Bright-black-eyed silvery creature, brushed with brown,
The wings not folded in repose, but spread.
(Who would you be, I wonder, by those marks
If I had moths to friend as I have flowers?)
And now pray tell what lured you with false hope
To make the venture of eternity
And seek the love of kind in wintertime?*

Robert Frost, To a Moth Seen in Winter

4.1 Introduction and Methods

Weir Hill contains significant natural resources. The purpose of this section is to describe the natural resources that characterize Weir Hill and to describe the significance of and the threats to these resources. This section establishes the foundation for the recommended natural resource management actions found in Section 9. Between 2001 and 2004 a concentrated effort was made to understand and detail the ecology of Weir Hill and natural resource inventories of the property's flora, breeding birds, Lepidoptera, fire history, and land use history have recently been completed and provide the basis for this natural resource description. The results of these efforts are summarized in this section.

4.2 An Overview of the Natural Landscape

For its size, the 194-acre Weir Hill Reservation contains an impressive diversity of plant communities. Physical characteristics – a double drumlin comprised of shallow, poorly drained glacial till that slopes steeply into Lake Cochichewick – and a 6,000 year legacy of human influence have shaped the natural landscape of Weir Hill. With sweeping views of the Merrimack River Valley and over a mile of lake frontage, Weir Hill has attracted people to its slopes for thousands of years. Indigenous cultures and early settlers caught spawning runs of alewife on their spring ascent of Cochichewick Brook; colonists grazed cattle and sheep and farmed the slopes of Weir Hill, a practice that continued into the 20th century; and today, the property is enjoyed by area residents for its scenic beauty and recreational opportunities. The plant communities that characterize the site make evident this long history of human use and occupation, and it is clear that much of the property has been shaped by a history of frequent fire, a tool used by indigenous cultures and European settlers to clear and maintain the land for hunting and agriculture. Approximately 80 acres of the 194-acre property has burned on an irregular basis, creating what may be one of northeastern Massachusetts' better examples of a fire influenced landscape (Map 6). Here, a number of plants uncommon to the area occur in abundance. Given the property's long association with fire, it is likely that the resulting

plant community provides habitat for a number of species, especially invertebrates, that are fire obligates. With a relatively large proportion of Massachusetts' listed Lepidoptera associated with fire-dependant plant communities, Weir Hill may provide important habitat for a number of state-listed species in addition to those already documented. In addition, wet meadows, seeps along the Drumlin's eastern slope, and a mature oak-hickory forest add to the diversity of the Reservation.

4.3 Regional Context and Open Space Setting

Weir Hill is part of an important complex of protected watershed lands along the western and northern shores of Lake Cochichewick, the town of North Andover's water supply. Currently 25% of the lake's 2,732-acre watershed is protected open space with a larger portion still remaining undeveloped and unprotected.

While North Andover has retained some of its rural character, the natural communities of Weir Hill are fairly isolated (Map 11 in Section 8). Bounded by water on three sides and suburban neighborhoods to the northwest, a 30-acre woodland paralleling Lake Cochichewick is Weir Hill's only physical connection to adjacent protected areas – the Osgood Hill and Mary Charles Conservation Areas. For the property's two most significant ecological features, the 80-acre fire-influenced community and the wet meadows, their uncommonness compounds this isolation. While beaver activity may, in time, increase the prevalence of wet meadows, fire's influence on the landscape is waning and the 80-acre fire-influenced community is essentially an island surrounded by a landscape inhospitable to many of the uncommon plants and animals that make this community unique. Isolation may be the greatest threat to these communities' long-term viability.

4.4 Watershed Setting

Weir Hill lies within the Merrimack River Watershed, and two-thirds of the property is bounded by the shores of Lake Cochichewick and Stevens Pond. A series of intermittent streams and seeps drain the property into these water bodies and Cochichewick Brook. One intermittent stream originates in the saddle between the double drumlin that forms Weir Hill and empties into Stevens Pond; the property's only vernal pool is found at the headwaters of this stream. A second intermittent stream forms along the northeast corner of the property and flows into Lake Cochichewick. A watershed divide separates this stream from the red maple swamp mosaic that drains the northern portion of the property into Cochichewick Brook via a perennial stream.

Lake Cochichewick, the largest fresh water body in Essex County, is the sole water source for the Town of North Andover. Weir Hill is part of an important complex of protected lands surrounding the lake, and approximately 100-acres of Weir Hill Reservation are within the Lake's 2,732-acre watershed. Protecting the lake's water

quality is paramount, and management and property use must be mindful of water quality impacts.

4.5 Geology and Soils

Weir Hill rises 200 feet above the western shore of Lake Cochichewick to an elevation of 305 feet. Part of a cluster of hills in and around Boston that were formed by similar glacial action, Weir Hill is a geologic feature called a drumlin. As the glacier moved, it scraped the landscape and incorporated the rock debris, called till, into its load.

Geologists theorize that drumlins formed beneath the margin of the ice sheet as clay-rich sediments in the till accumulated into sticky obstructions. The ice flowed up over these obstructions and molded the till into parallel hills shaped like eggs sliced lengthwise.

Formed by the glacier's motion, drumlins are elongated in the direction of glacial flow. Weir Hill is a double drumlin – two connected drumlins. Its soils – fine sandy loams of varying degree of stoniness: Paxton, Merrimack, and Woodbridge – are typical of drumlins in the region (Map 5). The soils are acidic, well drained, and due to steep slopes, very erodable. In addition, the substratum of the Paxton and Woodbridge soils contain a hardpan (impenetrable) layer of reduced permeability and a seasonally high water table is found at a depth of 18-36 inches. A seep along the eastern side of Weir Hill results and is visible in late spring and can create icy trail conditions during winter.

4.6 Climate

Located within the Northeast Massachusetts Coastal Plain, the climate of Weir Hill is extremely variable. Summers are typically warm and humid; winters are usually cold and often wet. Average temperature in July is 72.5° Fahrenheit, and in January, 24.7° Fahrenheit. Annual precipitation is variable and averages 42.8 inches.¹

The local microclimate is also influenced by topography. The sun-baked south and southwest facing slopes of Weir Hill are further dried out by the south-southwest winds that prevail through the summer months. In contrast, the north facing slopes are substantially cooler and wetter.

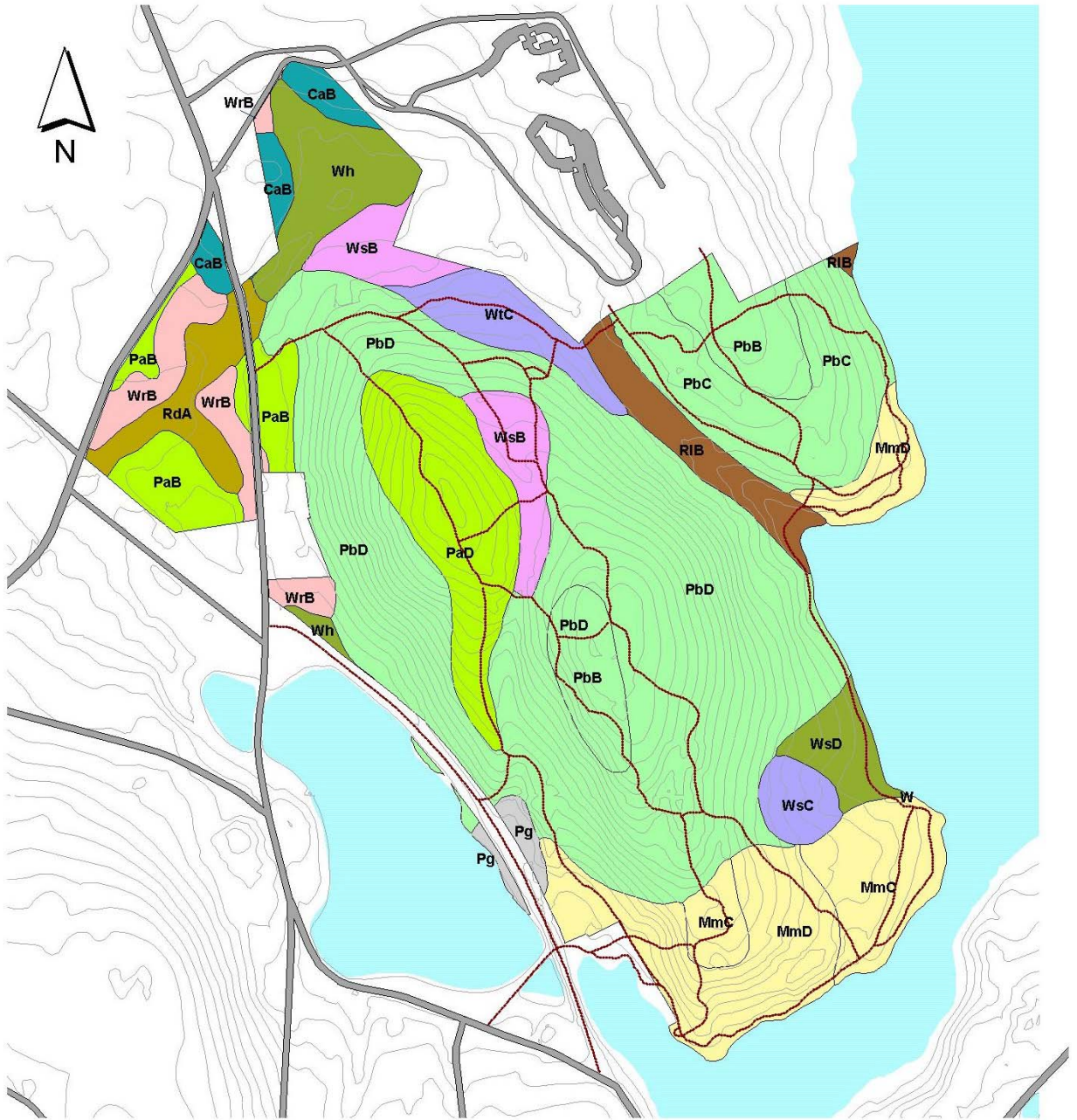
4.7 Natural Community Types

For its size, Weir Hill contains a surprising diversity of natural communities, some of which are uncommon to the region. Soils, topography, and the legacy of human influence – fire and agriculture – have combined to create a diverse and ecologically significant property. A botanical inventory conducted in 2001 documented 10 different plant communities at Weir Hill. Many, but not all of the community types at Weir Hill match those described by the Massachusetts Natural Heritage & Endangered Species

¹ National Climate Data Center: Lawrence Station.

Map 5

Weir Hill - Soils



Soil Series

 Ca - Canton	 Rd - Ridgebury
 Mm - Merrimac	 RI - Ridgebury
 Pa - Paxton	 Wh - Whitman
 Pb - Paxton	 Wr - Woodbridge
 Pg - Gravel Pit	 Ws - Woodbridge
	 Wt - Woodbridge

Slope Codes

A	0-3 %
B	3-8 %
C	8-15 %
D	15-25 %

ex. PaB = Paxton 3-8% slope



Soils based on NRCS STATSGO Project. Provided by MassGIS.

Map produced July 2005.

Program² well enough to classify them as such – mostly because the concept and environmental setting correspond for each. Of particular note were the over 80 acres of black oak – scarlet oak woodlands and successional openings that have an extensive fire history. Also of interest are the two wet meadows associated with agricultural fields, the seeps on the eastern toe of the drumlin, and the mature oak-hickory forest covering the property's northeast slope. These communities are briefly described below. See the accompanying community type map (Map 6) for the distribution and extent of community types at Weir Hill.

Fire-Influenced Community:

The 80-acre fire influenced community is the property's most significant ecological feature. Once more common, fire and its influence on the landscape has declined as the region has developed and tolerance for wildfire decreased. At Weir Hill, a history of frequent fire is well documented for the latter half of the last century. However, there are clues that allow us to speculate on fire's impact prior to records kept by the North Andover fire department and one could speculate that fire's influence dates back to when indigenous cultures occupied the area. Agricultural practices, accidental ignition associated with railroad operation, and most recently, mischievous youth have helped to perpetuate fire's influence. Regardless of its history, the result is a plant community that is increasingly rare in Massachusetts and Essex County especially. Today, Weir Hill has become a refugia for many plant and animal species that depend on fire-influenced habitats.

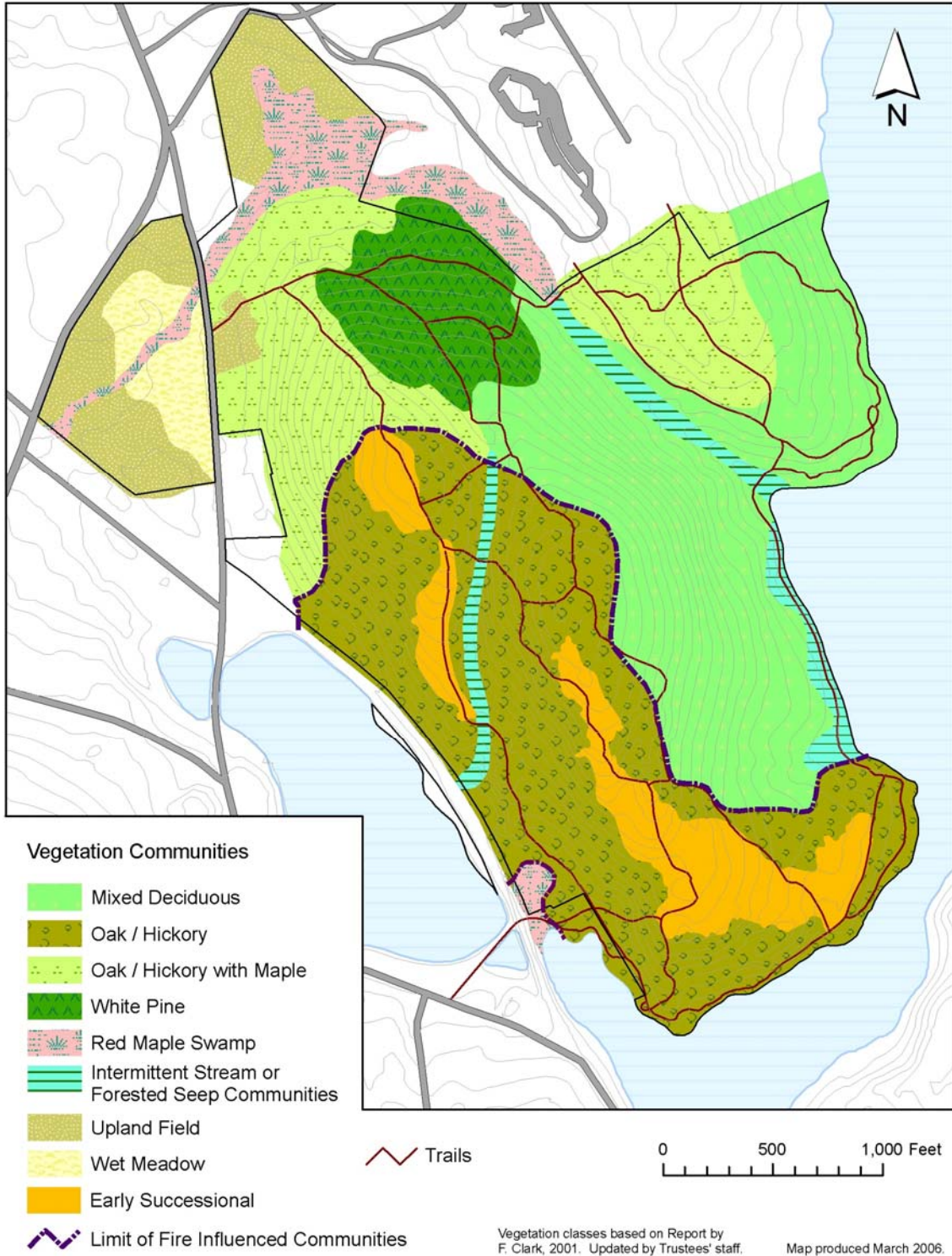
Approximately 80 acres of Weir Hill Reservation show evidence of fire history (Map 6). The last large fire occurred in 1995 when approximately 60-acres burned. This community covers much of the southwestern quarter of the Weir Hill drumlin where south and west facing slopes are more prone to dry wind and warm temperatures, which aids in spreading fire. Multiple fire scarring, dramatic hollow trunks, tree age-class discontinuities, coppice undergrowth, double-trunked trees, and the absence of fire-intolerant species characterize this community. The plant community in this area is a mosaic of black oak-hickory woodland of varying age and development, and open areas maintained as vistas, fields, and fire brakes by annual mowing. The black oak-hickory forest mosaic is typified by a dominance of black oak and a variety of hickories. This community includes a variation of the Black Oak Scarlet Oak Woodland, a S3/S4 Priority community type listed by MNHESP.³ White oak is occasional and scarlet oak is rare.

² Swain, P.C. and J.B. Kearsley. 2000. Classifications of the natural communities of Massachusetts. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife. Westborough, MA

³ Natural Heritage uses a "state rank" (SRANK) to indicate level of rarity and threat of plant communities. This section includes the SRANK for communities where they fit the Heritage classifications to illustrate a community type's abundance at the state level.

- S1 = Typically 5 or fewer occurrences in the state. Especially vulnerable to extirpation.
- S2 = Typically 6-20 occurrences. Very vulnerable to extirpation.
- S3 = Typically 21-100 occurrences. Vernal pools are given this rank because of the limited acreage that they represent.
- S4 and S5 indicate communities which are apparently or demonstrably secure in MA"

Map 6
Weir Hill - Vegetation



These species form a canopy 60-70 feet tall and provide between 40-60% total cover. The crowns of the largest trees are often broadly spreading indicating that they have grown without competition from other trees. The subcanopy is only 10-30 feet tall and includes the same species. In some areas the subcanopy is dense with numerous small trees 4-6 inches in diameter, in other areas the subcanopy is sparse and an ericaceous shrub layer provides 40% cover. Occasionally, fire intolerant species such as white pine and red maple have seeded into areas where fires have not burned recently.

Within this oak-hickory matrix three open areas have been maintained as vistas and fire brakes. These openings vary in their degree of herbaceous versus woody cover in relation to their age and mowing frequency. The most recent addition, along the southwest slope of Weir Hill, was created by and expanded after the 1995 fire which moved through much of the oak-hickory forest. Fire intensity along this southwest slope killed many of the mature trees, opening the canopy along the slope. Property managers have since maintained and expanded the opening by brush-hogging regrowth repeatedly throughout the growing season, to create a fire brake and maintain a more open landscape. The consequence is a mosaic of primarily open land covered with grasses, low shrubs and tree sprouts growing in and around woodlands of black oak, hickories, and more rarely pitch pine. Overall, the community is characterized by successional woody and herbaceous plants. Sprouts of oaks and hickories are frequent to common along with colonies of low growing heaths, such as black huckleberry and lowbush blueberries. Grasses are patchy with little bluestem scattered throughout. Various wildflowers can be found in bloom throughout the year including relatively uncommon to rare plants such as bird-foot's violet, wild indigo, short-toothed mountain mint, toothed white-topped aster, stiff-leaved aster, and various bush clovers. Two species of scrub oaks occur in abundance in this area, and are being excluded from annual mowing in hopes of increasing their ecological value.

Weir Hill Fire History:

It is no coincidence that Weir Hill has, and continues to have a close relationship with fire; a relationship founded in its soil – well-drained sandy glacial deposits, and reinforced by the legacy of human occupancy and floral adaptation to those cultures' most powerful tool – fire. The result is one of Essex County's few remaining fire-dependant communities where locally rare fire-tolerant and dependant plants such as scrub oak, wild indigo, and bush clovers occur in abundance. Fire's influence on a plant community is complex – one affecting soil composition and chemistry, light levels, and species composition. Trying to mimic fire's effect without its use is challenging. Fire removes leaf litter and prevents the buildup of duff layers, releases nutrient back into the soil, and creates the thin, mineral soils required for germination by many fire-dependant plants. In addition, frequent fire reduces competition from non-tolerant species such as white oak and white pine, and maintains an open subcanopy providing light conditions that promote the development of a diverse herbaceous and shrub layer. The plant community that evolves in a landscape shaped by periodic fire disturbance becomes dependent on fire to create and maintain the requisite germination and growing conditions. Many of these species exhibit specific adaptation to fire including thick

insulating bark, the ability to resprout after being damaged by fire, seed release timed to coincide with fire, and a growth habitat that promotes frequent, low intensity fires.

Southeastern Massachusetts, with its warmer temperatures and course-textured coastal plain soils, is more typically associated with fire than Essex County. Forests in Barnstable, Dukes, Plymouth, and Nantucket County are the most flammable in New England and as fire prone as those of southern California. Moving north and inland, elevation and humidity increase and fire frequency decreases substantially. In places like Essex County, fire only occurs with any degree of regularity in areas where steep slopes and shallow soils combine to create physiological drought conditions – conditions typical of the south facing slopes of Weir Hill.

However, soils alone cannot explain the presence of a well developed fire influenced community that potentially pre-dates European contact. What is also required is an ignition source. Lightning, which is usually accompanied by rainfall in the northeast, is not a significant cause of fire in Massachusetts. Instead, 98% of Massachusetts wildfires are started by humans.⁴ Today carelessness and vandalism account for most fire ignitions. However, fire was, until recently, an important tool used to maintain the land and was employed by Native Americans, European Colonists, and in modern agriculture. While there continues to be debate over the extent to which Native Americans used and influenced the Massachusetts landscape with fire, it is clear that certain areas evolved a close relationship with fire due to frequent and repeated burning by native cultures. Weir Hill, which derives its name from the nets used by Native Americans and Colonists to capture the spring alewife runs, has a long history of cultural activity dating back over 6,000 years. The artifact record and area descriptions at contact provide evidence that Weir Hill supported Native Americans over a long period of prehistory. It is likely that the native-people who camped on the shores of Lake Cochichewick set fire to the landscape, and Weir Hill's relationship with fire began with these cultures' occupation. That relationship was perpetuated by colonists who grazed Weir Hill and likely repeatedly burned the land to stimulate herbaceous growth and clear woody debris. The Essex Railroad which traces the southwest toe of Weir Hill and operated from 1848-1926 was also a likely ignition source as sparks blew from the coal-fired trains.

Fire log books from the North Andover Fire Department provide the most detailed account of Weir Hill's recent fire history. These log books describe numerous small-scale brush fires and relatively few large outbreaks. Fires most commonly occurred in the spring, burn for less than two hours, and were caused by children and teenagers playing with incendiary devices. Large fires of note include a 75-acre blaze in April, 1973, a 10-acre fire in May 1973, a 20-acre fire in May 1980, a 13-acre fire in June 1980, a 50-acre burn in 1986, and a 60 acre blaze in May, 1995.

Weir Hill has burned repeatedly in the past. It will continue to do so in the future. One of the challenges for this plan is to manage the property in a way that perpetuates the significant ecological features of this fire influenced community while protecting the surrounding suburban community from fire's potential destructiveness.

⁴ Massachusetts Bureau of Forest Fire Control

Forests:

Forest covers approximately 160 acres of Weir Hill and can be more or less divided into four types within the continuum of dry acidic communities. These range from the fire dependant oak-hickory forest described above; oak-hickory-maple woodland, 33 acres; mature oak-hickory forest, 53 acres; and a white pine woodland, 14 acres. Except for the fire dependant community, these woodlands are fairly typical of the region; all are described in detail in Frances Clark's 2001 botanical inventory. Of note is the 53-acre mature oak-hickory forest on the property's moist northeast slope. Protected from fire by the slope's micro-climate and no recent history of logging, the forest canopy is comprised of a variety of deciduous trees including red oaks, a mix of hickories, white ash, black birch, and a few butternuts (*Juglans cinera*), a state watch-listed species. The subcanopy is equally diverse with a variety of oaks, black birch, red and sugar maple, occasional American beach, and scattered hornbeam and ironwood. Invasives are minimal in this community and the forest is unfragmented by trails.

Wetlands:

There are a handful of wetland habitats interspersed throughout Weir Hill including over a mile of frontage along the shores of Lake Cochichewick, two intermittent streams, a forest seep community along the drumlin's eastern toe, a red maple swamp marsh mosaic, and diverse wet meadows maintained by annual mowing. The stream that drains this marsh mosaic becomes perennial downstream of Steven's Street where it bisects the wet meadow community. The property's only vernal pool is found at the shoulder between the two drumlins at the origin of the drier of the two intermittent streams. Here, a series of shallow pools provided breeding habitat for wood frogs, whose egg masses can be found in abundance during the spring. A S3 priority community type listed by Massachusetts Natural Heritage and Endangered Species Program, this series of vernal pools may be the only breeding area on the property for vernal pool obligates.

Land use history has had an important influence on many of the property's wetland communities. The red maple swamp in the property's southwestern edge has formed in a borrow pit created during construction of the railroad. The red maple swamp along the northern boundary of the property developed since the 1970s from previously cleared agricultural land. A dam near Stevens Street creates an impoundment upstream and an emergent marsh has formed in the swamp's interior. The two wet meadows to the west of Steven's Street are maintained by annual mowing and are one of the property's most significant ecological features. These meadows contain a diversity of sedges, grasses, and forbs including a state-listed-species. The flat-topped aster (*Aster umbellatus*) and turtlehead (*Chelone glabra*) are two important butterfly host plants and support populations of Harris' and Baltimore Checkerspot.

The forest seep community forms along the eastern toe of the drumlin where water, trapped above a hardpan layer, breaks out creating wet soils through the winter and spring which dry by early summer. Consequently this area supports different vegetation, in particular the understory trees and herbs including witch hazel (*Hamamelis virginiana*), hornbeam (*Carpinus caroliniana*), hop hornbeam (*Ostrya virginiana*),

spicebush (*Lindera benzoin*), and winterberry (*Ilex verticillata*). In this area ferns and wildflowers carpet the forest floor in the spring, although many species dry up or disappear as the season progresses. This community supports a number of species not found at any other site on the property. The non-native Japanese barberry (*Berberis thunbergii*) and European buckthorn (*Rhamnus frangula*) are encroaching and threaten this community.

Along the edge of Lake Cochichewick is a shoreline community typical of swamps and pond shores. The shoreline is usually abrupt, dropping four-five feet to the water's edge and is dominated by red maple, grey birch, and rarely river birch, a watch-listed species. Typical shrubs include sweet pepperbush, highbush blueberry, winterberry, and both smooth and speckled alder. The popular Cochichewick Trail traverses much of the lake shore. Sandwiched between the trail and the lake, the shoreline community will gradually be squeezed into an increasingly narrow band as it is unable to retreat with shoreline erosion. At Walden Pond, in Concord Massachusetts, a similar scenario has led to the elimination of the shoreline community over much of the property.

Grassland:

Four small fields cover approximately 15 acres of the reservation and are maintained by annual mowing late in the growing season. Two of these fields border the wet meadows west of Stevens Street, a one-acre clearing at the Steven's Street entrance provides a more open approach to the reservation, and a small crescent-shaped field borders the northern boundary. These fields support typical European hay species and invasive exotics are encroaching from around their borders. Isolated and fragmented, these fields have little potential to support viable populations of grassland breeding birds.

In addition to the grasslands described above, another small graminoid dominated clearing is found at the northern end of the fire influenced mosaic. While this area has not burned recently, the clearing supports a number of species typical of the other successional openings scattered throughout the black oak – scarlet oak woodland mosaic and this clearing is part of Weir Hill's fire influenced plant community. Native grass species dominate including little bluestem (*Schizachyrium scoparium*) and Pennsylvania sedge (*Carex pensylvanica*). Lowbush-blueberries (*Vaccinium angustifolium*) form dense colonies; and the occasional black cherry, grey birch, trembling aspen, and scrub oak seedlings are scattered throughout.

Railroad Community:

The former railroad bed and associated right-of-way that skirts the western toe of Weir Hill has been converted to a trail system and is owned for the most part by the New England Power Company. Surrounded on either side by Trustees property, the railroad bed is a private inholding within the Reservation. While the political boundaries are clear, recreation and management of the railway have the potential to affect the natural communities and visitor experience at Weir Hill. The 50-foot linear community supports a variety of native and non-native weedy and successional species and can be considered an integral part of the black oak – scarlet oak mosaic. Some of the species found on this site are uncommon and include fire dependent plants such as wild indigo and bush

clovers that are found at Weir Hill as well as the state-threatened purple needle-grass (*Aristida purpurascens*). It is not uncommon for these rail sites to support rare plants. Railroad rights-of-way can have an unusual land use history with comparatively little human intervention – grazing and farming – and as such can function as a refugia for certain plant species. While not part of the reservation, the railroad bed bisects the property providing an opportunity for additional native species to colonize the dry open slopes of the successional areas. It is unlikely that the purple needle-grass will colonize up the steep slopes of Weir Hill on its own and this species may be a candidate for introduction. At the same time management needs to be aware of the potential for invasive species to encroach from the site as well. Ecologically and recreationally the Rail Trail and Weir Hill Reservation are functionally connected, a connection that may facilitate joint management of the Rail Trail to the benefit of rare plant protection, invasive species management, and visitor enjoyment.

4.8 Wildlife

The size and isolation of Weir Hill limits its capacity to support large and/or wide ranging animals. However, the variety of habitats found at the reservation provides habitat for a great variety of birds, moths, and butterflies. The documentation of a number of rare Lepidoptera (butterflies and moths) within the wet meadows and fire-influenced landscapes demonstrates that these rare plant communities function as habitat for an invertebrate community uncommon to the region.

Birds:

The variety of plant communities found at Weir Hill supports a diversity of bird life. Breeding bird surveys conducted during the summer of 2001 documented more than 50 species. While most species were common, wood thrush presence suggest that the reservation is large enough to support some forest interior species. Pileated woodpeckers, another area dependant species, has been documented repeatedly at the site and is likely utilizing some of the dead standing trees created during the 1995 fire. In addition, the fire-influenced community supports a number of species typically associated with early-successional habitats such as eastern towhees, brown thrashers, and blue-winged and prairie warblers. Due to changing land use patterns throughout the region, this community type and its associated avifauna are in decline. Whip-poor-wills, another early successional species in decline have not been documented at the property and the fire-influenced community may not be large enough to support this ground nesting species. While there are several acres of grassland, they are isolated and fragmented and provided limited habitat for breeding grassland birds, specifically bobolinks. While bobolinks have been documented in the past, given the property's landscape context, it is unlikely that these fields could support a viable breeding population of grassland birds.

Mammals:

Little is known about the mammals at Weir Hill, but the populations of many small to medium sized mammals can thrive in suburban landscapes. Raccoon, opossum, and skunk are probably common, as are small mammals – moles, mice, squirrels and

chipmunks. With open fields, abundant invertebrate populations, and suitable roosting habitat in the numerous hollowed trees created by fire, bats may be abundant at the property as well. In addition, meso-predators such as fox and coyote have been observed, and fisher is likely. Deer are also common on the property. Given Weir Hill's landscape context – surrounded by suburban neighborhoods and a connection with adjacent conservation land (Osgood Hill and Mary Charles Conservation Areas) there exists the significant potential for the local deer population to increase. Statewide, burgeoning deer populations have had documented deleterious impacts on rare plants and plant communities; deer also serve as an important host for Lyme disease which is spread by the deer, or black-legged tick (*Ixodes scapularis*). These animals may become a future management concern. Given the potential long-lasting impacts of overbrowse on the local plant community, it is best to address a growing deer population before the problem manifests itself through declining range conditions and herd health.

Amphibians and Reptiles:

The vernal pool that forms in the shoulder between the two drumlins may provide the only breeding habitat for vernal pool obligates on the property. Over one-hundred wood frog egg masses were documented at this site during the spring of 2003. In addition, a spotted turtle, a species of special concern, has been reported in the red maple swamp / marsh complex at the north end of the property.

Invertebrates:

Weir Hill supports a diverse assemblage of Lepidoptera. Because of their complex life-cycles and species-specific feeding habitats, Lepidoptera are especially good indicators of habitat diversity and ecological function. A butterfly survey conducted in 2001 documented an impressive 47 butterfly species at Weir Hill. The species list for the property continues to grow and contains a number of rare and state-listed species. Three species: Baltimore checkerspot uncommon throughout state, Harris' checkerspot (state watch-list), and frosted elfin (species of special concern) are relatively uncommon throughout the state. The two checkerspots are found in the wet meadow habitat, the Harris' breeding exclusively on flat-topped aster, and the Baltimore on turtulehead. The state-listed frosted elfin, documented in low numbers during the summer of 2004, breeds on the wild indigo which is abundant throughout the fire-influenced communities. However, recent research suggests that micro-site characteristics are vitally important, and frosted elfins deposit their eggs only on wild indigo growing in partial shade, making this species vulnerable to fire suppression and community succession which can increasingly shade suitable sites. Likewise complete clearing may be harmful since it does not provide the partial shade, despite its host plant being abundant.

Butterfly abundance at Weir Hill may also be supported by the property's topography. Hill tops are often important butterfly sites as they function as a focal area that facilitates the meeting of the sexes in a phenomenon called "hill-topping". Many butterfly species appear to be obligatory hill-toppers and tend to congregate on hill or ridge tops. The same sites are used year after year, while apparently similar nearby sites may not be used. Sites do not necessarily provide nectar food sources for the butterflies or food plants for the next generation of caterpillars. Hill-top aggregations are essential for continuity of the

reproductive cycle of some butterfly species, and hill-top sites may constitute vital focal points for such aggregations. The importance of hill-topping sites is out of proportion to their extent, so that a small area can be vital to the survival of species over a larger area. Hill-topping is often found in species which seasonally or habitually have low density populations and which have a greater need to facilitate male - female encounters. It is unknown to what degree Weir Hill functions as a hill-topping site for butterflies.

Assessing the ecological significance of Weir Hill's fire-influenced community continues to be an important management question. A long, uninterrupted history of fire, abundance of fire dependant plants such as scrub oak (*Quercus ilicifolia* and *Q. prinoides*), wild indigo (*Baptisia tinctoria*), pitch pine (*Pinus rigida*) and bush clovers (*Lespedeza sp.*), suggest that Weir Hill has become a refuge for a number of fire-dependant species and that the site may provide habitat not just for uncommon plants, but also an invertebrate community uncommon to the region. A moth survey conducted during the summer of 2004 documented 237 species of macro Lepidoptera. While diversity was low given sampling frequency, cool temperatures during collection periods likely influenced the results. The surveys did document one species of special concern, the coastal plain euchaena, *Euchlaena madusaria*, a blueberry feeder, as well as four other barren affiliates: *Cyclophora packardi* (Geometridae), *Hyperstrotia flaviguttata* (Noctuidae), *Apharetra dentata* (Noctuidae), and *Zale curema* (Noctuidae). *Curema* utilizes pitch pine as its larval hostplant, *packardi* feeds on oaks, and the remaining two species utilize blueberry (Robinson et al, 2002). Although barren affiliates, these four unlisted species are not barren obligates and are not likely to be placed on the Massachusetts Endangered Species list in the near future.

Because the total acreage of the open canopy scrub oak thicket and blueberry-dominated "heathland" is small (less than 25 acres total), this site is marginal for supporting a robust barren-affiliated lepidopteran fauna. Nevertheless, it appears to be suitable habitat for the one state-listed species documented at Weir Hill Reservation, *Euchlaena madusaria*, and will likely continue to support this species if these open areas are maintained. Larvae are feeding during May and June, thus mowing or burning, if contemplated, should be avoided during these months. Also, mowing these two areas should take place on alternating years (at a maximum) so that each area would have at least one full year without disturbance.⁵

Rare Species

As described above, Weir Hill provides habitat for and supports populations of a number of state-listed rare species. These species receive special protection under the Massachusetts Endangered Species Act, which protects rare species and their habitats by prohibiting the "take" of any plant or animal species listed as Endangered, Threatened, or of Special Concern by the Massachusetts Division of Fisheries & Wildlife. Protecting rare species is Massachusetts Wildlife's Natural Heritage & Endangered Species Program's highest priority. Rare species protection is also a management priority at properties of The Trustees of Reservations. Given the special attention rare species receive, state-listed species found at Weir Hill are listed below along with a brief natural

⁵ Mark Mello personal communication

history description. This list reflects our current knowledge, and in time additional rare species may be discovered. While not protected under the state's Endangered Species Act, those species listed as Watch-Listed are also described. Finally, species in significant decline, state-wide and regionally, have also been included.

Barren Community Affiliates

Plants

- Purple Needle-grass (*Aristida purpurascens*), (T): Purple needlegrass is a densely tufted perennial belonging to a distinctive genus of mostly xerophytic (drought adapted) grasses which are easily recognized by their long-awned "bottlebrush" flower spikes. In Massachusetts purple needlegrass is usually found in the dry, nutrient-poor, sandy habitats known as heathlands and sandplain grasslands. Purple needlegrass is listed as Threatened in Massachusetts. Since 1978 only 13 populations of purple needlegrass remain, occurring mostly in small remnant patches of habitat. Purple needlegrass is currently restricted to Cape Cod, the Islands, and Weir Hill. Weir Hill's population, located within the barrens complex along the railroad right-of-way, is one of only two mainland populations found in Massachusetts.
- Violet Bush-clover (*Lespedeza violacea*), (WL): Violet bush-clover is one of the four bush-clover species found within the barrens openings at Weir Hill. This species is associated with dry oak woods and fire. *Lespedeza violacea* occurs occasionally throughout the scrub oak opening and should persist at Weir Hill as long as habitat is maintained.

Invertebrates

- Coastal Plain Euchaena (*Euchaena madusaria*), (SC): The coastal plain euchaena is a species of moth confined to barrens and heathlands habitats in Massachusetts. Twelve individuals were collected from Weir Hill's scrub oak opening during a 2004 Lepidopteran survey, suggesting that a breeding colony is resident at Weir Hill. McGuffin (1981) lists blueberry, jack pine, soapberry and spruce as larval hostplants. Only the blueberry (*Vaccinium*) occurs at Weir Hill. Since members of this genus are polyphagous (feeds on many types of plants), *madusaria* may utilize other plants as well. However blueberries (and/or possibly scrub oak) are the most likely hostplants for this species at Weir Hill. Continued success of this colony at Weir Hill will require maintaining the open canopy thickets that currently are present here.
- Frosted Elfin (*Callophrys irus*), (SC): The frosted elfin is a butterfly species associated with dry-open habitats maintained by natural and anthropogenic disturbances. *C. irus* has declined severely throughout its range in the last 50 years, due primarily to habitat loss. It is now a species of special concern or threatened throughout most of the northeastern United States. In Massachusetts it is considered both uncommon and a Species of Special Concern, however, the population within the state is considered one of the species' last strongholds. The species is especially vulnerable to local extirpation. It is non-migratory, univoltine (one generation per

year), and occurs in relatively small and localized populations. *C. iris* is also highly host plant specific with populations typically dependent on a single food plant. The host plant for the Weir Hill population is wild indigo (*Baptisia tinctoria*). Uncommon in Essex County, wild indigo occurs in abundance in Weir Hill's barren community. Recent studies have demonstrated that frosted elfin only lay their eggs on plants growing under specific microclimate conditions – partial shade, and that instances can occur where the removal of a single tree can reduce the suitability of a site for breeding. While *B. tinctoria* can be locally abundant, suitable conditions for larval development tend to be clustered into a few small patches, increasing this population's vulnerability.

Wet Meadow Affiliates

Invertebrates

- Harris' Checkerspot (*Chlosyne harrisii*), (WL): Harris' checkerspot, a butterfly whose larval host plant, flat-topped aster (*Aster umbellatus*), occurs within the wet meadow adjacent to Stevens Street. Small populations of the Harris' and Baltimore checkerspot attract butterfly enthusiasts to the wet meadow at Weir Hill. Purple loosestrife (*Lythrum salicaria*) is abundant in the wet meadow and its encroachment will eventually reduce the abundance of native plants, including flat-topped aster, within the wet meadow and reduce the area's habitat value for Harris' checkerspot and Lepidoptera in general.

Other Listed Species

Plants

- River Birch (*Betula nigra*), (WL): River birch is a species associated with flood plains and shorelines where retreating spring floods promote favorable germination conditions. In Massachusetts, river birch has a limited distribution primarily occurring in Essex County. This species can be abundant along rivers, especially the Merrimack and its tributaries, and ponds where flooding and associated sediment transport (both erosion and deposition) occur unimpeded by development and flood and erosion control. River birch is common along the shoreline of Lake Cochicewick and seems relatively secure as long as shoreline habitat is protected.
- Butternut, (*Juglans cinerea*), (WL): Butternut or white walnut grows on rich loamy soils in mixed hardwood forests and produces large seeds valuable to wildlife. Butternut is being killed throughout its range by *Sirococcus clavignenti-juglandacearum*, a fungus most likely introduced from outside of North America. The fungus initially infects trees through buds, leaf scars, and possibly insect wounds and other openings in the bark, rapidly killing small branches. Spores produced on branches are carried down the stem by rain, resulting in multiple, perennial stem cankers that eventually girdle and kill infected trees. Butternut canker was first reported from southwestern Wisconsin in 1967; however, it has probably been present much longer than that based on detailed examinations of killed trees in North and South Carolina. The disease has contributed to as much as an 80 percent decrease in living butternut in some States. The few trees documented at Weir Hill

are mature and no regeneration has been observed. This shade-intolerant species is not long lived and, thus, unless open canopy conditions are maintained and competing tree species controlled, butternut will likely not persist at Weir Hill. Barrens management may benefit this species.

Vertebrates

- Spotted Turtle (*Clemmys guttata*), (SC): Spotted turtle inhabit a variety of wetland habitats in Massachusetts, including both forested and nonforested types. They dwell in marshy meadows, bogs, small ponds and brooks, ditches, and other shallow unpolluted water bodies. They are also found in red maple swamps and woodland vernal pools. Spotted turtles are relatively long-lived and mature late – at about 8 to 10 years of age. Development and habitat fragmentation are likely the greatest threat to the spotted turtle. Increased residential development, road construction, wetland alteration, and destruction of upland habitats – all severely impact the spotted turtle. Egg predation by the increasing populations of skunk and raccoon are also a threat. In addition, road kills take a significant toll on egg-laying females as they travel to their preferred nesting sties such as roadsides, sand pits, and yard and foundation excavations. At Weir Hill a single individual was documented within the red-maple swamp near the herd walk. The wet meadow also provides suitable habitat for spotted turtles.
- Eastern Bluebird (*Sialia sialis*), (WL): Eastern bluebird populations declined in recent years to as low as 17 percent of their previous numbers in the late 1950s and early 1960s. Reasons postulated for this decline include severe winters, harmful effects from the use of pesticides to control fire ants, and competition with other hole nesters (e.g., house sparrows) for increasingly scarce nest sites. Eastern bluebird populations are increasing in some regions as the number of natural nesting sites has been augmented with artificial nesting boxes. Eastern bluebirds are semicolonial nesters and tend to nest where other bluebirds have already settled. At Weir Hill, fire has likely increased the availability of suitable nesting sites.

4.9 Summary of Ecological Highlights

- The 80-acre fire-influenced community on Weir Hill’s Southwest slope is one of the regions better examples of a fire-influenced landscape. The site hosts a diversity of herbaceous and fire dependant plants, many which occur in abundance. The presence of at least two state-listed barren obligate Lepidoptera evidence that the site functions to support a plant and invertebrate community uncommon to the region.
- The nine-acre wet meadow at the foot of Weir Hill adjacent to Stevens Street supports another uncommon plant community and associated Lepidoptera. The diversity of butterflies found at the site has attracted the attention of local Lepidopterists.
- The Lepidoptera community is significant and its diversity likely serves as an indicator that invertebrate diversity in general is high at Weir Hill.

- The seeps along the toe of Weir Hill's east slope add to the plant diversity of the reservation.
- Protected from development and with over one-mile of lake frontage, Weir Hill contributes significantly to the protection of Lake Cochichewick water quality.

4.10 Threats

Weir Hill is surprisingly diverse, supporting some 300 different species of plants, 50 species of butterfly, 237 moth species and a number of rare species. However, these rare species do not exist independently of their habitat, and the abundance of rare species at Weir Hill is a testament to the property's overall diversity. While it is important to think about management and protection of individual species, the greater challenge is to perpetuate the conditions that have led to the creation of this diverse landscape its associated rare species. Protecting Weir Hill's capacity to support biodiversity will entail allowing for or re-creating disturbance processes, such as fire, and addressing property-wide threats such as invasive species, soil erosion, and fragmentation. The main threats to Weir Hill's capacity to support biodiversity are listed below:

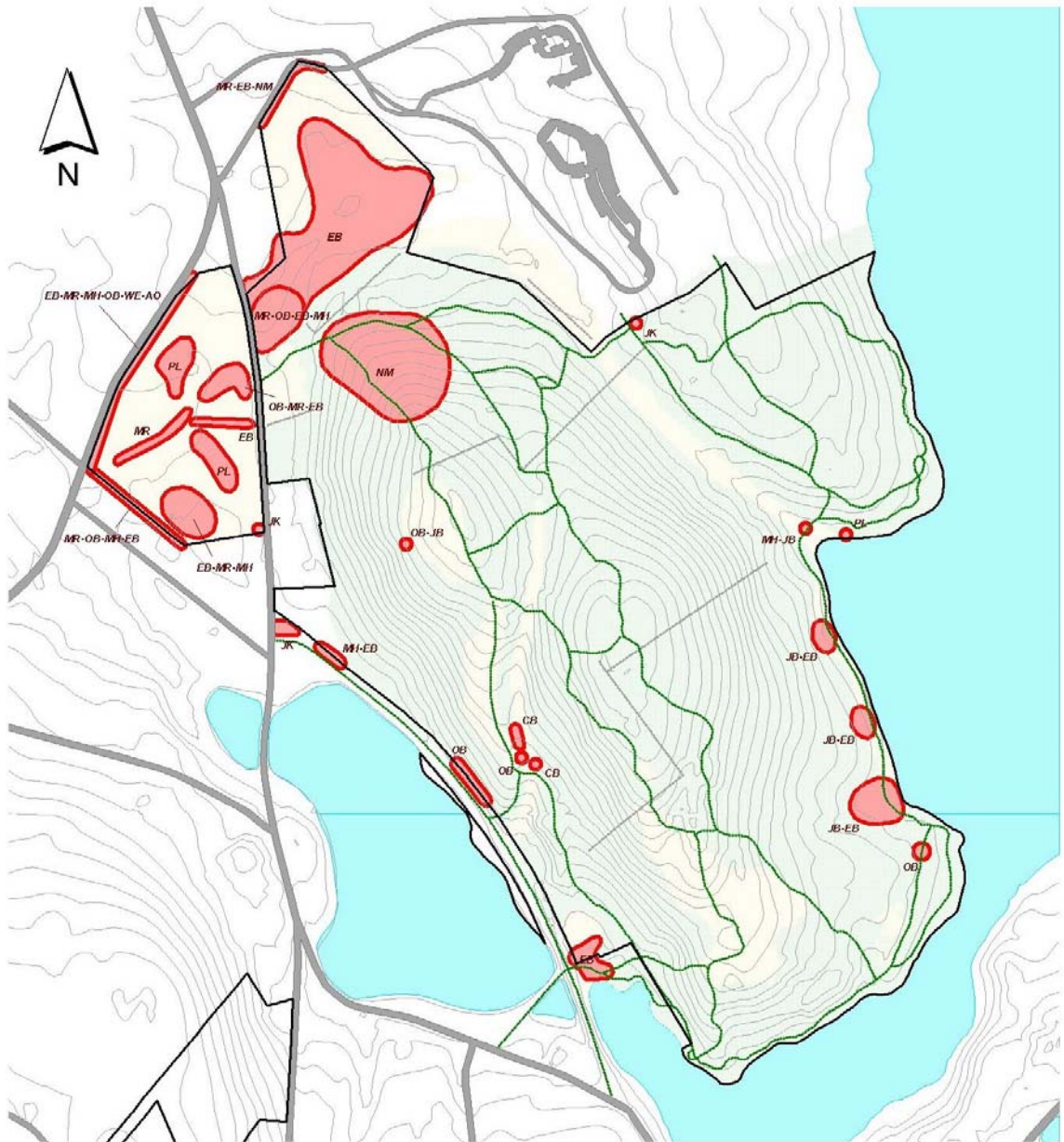
Non-native Invasive Species:

Non-native invasive plants can threaten native species, community types, and degrade wildlife habitat as well as crowd out and replace existing species. This ability to outcompete other plants typically results in dramatic changes to the structural and species composition of the landscape. As such, invasive species represent a significant threat to our reservations and commensurate management challenge. Frances Clark's 2001 botanical inventory provides a first assessment of the invasive species management challenge at Weir Hill. In general, invasive plants are well established around the property's perimeter, but encroachment is light with scattered incipient colonizations within the interior habitats (Map 7). Norway maples currently dominate much of the subcanopy of the white pine forest and the heavily shaded understory is sparsely vegetated and eroding. Preventing Norway maples from spreading beyond their current extent is warranted. Purple loosestrife is well established within the wet meadow. Given the ecological significance of this habitat, the use of biological control may be warranted. Other areas for management include barberry and buckthorn control along the seep habitat, control of incipient colonizations within the property's interior, knotweed control, and removal of the largest and most productive plants from around the property's borders. Invasive species management within the 250-foot non-disturbance buffer zone extending around Lake Cochichewick will have to be coordinated with the local Conservation Commission.

In addition, the invertebrate fauna, specifically Lepidopteran diversity is potentially threatened by two non-native invertebrate species: the Tachinid fly (*Compsilura concinnata*) and European honeybees (*Apis mellifera*). The generalist parasitoid Tachinid fly was repeatedly introduced to North America from 1906-1986 as a biological

Map 7

Weir Hill - Invasive Species



General Locations of Invasive Species

Reservation Boundary

Trails

- AO - Autumn Olive
- CB - Common Buckthorn
- EB - European Buckthorn
- JB - Japanese Barberry
- JK - Japanese Knotweed
- MH - Morrow's Honeysuckle
- MR - Multiflora Rose
- NM - Norway Maple
- OB - Oriental Bittersweet
- PL - Purple Loosestrife
- WE - Winged Euonymus

0 500 1000 Feet



Vegetation based on data from
Carex Associates, 2001.
Map produced February 2005.

control agent against 13 different pests, primary of which was the gypsy moth (*Lymantria dispar*). Because the gypsy moth is univoltine (having one generation per year) and the Tachinid fly produces three to four generations per year, the fly must find alternate hosts for successive generations after gypsy moth larvae are no longer available. *C. Concinata* has been recorded parasitizing over 180 different species of native Lepidoptera, and is suspected to have caused the decline of many species of Lepidoptera native to Massachusetts.

European honeybees, generally regarded as beneficial insects for the pollination services they provide to agricultural operations, were introduced to North America by the first European colonists and compete with native pollinators for nesting sites and floral resources. While these impacts have not been well quantified, studies have demonstrated reduced native pollinator diversity and abundance in the presence of European honeybee colonies. Given the high diversity of Lepidoptera documented at Weir Hill, including a number of rare species, The Trustees should be cognizant of the potential impacts of apiary activity on or adjacent to the property. A single colony of European honeybees can forage over a mile away from their hive, and apiary activity on or adjacent to the Reservation can potentially impact native invertebrate diversity on the property.

Erosion:

Steep slopes and shallow, poorly drained soils make erosion a significant concern at Weir Hill. In some areas trails have become quite wide and there are clear signs of washouts. In addition, some areas along the shoreline have become compacted and eroded by frequent use by pedestrians and dogs. The loss of these thin surface soils may influence the extent and quality of the communities found at the reservation and potentially limit future restoration efforts along the shoreline and within the fire-influenced communities. In some areas there are opportunities to improve or re-route trails to minimize this threat. In other areas, trails may need to be abandoned to prevent further damage. The loss of these thin surface soils may influence the extent and quality of priority community types (i.e. oak-hickory mosaic) and restrict potential future restoration efforts in this area and along the shoreline.

Impacts to Water Quality:

Lake Cochichewick is the sole source of drinking water for the town of North Andover. Protecting the Lake's water quality and ensuring our management and visitor use does not adversely impact water quality has to be a priority. At Weir Hill, dog walking is among the most popular uses of the Reservation. Owners that allow their dogs to swim in the lake, or fail to pick up after their dogs can contribute to water quality problems. In addition a number of spots along the shore have become compacted by frequent use. In these areas vegetation is sparse and erosion is accelerating. The worst areas have alluvial fans of sediment extending into the lake. Careful trail planning and general visitor education will help prevent these impacts. In addition, invasive species management in proximity to the lake's shoreline will have to consider potential impacts to water quality; coordination with the local conservation commission will be warranted.

Wildlife Disturbance and Collecting:

In recent years nature watching, specifically butterfly observation, has grown in popularity at the Reservation. Within the wet meadow, repeated foot traffic creates footpaths, degrades the habitat, and has caused minor impacts to a rare plant population. Preventing these impacts is warranted and should be facilitated by the small size of this user group. While it is unknown if collecting is taking place, The Trustees will need to consider this possibility moving forward. The loss of even a few breeding females from a small population like that of the frosted elfin may be catastrophic.

Deer:

Deer populations are increasing throughout much of Essex County, and as their numbers grow, their foraging activities can alter natural communities and threaten rare plant populations. In addition, Deer are carriers of Lyme disease and the incidence of human cases of Lyme are positively correlated with deer density. During her botanical inventory in 2001, Frances Clark noted abundant deer sign in the wet meadows and frequent browsing in the uplands. At this time it is unclear what impact deer are having on the reservation, but if the local population continues to grow, deer may become a management concern.

Fire:

Environmental conditions and a fire prone landscape suggest that fires will continue to occur at Weir Hill. However, the role fire will be allowed to play in the future remains unclear. Since the last fire in 1995, when 60 acres of the reservation burned, the North Andover Fire Department has requested that The Trustees improve access for fire fighting equipment and maintain fire breaks to facilitate control. There may be many reasons why improved fire fighting capacity at Weir Hill is warranted, however it cannot be provided without affecting fire's influence on the property - its frequency, extent, and intensity – in other words how fire will be allowed to shape the flora and fauna of Weir Hill. Therefore, the greatest challenge for ecological management at Weir Hill is in the perpetuation of the significant elements of the fire-influenced landscape in a political environment that is increasingly intolerant of wildfire.

Ironically, fire suppression presents a double threat to the ecological function of the fire-dependant communities: successful fire suppression will result in a gradual shift in community composition towards fire-intolerant species such as white oak, red maple, and white pine, and increased shade; conversely, suppression can also lead to the buildup of fuels, such that when fire does occur, it burns with greater intensity and affects a larger area than in the absence of suppression. Such high intensity burns can damage the soil and seed bank, significantly altering the plant community adapted to frequent, low intensity burns. In addition, because of this community's small size and relative isolation, an intense fire that affects a large portion of the Weir Hill fire-influenced community has the potential to extirpate populations of rare plants and animals. Once lost, reestablishment is unlikely due this community's isolation within a developed landscape.

Fire, and its control are a given at Weir Hill. How we provide for control will determine the degree to which we alter the ecological integrity and significance of those communities dependant on fire. While we cannot expect to maintain all the elements of the 80-acre fire-dependant community, a well designed and articulated fire management plan can help perpetuate those elements deemed most important. Economic and political constraints may limit our ability to use fire in a controlled setting, and much of our management may be in proactive thinning and brush cutting designed to mimic the effects of fire while reducing fuel loads and creating fire brakes. Doing so does not guarantee the perpetuation of the significant elements of the fire-influenced community and does not guarantee an ability to control fire. In our favor, it appears that the topography and landscape setting have effectively controlled the extent of fire's influence at Weir Hill – surrounded by water on three sides, and a microclimate inhospitable to fire on the drumlin's northeast slopes, it is unlikely that a fire, controlled or not, will burn beyond the current extent of the fire influenced community.

4.9 Significant Opportunities

- Significant ecological opportunity to perpetuate and enhance the fire-influenced community while providing increased control of fire.
- Ecological interpretation of: watershed issues and protection, Lepidoptera diversity and conservation, fire, etc.
- Conservation and management opportunity for the state-threatened purple-needle grass. The small population that occurs along the railroad corridor is vulnerable to desires to pave the trail as well as its location on private property.
- Opportunity to conduct a comprehensive invasive species management program to protect the significant features of Weir Hill.
- Opportunity to work with New England Power Company and local trail committees to enhance the ecological value of the railroad corridor.
- Significant opportunity to enhance the ecological function of the Cochichewick Lake watershed through a collaborative restoration effort that might include creation of fish ladders to restore anadromous fish runs in Cochichewick Brook, and the installation and monitoring of nesting platforms for osprey and common loons.

Section 5 Cultural Resources

*Something there is that doesn't love a wall,
That sends the frozen-ground-swell under it
And spills the upper boulders in the sun,
And makes gaps even two can pass abreast.*

Robert Frost, Mending Wall

5.1 Introduction and Methods

Stone walls, worn paths, isolated old growth trees and a few broken foundations are the features that define the *cultural landscape* of Weir Hill Reservation. Excerpts from a National Park Service publication¹ elucidate this term.

- a cultural landscape is a geographic area, including both cultural and natural resources,... associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.

Within this broad category, Weir Hill Reservation is classed as a *historic vernacular landscape*:

- a landscape that evolved through use by the people whose activities or occupancy shaped that landscape....the landscape reflects the physical, biological, and cultural character of those everyday lives. Function plays a significant role in vernacular landscapes.... Examples include rural villages, industrial complexes, and agricultural landscapes.

Clearly, Weir Hill qualifies as an agricultural landscape, defined by its manmade features and manipulated land. The National Park Service has spelled out the planning process recommended for cultural landscapes in detail, and that process is being followed for Weir Hill. The process includes:

- historical research
- resource inventory and documentation of existing conditions
- evaluation of integrity and significance

Subsequently, a preservation approach, management plan and maintenance strategy are worked out, with arrangements for keeping a record of treatment and future research recommendations.

5.2 Cultural Resource Inventory

Prehistoric Archeological Resources: No formal archeological research has been conducted on Weir Hill, but the finds of amateur investigators from the early 20th century

make it clear that Weir Hill supported occupation by Native Americans over a long period of prehistory. The drawback of the amateur investigations is a lack of documentation: areas that may have been camp sites or specialized resource procurement sites can only be vaguely identified.

Consequently, prehistoric resources of Weir Hill are identified as resource *areas*, rather than specific sites. Due to the threat from looters or ‘pot-hunters’ in archeologically sensitive areas, these areas have not been identified but are on file with The Trustees for future reference. These areas can be defined through a combination of artifact records (cf: those in the J. Wallace Smith collection at the Peabody Museum at Phillips Academy and landscape features that have been identified by scholarsⁱⁱ as correlates of Native American occupation). The correlates vary somewhat by prehistoric period, but generally include the following considerations:

- access to drinking water (springs)
- presence of well-drained or excessively drained soil
- level / near-level slope for campsite
- proximity to marshland providing varied foodstuffs and brushy plants
- proximity and ease of access to falls or rapids (especially for spring fish run)
- proximity to transport routes (eg: Merrimack River; number of overland trails)
- local availability of raw materials for stone tools (granodiorites, quartzites, steatite)
- appropriateness of site to seasonal weather/climatic conditions

The likelihood of Native American occupation of a particular area increases with the range and richness of locally-available natural resources. Little evidence of Indian occupation except a few short-term hunting camps is found, for instance, in Royalston, Massachusetts, a craggy town with low stream rank, very stony soil, and long winters. At the other end of the spectrum, it is difficult to identify an area of Ipswich - a fertile river delta - that was *not* used or occupied by Native Americans over a long time span.ⁱⁱⁱ Andover / North Andover, with seventy prehistoric sites recorded^{iv} but very little site documentation, would appear to be more closely comparable with Ipswich.

Based on all these considerations, it is possible to broadly define prehistoric resource areas on Weir Hill. While these specific designated areas should be considered “highly sensitive,” it should also be assumed that, over 6000 years, all parts of Weir Hill were explored, used, and perhaps occupied by prehistoric native peoples. Only the areas with highest sensitivity are indicated on the accompanying Historic Resources map (Map 8).

Comment on condition: Artifact hunters have searched the lake shoreline for decades, especially during drought periods when more of the prehistoric shore is exposed. Level areas nearby, however, that might have been prehistoric campsites, have a relatively high level of integrity, the soil never having been disturbed by plowing or extensive development. The Sutton Pasture area is less disturbed than farther north, where construction of the Bulrushes/Country Club cottage at least disrupted the level area abutting the shoreline. It should be borne in mind that the shoreline itself, prior to the

mid-19th century, was as much as six feet lower than at present.

Historic Archeological Resources (structures): Weir Hill is surrounded by historic structures and the remains of them. Within the Reservation, however, the only identified building remains are those associated with the North Andover Country Club. The 1890s ‘Bulrushes’ camp, used as a clubhouse, was destroyed before 1940, but fragments of concrete and stone foundation walls, many partly submerged, still remain. There is no surface evidence of trash dumps or other auxiliary features that might be associated with the cottage.

Remains of a second structure are located on the western slope of the hill. A water reservoir, presumably constructed for and used by the railroad after 1848, has been almost entirely dismantled. What remains is the structure’s flat, rectangular footprint on the ground, with a discharge pipe still visible downslope.

Historic Landscape Resources: In contrast to the dearth of its structural resources, Weir Hill is essentially composed of a variety of historic landscapes and their defining elements.

- The single predominant cultural landscape feature on Weir Hill is its extensive network of stone walls, defining historic parcel boundaries and, in some cases, land use. The ecological significance of the walls’ presence in the landscape is nowhere better expressed than in Robert Thorson’s *Stone by Stone*:

Regardless of how they got there, and in what state of preservation they are, stone walls are now an important part of the ecological fabric of New England. They are not an alien rocky intrusion into otherwise pristine woodland; natural stone ledges have always been present [and] besides, the concept of pristine woodland is in error.... The modern flora and fauna of the forest respond daily to the grid of stone walls on the landscape... Old walls are physical edges between growing places.... walls are habitats... control local microclimates.... All of these effects, accrued since the time of farm abandonment, have transformed a complicated woodland ecosystem into an even more complex one, one capable of sustaining more biodiversity.^v

- The foundation remains mentioned above, situated on the lake shore and backed by a glade centered around the country club turn-around, together evoke an idyllic turn of the century rural landscape.
- A pair of tall, survivor oaks flanking an opening in a pasture boundary wall near Lake Cochichewick’s shore are evidence of land use choices perhaps three hundred years old.

Map 8 Weir Hill - Historic Resources



- Stone Walls
- Trustees property 2004
- Trails 2004 (for reference)



Map produced Sept. 2004, by The Trustees of Reservations.
Based on research and data provided by Electa Tritsch.

- A mix of footpaths, roadways and fire trails around the Reservation are artifacts of different functional requirements. While documentation can be offered for dates or periods during which each of these functions operated (livestock and cart paths, 17th-early 20th centuries, fire roads late 20th century, etc.), it is impossible to isolate most trails as serving only one function. More commonly, what is today known as the Scrub Oak Trail, served a range of functions during its history. Similarly, the Cochichewick Trail skirting the lake shore may have been walked first by Pawtucket people four thousand years ago.
- The broad sweep of scrubland on the western side of Weir Hill, delineated by stone walls and deeply rutted paths, is a composite of culturally influenced natural features. Grazing, fire, and more recent landscape management have interacted with droughty conditions to create a fire-adapted natural community rare in the fertile Merrimack Valley watershed.
- Two land parcels, in particular, combine to illustrate the landscape elements of historic livestock management on Weir Hill. The parcels identified as “Johnson Farm Hill Pasture” and “Weir Hill Pasture” form a saddle over Weir Hill. The land, outlined by stone walls, begins at the northwest end with the 17th century *catell Road* from Andover village. From there it opens out across the top of the northern Weir Hill drumlin, skirting a stream on the east slope and finally narrowing down again to a herdwalk that funnels livestock toward a safe drinking place at the lake shore.¹

General comment on condition: Much of Weir Hill has not been managed as a historic landscape since it was acquired by The Trustees. Exceptions to that are the open southwest side of the hill and the Sutton Pasture, both of which are mowed once a year, and the hilltop field that is mowed to maintain the scenic view from the summit. Many of the stone wall field boundaries have been overtaken by brush and young woodland. Trails on exposed slopes are severely rutted in places and their surfaces highly compacted – likely a result of centuries, rather than decades of erosion and use. Maintenance of some trails and roadways as fire roads has coincidentally preserved historic features such as the road from Osgood Hill to the Country Club.

Based on the historical research reported at length in the accompanying North Andover land use history report and summarized in Section 3 of this briefing document, Weir Hill Reservation is a rare, undeveloped agricultural landscape survival. In Secretary of the Interior (NPS) terms:

The Weir Hill historic resource area has a high level of cultural significance at the local and regional level, affording insight into

¹ This watering spot was later blocked with a manmade berm at the water’s edge. It is likely this action was done during the Moses T. Stevens / Country Club period, to prevent land access *from* the lake, rather than water access *to* the lake.

historic and prehistoric settlement patterns, agricultural practices, and natural resource manipulation and management. It shows excellent site integrity and is potentially eligible for listing as a heritage landscape on the National Register of Historic Places.

5.3 Threats

The extensive stone walls that criss-cross Weir Hill are the major feature that provides evidence of man's impact on the double drumlin. The walls have proven remarkably stable over the course of perhaps as much as 350 years. This can be attributed partially to a limited palette of land uses and land ownership within the borders of the Reservation. It can also be partially attributed to the simplicity with which they were assembled in the first place. Most of the Weir Hill stone walls are what Thorson has termed "tossed walls"^{vi}: not meticulously constructed to support a structure or as a stand-alone barrier to livestock, but rather to sketch ownership boundaries and provide a base for wooden (or later barbed wire) fencing. Nevertheless, a few significant threats can be identified.

- The most common threat is frost upheaval. This is less of a problem in thin-soiled, well-drained areas than when rocks sit on a loam base.
- Arboreal and shrubby growth in the wall line eventually dislodges stones or whole sections of the structure by root action, trunk expansion or the collapse of decaying trees.
- "Soil creep" – the process of earth moving downhill over long periods of time – will eventually push over a sidehill wall.
- Animal (accidental) and human (purposeful) interference will knock down or remove wall components of varying sizes.

The second significant threat to cultural resources at Weir Hill is the potential for looting or 'pot-hunting' in archeologically sensitive areas. A recent visitor interview left the impression that the presence of Native American artifacts in the vicinity is common knowledge among some, if not most, local residents, and any avocational archeologist in the region could acquire this same information by a quick search of scholarly journals. Staff has also seen visitors with metal detectors and have been told that pot-hunting does occur during drought periods along the lake's shoreline. The limited scope of ranger patrols of the property provide plenty of opportunity for unauthorized excavation, which is especially likely during drought periods when the shoreline is exposed.

5.4 Significant Opportunities

The potential for interpretation of this rare survival – a vernacular agrarian landscape – is discussed further under management recommendations. Briefly, the Weir Hill cultural landscape offers significant opportunities to engage:

- casual visitors via trail design, signage and interpretive literature
- members of the surrounding communities in a story about how people have interacted with the land for millennia.
- scholars and special interest groups via publications and field trips.

ⁱ Charles Birnbaum, *Protecting Cultural Landscapes* (Preservation Brief #36, National Park Service 1994) p. 1 ff.

ⁱⁱ including Public Archaeology Laboratory staff and Dr. Barbara Luedtke. See Tritsch (1996) for summary.

ⁱⁱⁱ See Tritsch, *Borderlands* (2004) and *Groundswell* (2001), reports to The Trustees.

^{iv} records of R. S. Peabody Museum of Archaeology.

^v Thorson (2002), pp. 185-187.

^{vi} *Ibid*, various references.

Section 6: Visitor Experience

*Love and forgetting might have carried them
A little further up the mountainside
With night so near, but not much further up.
They must have halted soon in any case
With thoughts of the path back, how rough it was
With rock and washout, and unsafe in darkness
Robert Frost, To Look at Two*

6.1 Introduction

Weir Hill includes four miles of moderate hiking trails where visitors may encounter a mixed landscape of forest, fields, hills, and over a mile of lakeshore frontage. Lake Cochichewick and Stevens Pond border the property and shoreline trails are among the most popular with visitors to the reservation. The hill top vista overlooking the Merrimack Valley is a primary destination.

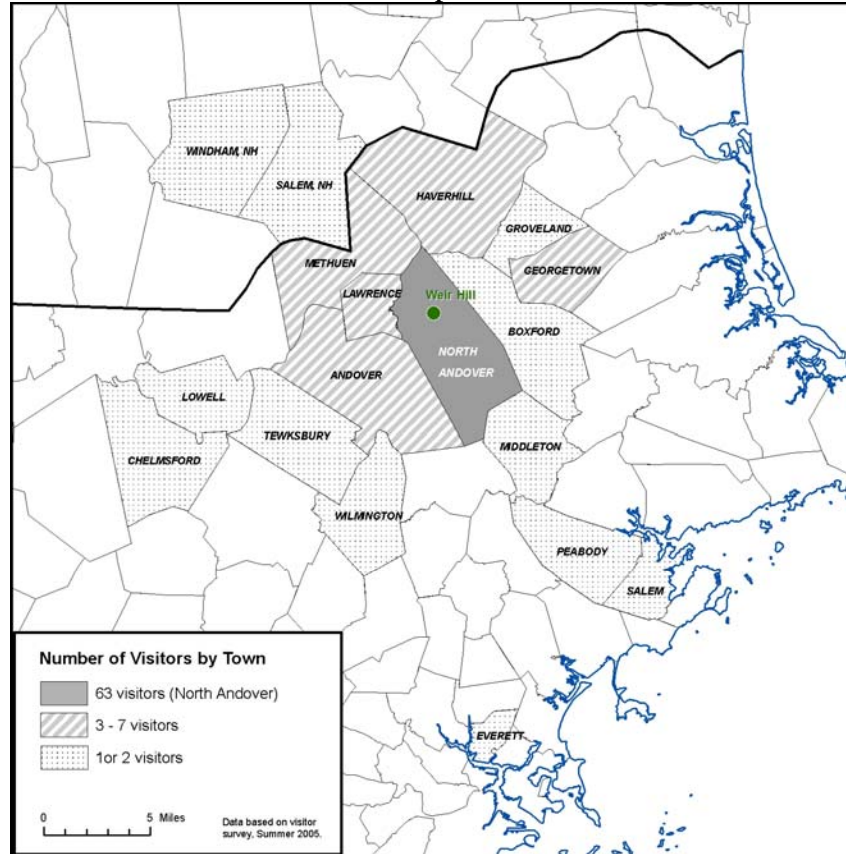
A visitor survey was conducted in the summer of 2004, with the help of the University of Massachusetts, in an attempt to learn more about our visitors, their activities, as well as their general perceptions about the property. Analysis of the survey results indicate the majority of visitors live locally and come to Weir Hill to walk, especially to walk their dogs. Most visitors had praise for the condition of the reservation and The Trustees' stewardship. However, a few minor problems emerged. A copy of the visitor survey and the full report is available on file with the Superintendent).

6.2 Visitor Profile

Visitors were interviewed by Trustees' staff during a six week survey period, a process that yielded a total of 101 completed questionnaires. A variety of days and times were covered to help ensure that the sample would be representative of all visitors to Weir Hill. Based on the results we can characterize our visitors as follows:

- 95% of our surveyed visitors were from Massachusetts
- The majority (62%) were from North Andover, however there were visitors from a total of 20 different communities (most within a half-hour drive: see Map 9)
- Despite the close proximity of Lawrence, only 4% (n = 4) of visitors were from Lawrence
- Most were repeat visitors, with 72% of the respondents having visited the property more than 10 times in the last year
- 72% were **not** members of The Trustees of Reservations
- 93% of those surveyed were white, with nearly an equal number of females and males

Map 9



6.3 Visitor Activities

Although a number of different visitor activities were observed, the vast majority (85%) were at the property to walk. Out of the total respondents, 65% were walking a dog and 21% were simply walking. Other activities witnessed by the surveyors were fishing (6%), jogging (5%), biking (2%) and picnicking (1%).

While not covered in the scope of the visitor survey, the perception of staff is that visitor use is distributed throughout the year, week and day. While weekends were observed to be busier than weekdays, there are regulars that visit the property daily.

6.4 Visitor Perception

In the survey, visitors were asked to comment on 10 possible problems, ranging from crowding to poorly behaved dogs, as either a small or large problem. When responses were combined the following emerged as problems:

- Trails poorly marked (37%)

- Insufficient information about Weir Hill (33%)
- Litter (32%)
- Visitors not picking up after their dogs (30%)
- Dogs off leash (23%)
- Poorly behaved dogs (20%)
- Trails poorly maintained (14%)

Not surprisingly, dog walkers and non-dog walkers perceived problems differently. Non-dog walkers were more likely to identify dogs off leash (48.6% vs. 8.2%) and poorly behaved dogs (28.6% vs. 15.4%) as a problem than dog walkers. Furthermore, dog-walkers were more likely to identify rude visitors as a problem, possibly as a result of non-dog walkers confronting them about their dogs' behavior.

The presence of too many people at the reservation and mountain bikes were rarely identified as problems by any visitors.

General Comments

Visitors were asked if they had any comments to make beyond the survey questions. While these comments are subjective they do provide insight into how visitors appreciate the property. The following is a summary of these comments.

- Visitors commented on the good job The Trustees was doing and felt the reservation was beautiful the way it was and appreciated the “natural” feel.
- It is clear that many visitors do not distinguish the town owned land from the reservation and this is reflecting poorly on The Trustees.
- Dog walkers in general appreciate the property being open to dogs and the no leash requirement in particular, while others felt threatened by dogs.
- Visitors felt that trail conditions, particularly in winter, needed to be improved and that maps could help visitors navigate the property better in all seasons.
- Fishing, which may be an increasing activity, generated a few, but interesting comments. Because Hispanics have been observed to be the primary fishermen, it may be productive to post signs in Spanish.
- Visitors are aware of and appreciate nature. Several visitors specifically mentioned loons, deer, fox, coyote and blueberries.

While not identified in the visitor survey, Weir Hill is becoming increasingly popular with butterfly hobbyists. Staff have seen evidence of their walking through fields and at least one neighbor commented that she sees people with nets in the fields to the west of the main entrance. The reservation is also mentioned occasionally by enthusiasts on the Massachusetts Butterfly Club web page. Butterfly watching in Massachusetts is

increasing in popularity and may become an even greater attraction at Weir Hill due to the significant diversity of species at the reservation.

6.5 Access and Circulation

Visitors access the reservation primarily by way of the Stevens Street entrance or through the town lot off Pleasant Street. The Stevens Street entrance has roadside parking only and increased use of Weir Hill has led to deteriorating parking conditions. Stumps, exposed rocks, and ruts make parking less than ideal, especially during winter when snow can limit parking space. Furthermore, Stevens Street is very busy and vehicles frequently travel above the speed limit, creating safety concerns for visitors as they park and especially when exiting since visitors frequently need to conduct a three-point turn to reverse direction. Parked cars along the roadside also obstruct driver's line of sight when pulling out onto Stevens Street.

It appears that the majority of visitors may access Weir Hill via the town parking lot, possibly because this allows easier access to the waterfront. The town's property between the lot and Weir Hill is used heavily for fishing. Litter, graffiti, and vandalism are frequent occurrences in this area and provide a less than inviting approach to Weir Hill. Because there is no boundary signs or other markers most visitors are unaware of where the town property ends and The Trustees' property begins, setting the stage for the concern that the problems at the Town Lot are likely distracting from a positive Weir Hill experience.

Both access points lack a sense of arrival for visitors and could be improved.

Once on the property, visitors can choose to walk, bike or run on more than five miles of trails (Map 1). Current trail configuration allows visitors to experience a variety of landscapes and vistas. Trails are not marked and some visitors, especially first time visitors, can find navigating the property confusing. Although most trails are in good condition, wet spots and eroded areas do occur. During the winter icing can be a problem, especially where seeps occur. This is especially the case along the Cochichewick Trail where it follows the shoreline. Some trail reconfiguration is needed, including closing steep and eroded trails and rerouting to avoid wet areas to protect resources and improve visitor safety.

6.6 Visitor Services

Visitors to Weir Hill are greeted by the standard Trustees' hanging welcome sign located at the Stevens Street entrance. A standard Trustees bulletin board, visible from the street, greets visitors along the trail. A property map is posted to orient visitors and other visitor information is updated regularly. Because The Trustees do not own the trailhead at the Town Lot, there is nothing to greet visitors accessing the property at this point. Until recently a bulletin board existed at the junction of the Hatch Trail and Stevens Trail to

orient visitors who do enter the property from the Town Lot. It was vandalized and is to be replaced.

Currently, no services exist for visitors with disabilities and there are no bathroom facilities, no access to drinking water, and no trash barrels; visitors must come prepared with their own water and pack out what they pack in.

6.7 Property Regulations

The following regulations have been developed to enhance the visitor experience and to protect Weir Hill's resources. They are posted at the main entrance:

- Littering is prohibited. Please carry out what you carry in.
- All fires are prohibited. The combustible nature of the forest floor and fields, and the exposure to wind make any use of fire hazardous.
- Possession of alcoholic beverages is prohibited.
- Camping is prohibited for public health reasons.
- Motorized vehicles, including trail bikes, motorcycles, snowmobiles, and all off-road vehicles, are prohibited.
- Hunting, trapping, and firearms are prohibited.
- Activities on Lake Cochichewick, North Andover's water supply, are necessarily restricted for public health reasons. Swimming is prohibited. Fishing and boating are restricted to residents of North Andover and then only with a permit issued from the Town.
- Cutting or removing vegetation is prohibited. Trees, shrubs, and wildflowers are of scientific interest and are a part of the beauty of the landscape.
- Disturbing, removing, defacing, cutting or otherwise causing damage to a natural feature, sign, poster, barrier, vegetation or other property on the Reservation is prohibited.
- Conduct that disturbs the tranquility of the Reservation or its enjoyment by others is prohibited.
- The Reservation is open from sunrise to sunset. Entering or remaining on the property between sunset and sunrise is prohibited.

6.8 Education and Interpretation

Currently there is no formal interpretive programming taking place at Weir Hill. The only interpretive materials present are those posted on the bulletin board and property brochure, both of which contain a map and a brief narrative about the property. Additional information is available on The Trustees' website. Opportunities for interpretation exist and include the reservation's natural and human histories, which are particularly rich and intertwined, and existing and planned habitat management.

6.9 Scenic and Aesthetic Resources

The scenery and landscape aesthetics at Weir Hill are important to the visitor. Indeed, to many visitors they are what define the property and their experience. These character defining elements at Weir Hill include hill top vistas, shoreline and lake views, and a landscape mosaic of fields and woods that are minimally managed creating a natural and wild feel.

Although placing value on various aspects of the landscape based on scenic qualities is a fairly subjective exercise, this section hopes to identify those elements that are generally recognized as having scenic appeal – those that are characteristic for the property and define the unique visitor experience. It is important to identify these scenic resources, and any potential threat to them, so that management strategies can be considered to help preserve and enhance these resources that add so much to the visitor experience.



Figure 3: View from summit looking west to Lawrence and beyond

6.9.1 Hilltops and Vistas

The reservation encompasses a 305-foot double drumlin which rises some 150 feet above the surrounding landscape. This change in elevation, accentuated by Lake Cochichewick

at its base, allows for the possibility of scenic outlooks. From the top of the northern drumlin, there is a vista that provides views to the west and northwest. On the local level, there are views of the agricultural fields of historic Kitteridge Farm, the old textile mills of Lawrence, and more of the Merrimack River Valley beyond. On the horizon, the profiles of Mount Wachusett, Mount Watatic, and Mount Monadnock can be distinguished on clear days.

On the southern drumlin, one passes through a series of open spaces along the southern ridge that provide a more intimate view of the surrounding hills and valleys to the south and west. From the top there is also a view directly down on to Stevens Pond which sits at the base of the western slope.



Figure 4: View looking south from southern hill top over barrens

Unfortunately, there is no vista overlooking Lake Cochichewick to the east from the vantage point of the hill top. Although this has the potential to be perhaps the most dramatic scenic feature of the property, the terrain, watershed zoning restrictions, and potential ecological impacts may make it difficult to achieve this. The possibility deserves further investigation prior to ruling it out entirely. The nearby Half-Mile Hill, which was protected by the town in 2003, does have an existing panoramic vista across the lake.

There are two primary threats to these scenic views: continued development of the landscape within the viewshed, and the loss of the view due to forest growth on the reservation. On the local level, where development will have the greatest visual impact, two separate pieces have been permanently protected. The Trustees hold a conservation

restriction on an 11-acre field on the easterly side of Stevens Street and also owns outright another 11 acres to the east of Academy Road. The most prominent piece of unprotected land within the viewshed is the Kitteridge property. The owners have expressed the desire to preserve their family homestead, but have thus far rejected The Trustees attempts to help them achieve that.

There are numerous challenges in keeping the vistas open. The steep slopes which allow for efficient and effective creation of vistas also present challenges in our efforts to mechanically maintain them afterwards. The recent acquisition of a four-wheel drive tractor should greatly enhance our ability to maintain some of these rough areas. The dynamic and somewhat unpredictable nature of the fire-adapted plant community surrounding these vistas represents a landscape that is in constant change. Wildfires have opened up the landscape creating new scenic opportunities in some areas, while other areas haven't seen fire in decades and have slowly reverted to forest, obscuring the horizon. Over a period of a couple of decades the vegetative structure in any given area can change dramatically. The recent strategic clearing along the ridge of the southern drumlin and at the lower edge of the vista looking west to Lawrence will help to preserve these views. Long-term preservation of these views should be an important criterion when determining the ultimate limits of clearing in this area.

6.9.2 Waterfront and Shoreline

Weir Hill has over a mile of shoreline on the 500-acre Lake Cochichewick. The trails that follow the shore offer a variety of views and scenes out across the lake. Indeed, the shoreline trails are the most popular with visitors due to the attraction the lake has for people.

Much of the lake shore and areas beyond are not protected as permanent green space. Several large institutional parcels occur along the eastern shore of the lake in direct view of visitors from the Weir Hill side. Protection of these parcels would minimize future negative impacts to the lake's scenery from potential development. However, Lake Cochichewick is the town's source of water and associated zoning restrictions will limit future impacts to the lake's water quality. These restrictions also minimize potential impacts to the lake's scenery indirectly through setbacks and buffer strips.

6.9.3 Natural and Wild Setting

Many visitors to Weir Hill have commented on its natural feel and wild look, which is a product of minimal management, topography, and fire. This appearance is in direct contrast to other nearby protected green spaces including the Stevens Coolidge Reservation and the North Andover Common which have formal gardens and lawns. It is also striking against the backdrop of the City of Lawrence, adjacent housing developments and nearby route 495 which can all be seen from the hilltop vista.



Figure 5: View from Pebble Beach looking northeast

6.10 Summary of Elements Important to the Visitor Experience

Most of Weir Hill's visitors are from the local area and they frequent the property often. This repeated visitation suggests that most visitors are having an enjoyable experience. Elements important to visitors include:

- **A variety of passive recreational activities are accommodated, especially dog walking.** Although visitors come to Weir Hill to jog, fish, watch nature and to spend time with family, nearly 2/3 of our visitors are walking dogs. Many of these visitors have especially identified the ability to let their dogs run off leash as important to their visit. The current perception by staff and surveyors is that the dog walkers are policing themselves and demonstrating good trail etiquette in general but some visitors identified dogs as a problem (see Threats to the Visitor Experience below).
- **Diverse and unusual scenery and aesthetics:** To many visitors the scenery and landscape aesthetics define the property and their experience. While hill top vistas and trails with views of the lake are important destinations, visitors have commented on how beautiful the reservation is and appreciate its "natural" feel. This natural feel so appreciated by visitors is due in large part to the minimal management the reservation receives and its unusual landscape that has been

influenced by fire. The diversity of landscapes and scenery within a modest-sized area is attractive.

- **Location and access.** Weir Hill's popularity is due in part to its convenience for many visitors. The great majority of visitors live locally and they visit the reservation regularly. The location of Weir Hill near the center of North Andover together with its two entrances and trail network allows Weir Hill to be easily accessible.

6.9 Threats to the Visitor Experience

- **Trails poorly marked or maintained.** Many visitors have expressed that they would like to see the trails marked and maintained better. First time visitors can find the trails confusing. Some trails have wet areas or eroded surfaces and some trails have significant icing issues in the winter due to seeps.
- **Association with adjacent poorly maintained land.** Litter and vandalism on the adjoining town-owned property have been identified as a problem by visitors that presumably detracted from their overall experience. Many visitors do not realize that this area is not part of the reservation. Signage or some other creative measure to let the visitor know when they have entered onto The Trustees' property should help. Since there is no information on the property, including a map, at the town entrance it is understandable that visitors would identify these as Trustees-related problems.
- **Poorly behaved dogs and dog waste.** Dog walking is a primary activity at Weir Hill and visitors identified dog waste, dogs off leash, and poorly behaved dogs as common complaints. Organization-wide, The Trustees' properties are experiencing increased dog-walking and conflicts as other open areas ban this activity or become developed. Dog related issues at Weir Hill will likely increase over time if not addressed.
- **Development of critical parcels within the important viewsheds.** Views to the west from the hill top openings include fields that are a significant part of the visitor experience at Weir Hill. The development of these fields would greatly detract from the existing viewshed.
- **Successional regrowth.** Obstruction of views from successional regrowth in cleared areas.
- **Changes to existing management.** Changes that would significantly alter the diverse, natural appearance of the reservation, particularly the fields and successional openings could alter the current "natural" and "wild" feel of Weir Hill.

- **Erosion and trampling of vegetation.** Visitor impacts (e.g. trampling of vegetation, soil compaction, erosion) to shoreline areas become unsightly.

6.10 Summary of Significant Opportunities

- The inclusion of long-term management benefits to scenic vistas as a consideration for habitat improvement/expansion (see Section 4). Clearing for habitat improvement will provide additional scenic vistas and landscape aesthetics.
- There is a significant opportunity to provide a better sense of arrival, improve safety, and establish expectations for visitor use at both entrances.
- Few visitors are from nearby Lawrence, a city of 70,000 (most residents are Hispanic). This represents a terrific missed opportunity for The Trustees to engage people in both the protection of Weir Hill and in conservation in general. Weir Hill has the potential to be a meaningful part of the greater Lawrence landscape, but to date, we have not figured out how to make this connection. It would appear that members of this community are going to the adjacent town land to fish, and this may provide an opening for us to build this connection.
- Many visitors would like more information about the property. The recently printed trail map and its accompanying interpretive information may help to meet this expectation, but there may be additional educational opportunities to help enhance the visitor experience.

Section 7 – Overview of Current Management

*“Oh, let’s go up the hill and scare ourselves,
As reckless as the best of them tonight,
By setting fire to all the brush we piled
With pitchy hands to wait for rain or snow.
Oh, let’s not wait for rain to make it safe.
The pile is ours: we dragged it bough on bough
Down dark converging paths between the pines.
Let’s not care what we do with it tonight.
Divide it? No! But burn it as one pile
The way we piled it. And let’s be the talk
Of people brought to windows by a light
Thrown from somewhere against their wallpaper.”*
Robert Frost, *The Bonfire*

7.1 Introduction

The Trustees of Reservations divides its statewide field operation activities into five regions. Within each region, the individual properties are further organized into management units. Weir Hill Reservation is one of four properties that is managed by The Andover/North Andover Management Unit of the Northeast Region.

This section provides an overview of the current management program at Weir Hill and highlights key issues associated with that program. It then assesses this management program and evaluates whether or not it is meeting the needs of the property. To assist in this assessment current staffing, equipment, financial resources, volunteers and committee’s, and membership support are considered. Section 10 of this plan will describe a new prescribed routine management program as needed that fully addresses the stewardship needs of Weir Hill.

7.2 Description of the Current Management Program

Table 7-1 below lists the specific actions which comprise the current management program at Weir Hill and details for each the frequency at which it is conducted; the number of staff hours currently invested in the task; and an initial determination of whether or not the task represents an appropriate investment of staff, financial and/or volunteer resources. (This determination is based on current knowledge; further analysis and review conducted in preparation of the Prescribed Routine Management Table in Section 10 may change this initial determination.) Also in Section 10, a performance level ranking will be assigned to each action. By assessing current performance level, staff will be able to identify the strengths and any deficiencies of the current management program and then develop a prescribed routine management program that will guide staff

work planning and the allocation of staffing and financial resources at the management unit level.

Table 7-1 Current Routine Management Program

<i>Task</i>	<i>Frequency</i>	<i>Season¹</i>	<i>Current Hours</i>	<i>Is this the Correct Task?²</i>	<i>Notes</i>
Brushsaw Field Margins	Annually	F	15	Yes	
Brushsaw shrublands	Twice a year	S, F	12	Yes	
Field Mowing	Annually	F	45	Yes	
Brushsaw Vistas	Annually	F	2	Yes	
Bridge Maintenance	As needed	All	2	Yes	As needed
Litter Control	Weekly	All	12	Yes	
Sign Maintenance	As needed	All	6	Yes	As needed
Snow Plowing	As needed	W	4	Yes	As needed
Update bulletin boards and restock brochures	Weekly	All	12	Yes	Bulletin board information could be updated more frequently.
Post and patrol boundary	Annually	W	2	Yes	
Trail Maintenance: includes patrolling trails for problems, clearing downed trees, cleaning out waterbars, and mowing and cutting back brush.	As needed	All	26	Yes	

In addition to the routine maintenance, the staff will undertake a number of projects, as time and conditions allow, that help to enhance the property’s scenic and ecological diversity while addressing local public safety concerns.

The western half of the reservation has historically received the bulk of our management time and effort. Since the acquisition of Weir Hill, The Trustees have undertaken a variety of efforts to reclaim portions of the hillside from early successional growth as changing conditions (e.g. frequent fires) presented new management opportunities. The rationale behind these efforts was to enhance the scenic and ecological diversity of the property and to retain a sense of its rural, agrarian character. In the early 1970’s, the field on the top of the hill was reclaimed to provide a scenic vista to the west. In the late 1980’s efforts were made to reclaim portions of the abandon horse pasture on the

¹ S= spring; Su= summer; F= fall; W= winter

² This determination is based on current knowledge; further analysis and review conducted in preparation of the Prescribed Routine Management Table in Section II may change this initial determination.

northwest corner of the property. Since then there have been ongoing efforts to push back the field margins to logical stopping points (stonewalls, steep terrain).

Public safety has been a recurring issue due to the reservation being prone to fires. There have been four significant brushfires, and numerous minor ones, since the Trustees have taken over the property (1970/75 acres, 1980/50 acres, 1986/25 acres, 1995/60 acres). These “wildfires” have not only had dramatic effect on the ecology of the site, but they have also raised concern from the local fire department for the cost, in terms of manpower and resources, resulting from their effort to control and contain these fires in a suburban environment. In 1986, the staff worked with the Town of North Andover’s Fire Chief to improve the access roads into the property. Trails were widened and in some cases re-routed to allow for the department’s forestry equipment to pass from the Stevens Street entrance out to Pebble Beach, essentially bisecting the area most frequently hit by fire.

The fire of 1995 was of significant size and intensity. Nearly 1/3 of the reservation burned. The fire was hot enough in some areas to top-kill even some of the larger, fire-adaptive oaks. Fire fighters from five communities battled the fire for over 11 hours. There were renewed complaints that our access roads were too narrow and did not provide adequate access to the property for the emergency vehicles. The aftermath of the fire also presented new opportunities. The staff began a six year effort to clear the burnt top growth along the southern ridge of the eastern drumlin, which is the area where the fire was hottest and the impact on the vegetation the greatest. The goals for this effort were to:

- Improve emergency access into areas most prone to hot fires
- Remove hazard trees along trails
- Create a fire break by removing some of the fuel load of dry dead material, and maintaining swaths of newly open areas along the ridge
- Create new scenic opportunities that can take advantage of the open terrain and elevation

This effort resulted in nearly five acres being cleared of brush and dead trees and a subsequent mowing regime was initiated to maintain this new area. A recent botanical inventory has helped to broaden our understanding of the overall fire-adapted ecological community at Weir Hill, adding further merit to creating and maintaining open areas as components of the larger fire-influenced landscape.

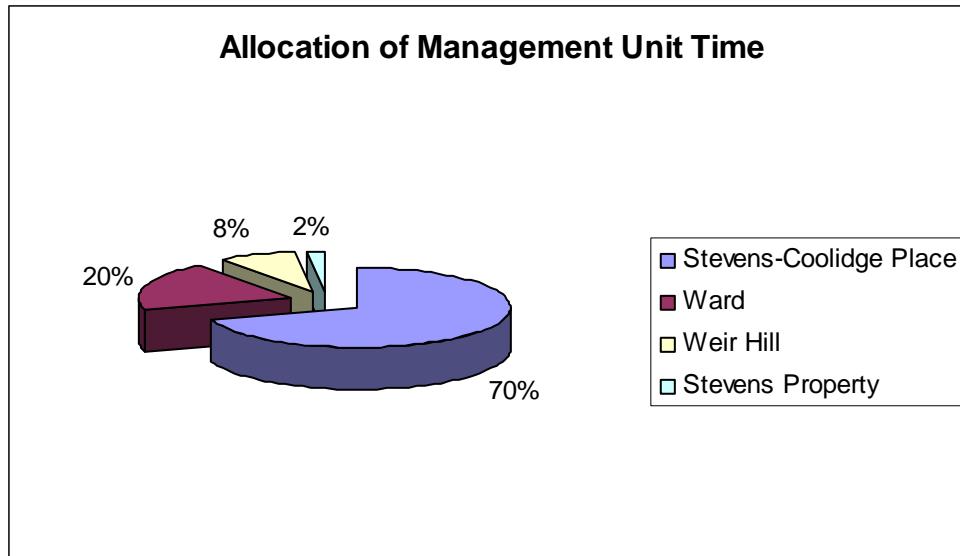
Projects currently being initiated in 2006 include the clearing of stonewalls along Osgood Street to improve the scenic value of the fields and the restoration (i.e., clearing) of 16 acres of barrens habitat. Both of these projects will result in additional routine maintenance.

7.3 Staffing

The Andover/North Andover Management Unit currently has three fulltime staff members: the Superintendent, Assistant Superintendent, and Maintenance Technician. They are responsible for the management of four distinct properties, totaling nearly 1,000 acres, including: The Stevens-Coolidge Place (91 acres), The Ward Reservation (700 acres), the Stevens Property (11 acres), and Weir Hill Reservation (194 acres). Additional part-time and seasonal help are discussed below.

The Stevens-Coolidge Place with its intensely cultivated gardens and formal landscape, seven structures, and active program and events schedule, has historically required the majority of the Management Unit's time. It is estimated that 70% of the staff's time is allocated to this property. Maintenance at the Stevens-Coolidge Place is also supplemented with two seasonal positions: a grounds crew position (40 hrs/wk x 17 wks), and a garden intern (12hrs/wk x 16 wks). The grounds crew position assists the fulltime staff at other properties within the Management Unit as necessary.

The Ward Reservation is by far the largest property in the Andover/North Andover Management Unit at 700 acres. This property features nearly 10 miles of hiking trails, a mix of woodlands and fields, two structures, and a 700 foot interpretive boardwalk. This property has had the benefit over the last three decades of having a dedicated volunteer putting hundreds of hours annually into the management of this property. In 1994, a new staff residence was built on the property to provide a greater presence and enhanced security on site. At that time, a new part-time maintenance position was created to help with the security and maintenance of the property. This position provided 17 hrs/wk in exchange for housing. In 2005, this part-time position was eliminated and the Maintenance Technician's staff residence was moved from The Stevens-Coolidge Place to the Ward Reservation. The Maintenance Technician's responsibilities were also adjusted so that his first responsibilities are to address the immediate needs of the Ward Reservation and then support the rest of the management unit. While this will allow for a more efficient and effective management of Ward Reservation, it has also temporarily left the management unit short handed. The hope for the future is to use the now vacant residence at The Stevens-Coolidge Place as an asset that could help address the manpower needs of the management unit. The Management Unit staff, as a whole, allocates approximately 20 percent of its time to the Ward Reservation.



The Stevens Property came to the Trustees in 1994 and consists of 11 acres that is primarily open agricultural land. Most of this property is utilized by a local farmer for hay production. The staff allocates approximately 2 percent of its time to this property.

Weir Hill came as a gift from the estate of Abbot Stevens in 1968. Additional land was given in 1975 and 1994 to bring the property to its current configuration of 194 acres. This property receives approximately 8 percent of the management unit’s time.

Comments/Issues:

- Limited staff time is one of the main hurdles that will have a direct effect on any new management strategies. Although there does not appear to be any critical unmet maintenance needs, there is a sense of missed opportunities that could add value to the scenic, ecological, and educational qualities of the property. Any significant management initiatives may need to consider contracting out a portion or all of a project in order to see it completed in a timely manner.

7.4 Equipment

Overall the Management Unit is fairly well equipped to handle the routine maintenance tasks at Weir Hill. The more significant pieces of equipment include:

- 2003 Ford ¾ ton 4wd pickup truck, with dump body
- 2004 55hp 4wd John Deere tractor with loader and 6’ rotary mower
- 3 chain saws and 2 brush saws
- 5 pairs of loppers and assorted hand tools

The Management Unit staff also has access to equipment shared by the northeast regional properties including:

- chipper
- dump truck (1 ton or more)

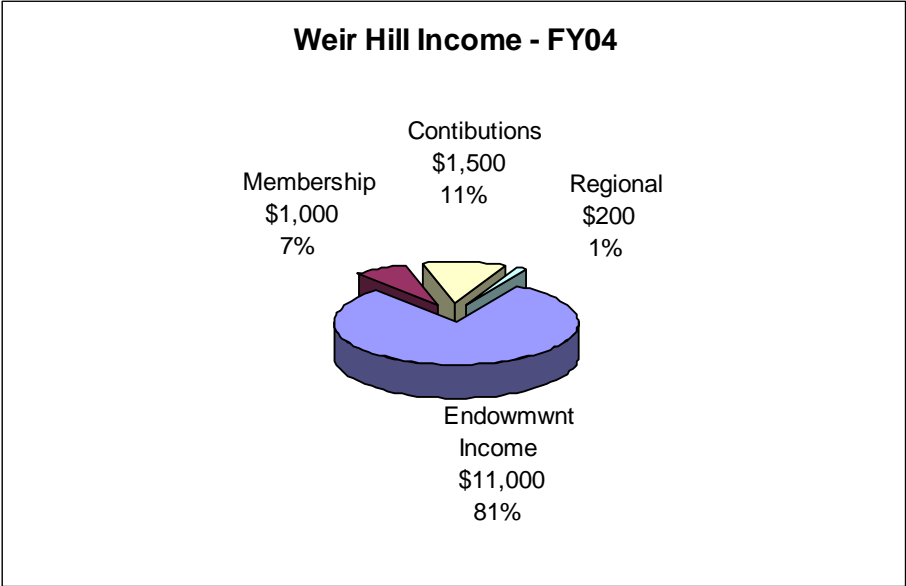
Comments/Issues:

- In 2005, the Management Unit's 30-year old farm tractor was replaced with a new tractor with more horsepower and four wheel drive. This new piece of equipment will greatly aid management at Weir Hill: its 4wd feature will allow for safe operation on rough and hilly terrain and the increased horse power will enable us to get the chipper up onto the hilltops.
- The only vehicle access onto the hill is off of Stevens Street. This roadway, which leads up the northern ridge of the western drumlin, is steep, vulnerable to washouts, and during wet or snowy conditions is impassable. This can be a significant limiting factor since the staff typically has greater scheduling flexibility to devote time to Weir Hill during late fall and early spring. The new tractor should improve accessibility but the aggressive wheel action may heighten erosion concerns. Access through the Town's entrance off of Pleasant Street has not proven to be practical to date.

7.5 Budget Overview

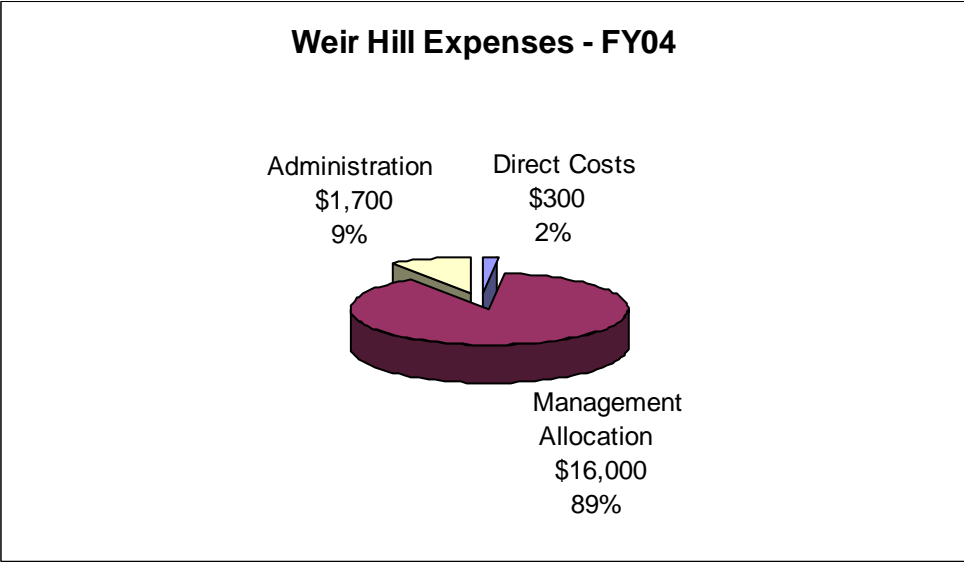
The annual Operating Budget for Weir Hill is prepared by the Superintendent along with property specific budgets for the other properties in the Andover/North Andover Management Unit, as well as a budget for the management unit's overhead expenses. Typically, Weir Hill runs a deficit.

In fiscal year 2004, the budget for Weir Hill had four different sources of revenue: endowment income, membership, contributions, and regional income. The total income for FY04 was approximately \$13,700. The Endowment Income represents 81% of the total income.

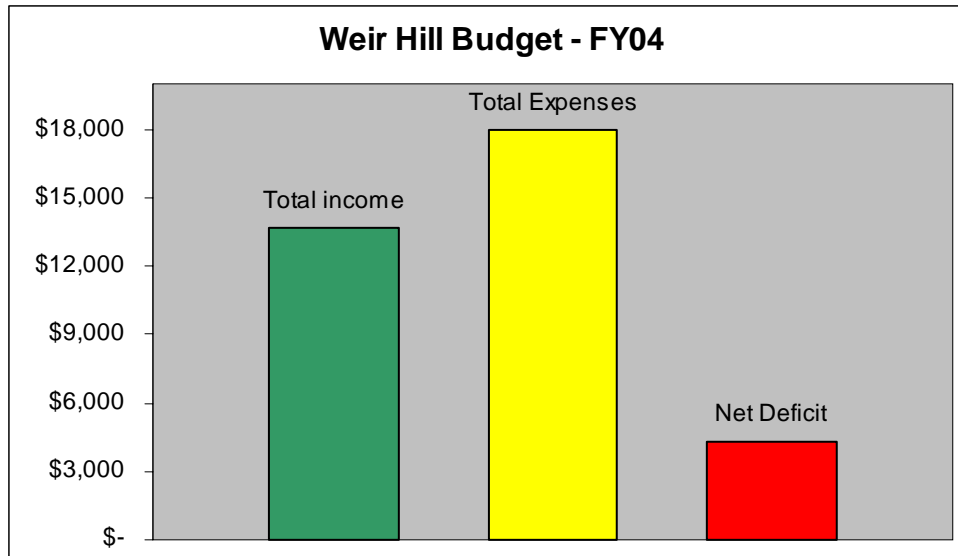


Major property expenditures in fiscal year FY2004 were:

- 89% Management Allocation (% of Management Unit & Regional Budgets)
- 9% Administrative Overhead
- 2% Direct Costs (Property Operations)



In fiscal year 2004, this resulted in a \$4,300 deficit.



Comments/Issues:

- The limited operating budget for Weir Hill has been a real obstacle, greatly restricting what can be accomplished on the property. It is hoped that this management plan can help to identify and validate property needs and management initiatives that are consistent with organizational goals; in addition to attracting further internal resources, we need to look for additional outside sources, including grants and membership income.

7.6 Committees and Volunteers

After its acquisition, Weir Hill shared a volunteer property committee with The Stevens-Coolidge Place. This committee would meet annually and advised the staff on any pertinent management issues. In 1986 a separate property committee was created for Weir Hill. Under the chairmanship of Gene Avrett, the Weir Hill Committee was instrumental in acquiring a grant from the Stevens Foundation to pay for the production of a trail map, signs, and trail improvements. In the mid-1990s the committee became largely inactive and ultimately dissolved.

Over the last five years the Trustees has organized an annual volunteer work day, “Conservation Works” at a number of properties across the state. Weir Hill has had volunteer projects as part of Conservation Works in four of the five years. On average, about twenty people have been involved each year for three hours of hands-on work and helped to restore scenic vistas and create fire breaks that staff would otherwise not have been able to accomplish.

Comments/Issues:

- The volunteer workdays have provided a significant boost to our management efforts over the last five years. This is certainly one approach to help offset the limited resources that are available to the property. It should be recognized that these workdays do require staff time for coordination and supervision. These efforts have been most successful when they have clearly defined objectives with tangible outcomes. Volunteers, at some capacity, could play an important role at Weir Hill in the future.

7.7 Regulatory Issues

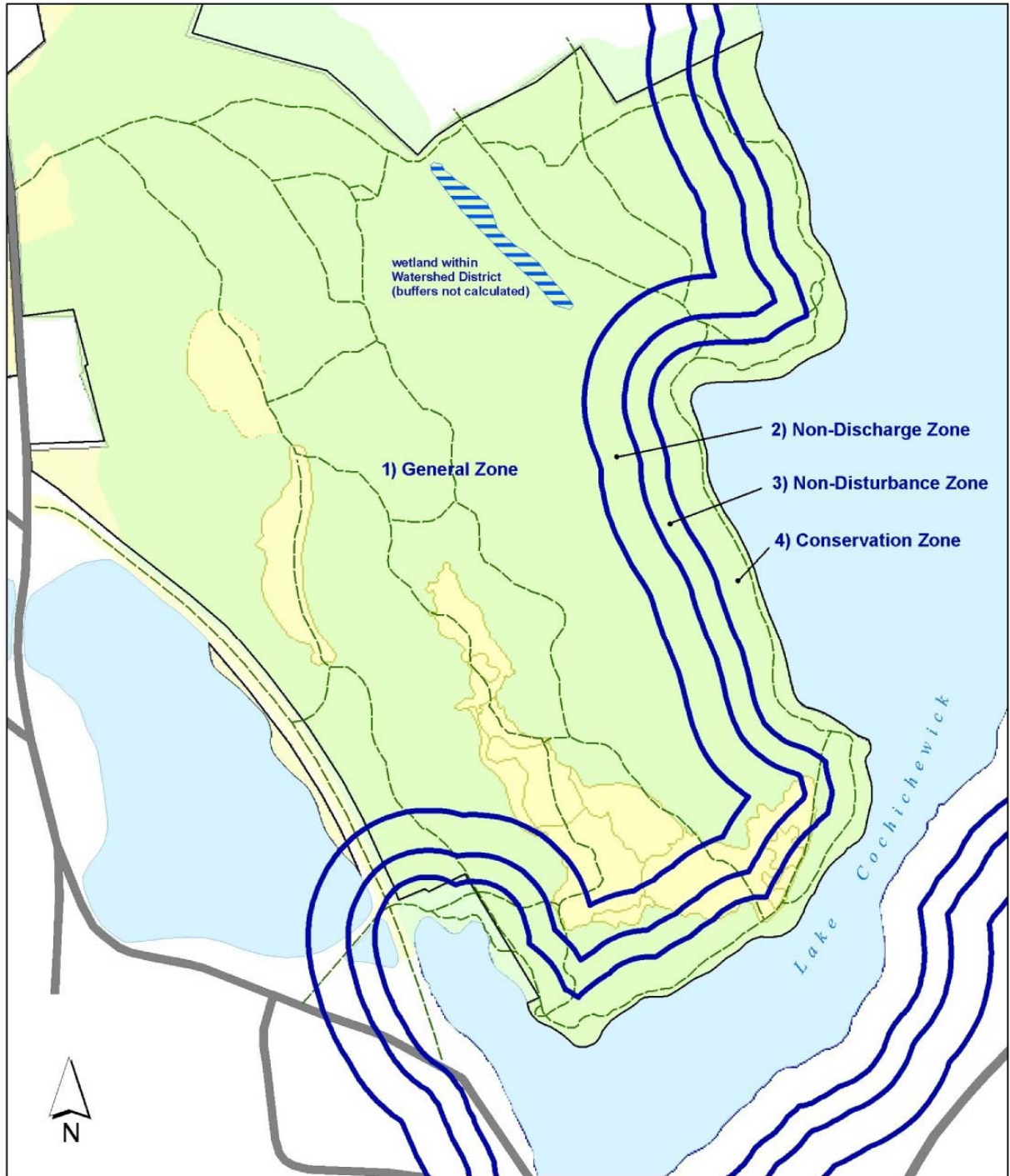
In 1985, The Town of North Andover amended its Zoning Bylaws to create a Watershed Protection District. This is an overlay district that is superimposed on the other existing zoning districts that applies to land that falls within the watershed of Lake Cochichewick. The intended purposes of these zoning regulations within the District are:


“... to preserve the purity of the ground water, the lake, and its tributaries; to maintain the ground water table; and to maintain the filtration and purifications functions of the land; while conserving the natural environment; and protecting the public health, safety and welfare.”


The Watershed Protection District is divided into four zones.

1. General: The General Zone applies to land within the District that is located beyond four hundred (400) feet from the annual high water mark of Lake Cochichewick.
2. Non-Discharge: The Non-Discharge Buffer Zone applies to land within the District that is located between 250 and 400 feet above the annual mean high water mark of the lake and between 150 and 400 feet from the edge of a wetland resource area within the watershed.
3. Non-Disturbance: The Non-Disturbance Buffer Zone applies to land within the District that is located between 150 and 250 feet above the annual mean high water mark of the lake and between 75 and 150 feet from the edge of a wetland resource area within the watershed.
4. Conservation: The Conservation Zone applies to land within the District that is located between 150 feet above the annual mean high water mark of the lake and between 75 feet from the edge of a wetland resource area within the watershed.

Map 10:
Weir Hill and Watershed Protection Zones



 Watershed Protection Buffers
 (150 ft., 250 ft., 400 ft.)

 Open or Early Successional
 Land Cover

 Forested Land Cover

 Trails

0 200 400 600 800 1,000 Feet

Buffers based on Town Watershed Protection District Zones,
 buffers measured from show of Lake Cochichewick.
 Map produced by The Trustees of Reservations June 3, 2005.

Approximately 1/3 of the Weir Hill Reservation falls into the Watershed Protection District (Map 10). There are numerous prohibited uses within the bylaws, some may have implications that could affect management strategies.

In the Non-Discharge, Non-Disturbance, and Conservation Zones one of the prohibited uses includes:

“The use, or method of application, of any lawn care or garden product (fertilizer, pesticide, herbicide) that may contribute to the degradation of the public water supply.”

The Non-Disturbance and Conservation Zones do allow for “vegetation removal or cutting” *if* it is in connection with the maintenance of an existing landscape area. There is also a provision for the “maintenance of fire access lanes by the Fire Department” throughout the district.

Comments/Issues:

- The purpose of this section in the management plan is to raise awareness of potential management issues, and not to be a definitive interpretation of the bylaws. The interpretation of what constitutes an “existing landscape” is vague when applied to Weir Hill. These bylaws should be considered when undertaking any change in the management program at Weir Hill.

Section 8: Land Conservation

8.1 Introduction

The Trustees of Reservations employs a variety of tools and approaches for preserving ecological, scenic and historic landscapes and special places that are threatened by inappropriate development. A primary focus of the land protection program is to acquire or protect by other means (such as a conservation restriction) important, privately owned inholdings or other threatened properties adjacent to existing reservations.

8.2 Description and Evaluation

Weir Hill stands as an oasis of serenity and natural beauty in the midst of the rapidly developing Town of North Andover and I-495 Corridor. . In 2005, the Corridor represents the advancing frontier of suburban and exurban development, spreading outward from Boston and making land protection at this boundary both more urgent and more costly. Weir Hill's mile of shoreline on Lake Cochichewick, the source of drinking water for the Town, provides important protection for the Town's water supply. In 1995 the Town purchased the 152 acre Osgood Hill property, also on Lake Cochichewick, and in 2001 voted to participate in the Community Preservation Act (CPA), in both cases demonstrating the community's support for protection of its water supply and its remaining open space. Both properties are open to the public. Subsequently, CPA funds have been used, among other projects, to purchase the property now known as Half Mile Hill and to endow a conservation restriction on the property, thereby protecting additional lake shoreline. In 2004, the Town purchased the Kettenbach property, completing protection of the Lake shore between Half Mill Hill and Osgood Hill. These acquisitions created a block of conserved land that significantly enhances the scenic and conservation value of Weir Hill, protects the watershed, and heightens the importance of protection of the few parcels which separate Weir Hill from the Town properties.

The Stevens Coolidge Place, a reservation of The Trustees of Reservations is located nearby, within walking distance "as the crow flies." However, the present pattern of landownership and the layout of roads and public sidewalks make pedestrian access between the two reservations difficult.

8.2.1 Restricted Land in the Vicinity of Weir Hill

A substantial portion of Weir Hill is bound by Lake Cochichewick, public roads (Osgood Street), and a Massachusetts Electric Company right of way. Abutting Weir Hill to the northeast is land owned by the Edgewood Retirement Community. While the majority of this land is developed as an assisted living facility, The Trustees holds conservation restrictions on much of the remaining undeveloped Edgewood lands, including that

portion that has frontage on Lake Cochichewick (Map 11). Both The Trustees and the Town of North Andover have sought to gain a public trail easement across the Edgewood lands, with a view to creating a pedestrian link between Weir Hill and Osgood Hill.

Lying between the Edgewood property and Half Mile Hill is the SFR Realty Trust property, an unprotected critical link in the chain of open space on the western shore of the Lake.

On the north, Weir Hill has frontage on the ancient way known as “Lane to Pond Pasture,” which terminates in the SFR parcel. This way serves as access to the Family Cooperative Preschool, and to Half Mile Hill. On most survey plans, the way is designated “private.” It is an open question whether the status of the way would support development of the SFR parcel. Across the Lane to Pond Pasture from Weir Hill is a parcel formerly owned by Samuel Rogers, which includes many of the residential and agricultural structures of the former Stevens farm. This parcel has recently been conveyed to the Edgewood community, subject to a conservation restriction on the northerly portion of the parcel.

The wetland regulations of the Town of North Andover include a 200 foot setback zone from the shore of Lake Cochichewick, in which no development may take place.

8.2.2 Management Considerations

Lane to Pond Pasture is a critical maintenance access for the northern part of Weir Hill. This old road is the only access to Johnson Field. It is also a critical link for public access for the proposed trail connecting Weir Hill with Half-Mile Hill and Osgood Hill beyond. While legal access for maintenance by The Trustees seems secure, the public’s right to access is not as clear.

8.2.3 Approaches to the Property

Proximity to the Stevens Coolidge Place (SCP) makes pedestrian access between the two properties highly desirable. From SCP, one may easily walk through the Common to the Museum of Printing on Massachusetts Avenue. From here, access would need to be developed to reach Academy Road, and to walk up Academy Road to the Stevens Lot on the east side of Academy Road. The Town assessors’ maps show the Stevens Lot as having frontage on Stevens Street, so The Trustees has the ability to develop a trail across the Stevens Lot from Academy Road to Stevens Street. Access would then need to be developed from Stevens Street to Pleasant Street, where a pedestrian could walk through the Town beach parcel to reach the path across the causeway to the Mass Electric right of way and Weir Hill.

8.2.4 Views from the Reservation

In the viewshed to the southwest of Weir Hill are several important protected parcels. The “Stevens Lot” is owned by The Trustees and protects a significant portion of the

northeast slope of Academy Hill. To the east of the Stevens Lot is the Stevens conservation restriction, comprising open fields.

The viewshed also contains the Kittredge Farm, a large parcel, with fields and historic farm buildings. Visible from both Weir Hill and Half Mile Hill, this parcel is an important element of the viewshed, but is also completely unprotected.

The east shore of Lake Cochichewick, visible from Weir Hill, is largely developed. Much of the development consists of individual home sites, although some larger parcels are owned by institutional landowners, such as the Brooks School and the Methodist Conference Center.

8.2.5 Ecological and Landscape Considerations

At this time few land protection opportunities remain that could influence the ecology of Weir Hill. The reservation is surrounded on three sides by Lake Cochichewick and much of the nearby area has been developed. Priorities related to ecology and landscape considerations are limited to maintaining the connection with town-owned lands to the north to minimize Weir Hill's isolation from other protected natural areas and protecting critical parcels important for viewsheds (e.g., Kittredge Farm and institutional lands along Lake Cochichewick's eastern shore). In addition, protecting important potential trail corridors connecting Weir Hill with Stevens Coolidge Place and Osgood Hill are priorities as well.

8.3 Critical Lands Inventory, Assessment, and Recommended Actions

The Trustees has developed criteria for assessing adjacent and nearby lands that may be important for maintaining a reservation's integrity and special character. These "critical lands" are ranked according to their current impact on the reservation and by the potential impact to the reservation if they were to be developed or their land use changed. The critical lands for Weir Hill have been ranked using the following criteria.

Critical: Parcels whose preservation is essential to the protection and integrity of key features **on the reservation**, such as wetland and aquifer recharge areas, hilltops and other unique landforms, scenic roads or road frontages, special vegetative features, rare species habitat or scenic views seen from the reservations. They also include parcels that eliminate inholdings.

Significant: Parcels whose preservation would add significantly **to the reservation**, but whose loss would not detract significantly from the character and quality of the reservation.

Valuable: Parcels whose preservation would add to the scenic, historic or ecological value of the reservation or would contribute to its efficient

management, but are **not considered critical or significant** (e.g. contiguous parcels of land without unique features).

Specific parcels identified as having an impact on Weir Hill are identified below and on Map 11. However, this assessment is not intended to suggest that other adjacent and nearby parcels not identified here are of no conservation value.

Critical

1. **Parcel 95/9.** Book 4642, Page 184; map 95, lot 9. This is probably the most visible single property from both Weir Hill and the Town-owned properties nearby. The property, known as the Kittredge Farm, is owned by a family corporation.

Recommended Action:

As owner of abutting land, sharing a long boundary with the Kittredge Farm, The Trustees should focus on maintaining a neighborly relationship and making the acquaintance of the corporate decision-makers.

Significant

1. **Parcel 36/2.** Book 3460, Page 234; map 36, lot 2. This parcel should be acquired as an addition to the collection of publicly accessible lakefront property in the vicinity. Its protection would create a corridor between Weir Hill and the extensive Town-owned lands to the north.

Recommended Action:

Owner should be contacted.

Valuable

1. **Parcel 59/3.** Book 2007, Page 270; map 59, lot 3. This parcel is an essential link in a potential pedestrian link between the Stevens Coolidge Place and Weir Hill.

Recommended action:

Continue ongoing conversation with landowner.

2. **Trail easement on Stevens CR parcel.** This could provide a significant portion of the pedestrian access between SCP and Weir Hill.

Recommended action:

Contact landowner.

3. **Parcel 96/33.** Book 2073, Page 40; map 96, lot 33. A trail easement across the parcel, either from Academy Road to Stevens Street, connecting with trail

easement on Stevens CR, or from Stevens Lot to Stevens Street, also connecting with trail easement on Stevens CR, would represent a significant portion of the pedestrian access between SCP and Weir Hill.

Recommended action:

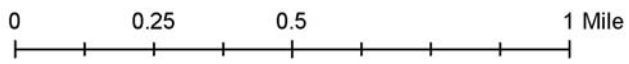
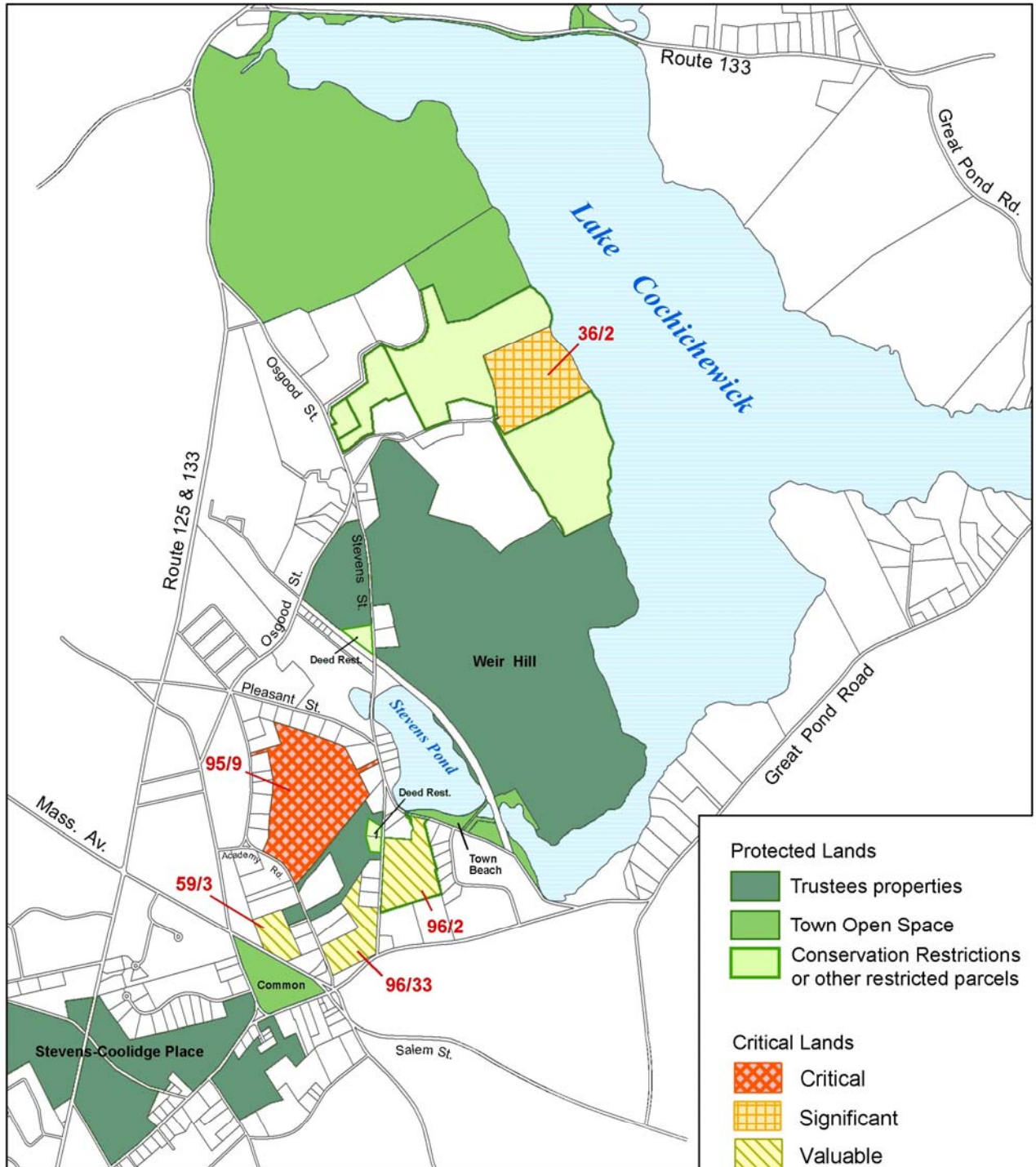
Contact landowner.

4. **Parcel 96/2.** Book 2806, Page 307, map 96, lot 2. The Trustees holds a CR; seek to acquire trail easement to permit pedestrian connection with Town beach on Stevens Pond.

Recommended action:

Contact landowner.

Map 11
Weir Hill - Critical Lands



Trustees properties and CRs from survey plans, adjusted to 1/2 meter orthophotos.
 Other parcels from town assessor's maps, automated by The Trustees, and adjusted to 1/2 meter orthophotos.
 Map produced January 2006.

Section 9: Recommendations

9.1 Introduction

Directed by The Trustees' mission and by the goals and guiding principles, as well as the vision set forth in the Executive Summary, this management plan provides a blueprint for action at Weir Hill. The plan specifically addresses the issues and opportunities identified in Sections 3 through 8, and directs efforts to protect the integrity of the property's resources while providing visitors with a high quality experience.

9.2 Natural Resource Management

Weir Hill is a unique ecological resource for northeastern Massachusetts. The reservation contains rare community types and species typically found in barrens habitat elsewhere (e.g., Cape Cod and the Islands). The early successional and barrens habitats are especially important for a variety of rare plants and invertebrates (e.g., butterflies and moths). Ecological management at Weir Hill will include minimizing the threat from invasive plants, preventing succession of early successional habitats important to many rare and uncommon species, and fire management. This approach will provide many opportunities for engaging visitors in the stewardship of Weir Hill.

Natural Resource Management Goals

- Minimize and/or eliminate threats to ecological resources
- Highlight the ecological significance of Weir Hill and its stewardship
- Protect rare species and enhance their critical habitat
- Restore degraded areas

Guidelines

- Only licensed personnel should apply herbicide.

Invasive Species Management

Action	Description/Rationale
1. Continue to update the invasive species inventory initiated by Frances Clark in 2001.	Documentation and monitoring of invasive species presence and distribution is central to directing action and providing early detection of new threats.
2. Develop and implement a comprehensive invasive species management plan.	This plan will be used to direct management efforts. Initial phases of the program will likely include: • knotweed control at the northern end of the property • Spot herbicide within barrens and oak – hickory community to control buckthorn and honeysuckle (may not be necessary if we have the opportunity to use fire to maintain these area) • Removal of large fruit producing plants around property boundary. Additional efforts may include: • Beetle release for loosestrife control in the wet meadow • Norway maple removal in pine forest • Barberry and buckthorn Control in the seep community

Wildlife and Rare Species Management

Action	Description/Rationale
3. Allow limited bow hunting in the remote portions of the property.	Weir Hill is well traveled and there are few areas remote enough to accommodate hunting given the property's high visitation, especially by dog walkers. However, there may be an opportunity to allow hunting within the wet meadow / upland field complex to the west of Steven's Street as well as in the swamp/marsh mosaic at the northern end of the property. This action will provide limited hunting pressure on the local deer population to help minimize negative impacts from over-browsing. Furthermore, limited unauthorized hunting appears to be occurring. Having hunting conducted under the auspices of The Trustees would be better.
4. Create Frosted Elfin management plan for the property.	Due to specific larval microclimate requirements, barrens management has the potential to significantly reduce suitable larval habitat simply by removing a single tree. Therefore a management plan that takes into consideration findings from Gene Albenese's thesis work should be created to ensure frosted elfin protection. Specific elements of such a plan might include: 1)Inventory of potential breeding sites 2)Population inventories during breeding season 3)Promotion of Baptisia in appropriate areas 4)Moratorium of mowing host plants between May and August 1 (dates per comm. with Gene Albanese – elfin researcher).
5. Introduce Purple Needle Grass (<i>Aristida purpurascens</i>).	Introducing purple needle grass on The Trustees' property will reduce vulnerability of this state-threatened plant (introductions along trails which support suitable conditions may facilitate second objective of narrowing trials since this grass tolerates limited trampling and disturbance.)
6. Introduce New England Blazing Star (<i>Liatris scariosa</i>).	Habitat for this rare species is ideal at Weir Hill and establishing a population here will help secure this species regionally. Seed could be harvested from Appleton Farms, where a viable population occurs, to maintain regional genotype. This showy species will benefit the visitor experience and help provide a valuable nectar source for invertebrates, an important resource at Weir Hill.
7. Release the beetle (<i>Galerucella</i> spp.) within the wet meadow to control purple loosestrife.	Purple loosestrife is an exotic invasive plant that threatens the wet meadow community which supports rare species dependent on native plants vulnerable to competition from purple loosestrife.
8. Monitor Bog Orchid.	The bog orchid is a rare species and the Weir Hill population represents the only known Essex Co. population. Monitoring will establish the health and potential impacts from deer, invasive plants (e.g., purple loosestrife) and butterfly enthusiasts that walk the fields.
9. Locate, map, and monitor Butternut trees on property.	Several specimens of this watch-listed tree are located at the Town entrance and near the crest of Weir Hill within the mature deciduous forest. Future management (e.g., clearing and/or burning for barrens habitat) has the potential to threaten these trees.
10. Develop mowing schedule for the fields, including Johnson Field that maintains grassland habitat. Note: this does not include the early successional habitats within the barrens.	The wet meadows and adjacent fields have a rich diversity of plants and invertebrates (e.g., butterflies). Rare species also occur in this habitat (e.g., Harris' Checkerspot). Without careful planning regarding the timing of mowing, some target species may be at risk.

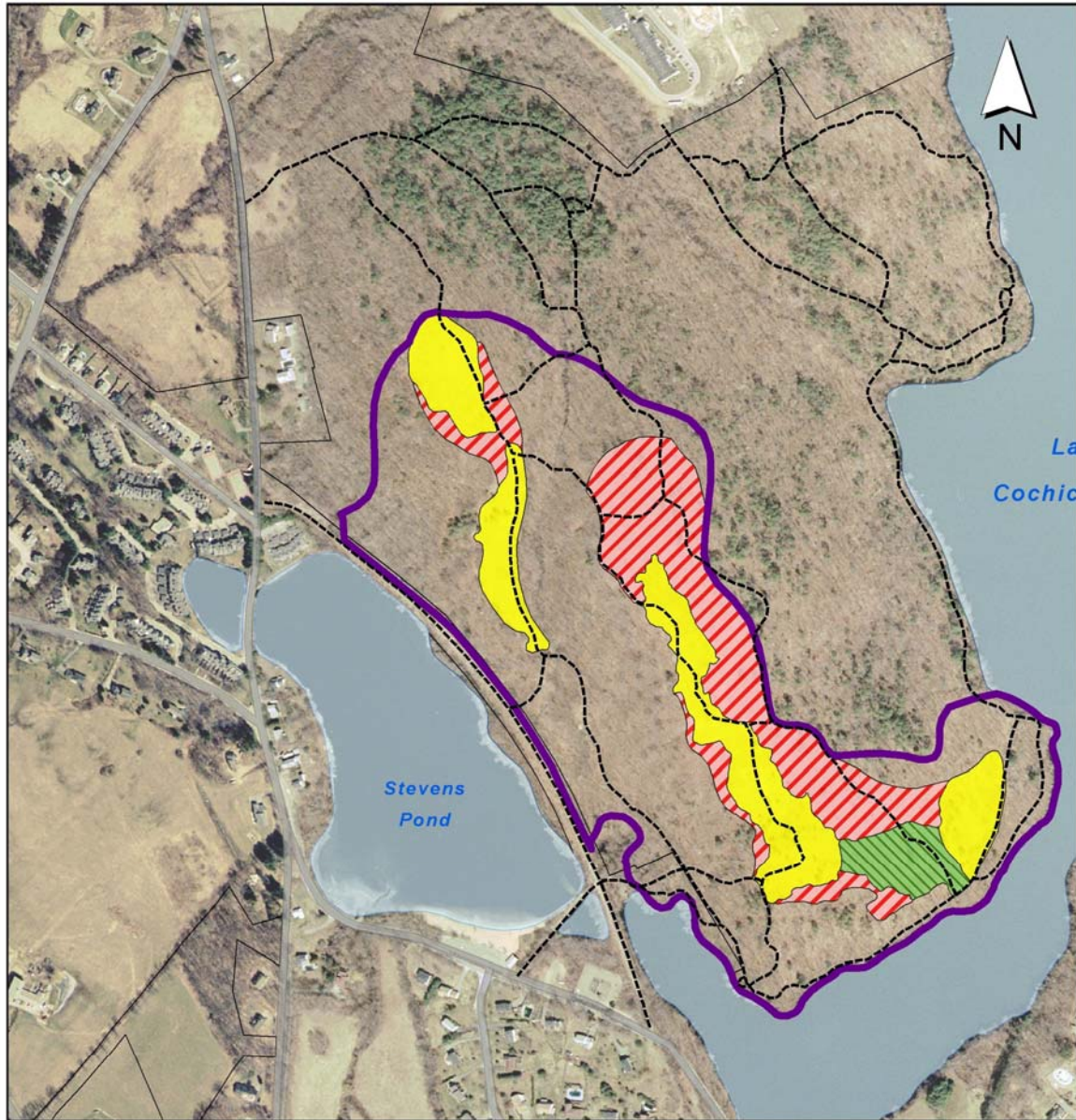
Fire / Barrens management

Action	Description/Rationale
<p>11. Implement short-term improvements to barrens habitat.</p>	<p>The barrens habitat, especially the early successional habitat is significant. Its long-term viability is likely dependent on improvements that expand the early successional habitat. Implementing the following actions will greatly improve the long term viability of this habitat at Weir Hill.</p> <ol style="list-style-type: none"> 1. Thin the canopy of the Oak-Hickory pocket on the lower slope of successional area -3 (see map 9-1) to promote forb diversity and extend the barrens community further down slope of succ-3 – perhaps in concert with small burn to mineralize soil and facilitate germination of target species. 2. Expand successional openings within the barrens community as proposed (see map 9-1). These early successional areas within the barrens provide critical habitat for several rare and uncommon species. 3. Create a mowing plan for successional area 3 that promotes the acorn production of Scrub Oaks, reduces sprouting of less desirable species, and has measurable goals. 4. Thin coppice growth within oak hickory matrix to promote understory diversity: target slope between succ-2 and 3. An experimental approach to maintaining diversity in forest understory – location is within the public’s eye and may help to visually connect successional openings.
<p>12. Develop a barrens management plan that focuses on the long-term management of the 80 acres influenced by fire.</p>	<p>This plan should clearly state goals for community composition and address:</p> <ul style="list-style-type: none"> •Consensus on the use of prescribed fire, including the development of a burn plan/program •Areas to be mowed and the frequency of mowing •Areas to be thinned •Areas where coppice growth will be cleared •Strategy for connecting cleared areas •Conservation targets need to be identified (e.g., rare species and community structure and composition) •Expansion of existing openings. <p>Fire is a critical tool for maintaining and enhancing the ecological significance of the barrens at Weir Hill. Use of fire in open areas will promote germination of target plant species and improve capacity of openings as fire brakes by reducing fuels.</p>


9.3 Cultural Resource Management


Weir Hill contains few structures or visible features readily identifiable as cultural features. However, the entire property is a cultural landscape having been shaped by humans for centuries, including Native Americans who used Weir Hill and adjacent areas. This use and its visible affect on Weir Hill’s landscape today provide interesting education opportunities for our visitors and interpretation of this landscape will help visitors to understand the significance of Weir Hill and its resources.


Weir Hill - Proposed Barrens Expansion



 Extent of Fire Influenced Communities

 Area currently managed as Barrens Community

 Expand Barrens Community through Thinning

 Expand Barren Community through Clearing

 Trails

0 200 400 600 800 1,000 Feet

Vegetation Communities defined by C. Clark and TTOR Staff. Communities delineated with GPS, NRCS Soils data, and 1/2 meter color orthophotos (2001). Map produced by The Trustees of Reservations July 13, 2005.

The Secretary of the Interior identifies four different acceptable treatments for historic (cultural) landscapes: preservation, rehabilitation, restoration or reconstruction. Based on published guidelines, it appears most appropriate to adopt a “preservation” strategy for Weir Hill Reservation. The primary goal of cultural landscape preservation is to retain historic fabric, including the landscape’s historic form, features, and details as they have evolved over time with any work focusing upon the ongoing maintenance and repair of historic materials and features rather than replacement or new construction.¹ The following recommendations for planning, treatment, and maintenance grow out of this preservation philosophy.

Cultural Resources Management Goals:

- Management will strive to protect and interpret prehistoric and historic cultural resources.

Guidelines

- **Under no circumstances should prehistoric resources be publicized or specifically identified as to location.** This is an open invitation to unauthorized excavation.
- Because staff may encounter historic and prehistoric archaeological sites that have been exposed due to erosion, guidelines for archaeological resource protection are highlighted here. Specifically, staff will work with The Trustees’ Director of Historic Resources to:
 - Report archaeological sites to the Massachusetts Historical Commission.
 - Maintain sites in their natural condition and work to protect them from inadvertent destruction. For example, avoid realigning drainage ditches or disturbing stone walls and record all unavoidable changes.
 - Keep records of any finds, including, where possible, noting the exact horizontal and vertical location.
 - Deposit archaeological artifacts in The Trustees’ Collection Center.
 - Prohibit any digging that has not been approved and report any unauthorized excavation to the State Archaeologist.
 - Discourage vandalism by not marking archaeological sites.
 - Minimize risk to archaeological sites by not constructing trails or other facilities in the immediate vicinity of a site.
- Because interpretation at Weir Hill will likely include Native American land use history, efforts should be made to stress that if artifacts are found to report them to The Trustees.

¹ paraphrase from National Park Service, “Secretary of the Interior’s Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Historic Landscapes (Introduction)”
<http://www2.cr.nps.gov/hli>.

Action	Description/Rationale
13. Conduct a brief staff training session on recognizing what stone tools look like.	Weir Hill as well as many other reservations have produced Native American artifacts, including stone implements, in the past. It is probable other artifacts will surface. A staff training session could be in the context of the Land and Visitors Conference. Together with an injunction to report any suspected artifacts with their exact locations, should be sufficient to allow staff to identify stone artifacts as they conduct routine activities.
14. Evaluate existing regulation on collecting to see if it addresses prehistoric artifacts at the appropriate level and modify as needed.	Due to the probability of artifacts occurring on the reservation this regulation will alert potential artifact hunters that excavation and collecting is illegal on all Trustees' properties.
15. Maintain (as necessary) large, old trees, especially the two large, old oak trees on the Bailey Wood Lot boundary.	The large old trees throughout Weir Hill indicate past land use history and some are probable historic boundary markers, and among the oldest trees on the reservation.
16. Clear saplings away from stone walls identified as priorities whenever feasible.	Stone walls are an important cultural feature and tree roots are among the major preventable causes of wall collapse.
17. Submit appropriate Area Form(s) to the Massachusetts Historical Commission, documenting the archeological and historic landscape elements of Weir Hill Reservation. Once forms are complete, pursue a National Register of Historic Landscapes designation for the property.	These forms will then be available for local, regional and statewide planning purposes, for educational initiatives, and as research tools. Listing in the National Register honors a historic place by recognizing its importance to its community or State and could also raise local awareness of the property and be a useful tool to promote interpretation.
18. Promote comparative study of private and museum collections from Andover / North Andover or, more broadly, from the lower Merrimack Valley.	This study would provide valuable information on natural resource use from Archaic through Contact Periods.
19. Identify the location of the prehistoric shoreline of Lake Cochichewick.	Identifying the prehistoric lake level would provide useful information for archeological prediction.
20. Conduct a comparative study of The Trustees drumlin properties.	There are a number of apparent correlations between the natural structure and composition of drumlins, and features considered desirable for human occupation and agrarian use. Drumlins at Weir Hill, Holt and Boston Hills (Ward Reservation), World's End and others might define and explicate the correlations, providing new insight into the mental templates for land use employed by both prehistoric and historic occupant groups.
21. Maintain annual mowing schedule for the south end 'Sutton Pasture.'	The semi-cleared area conveys a sense of unexpected and welcoming openness in the middle of a largely wooded area – suggesting a good stopping place or camp site – without specifically identifying the area as prehistorically significant. Include in mowing schedule discussed in Section 9.4.3
22. Expose and identify the herd walk as a cultural feature.	The herd walk is an important cultural feature. Saplings and small trees are establishing and beginning to obscure the feature and threaten the stonework.

General Recommendations on Cultural Resource Interpretation

Cultural resources, especially the features that characterize or define a manipulated landscape, are often unremarkable to the casual visitor. That is where interpretation comes in. The biggest and best of anything rarely needs interpreting. But the smaller, less obvious, more complex or more ‘normal’ components – of a landscape, for instance – may need to have attention drawn to them in order for the casual visitor, passerby or child to enjoy and appreciate their beauty or significance. Interpretation guides visitors to see a property more completely. Weir Hill’s history provides a fascinating story that will make the property come alive in our visitor’s minds.

The unguided visitor to Weir Hill will see a beautiful lake, a hillside, and a bunch of stone walls. The guided visitor will also see the lake and hill, but may also leave with a sense of that landscape put to use in the past. Given time and energy to explore, he may see the historic landscape as a continuum of our efforts to control, exploit, and protect ourselves from and, in turn, protect the natural environment. While this interpretation sounds like a tall order, the elements of it are simple. They can be unobtrusive and adaptable to a range of audiences and can be carried out by staff and volunteers. Examples include displays and information posted on The Trustees’ website or at the property’s bulletin board, a self-guided exploration (also known as a “quest”), or trail guides/brochures.

As mentioned, there is a potential down side to public interpretation of cultural resources. Foundations such as the country club cottage, which have gone essentially unnoticed, will have attention drawn to them. This becomes an open invitation to bottle hunters. However, identifying a resource and interpreting it may also help protect it by making visitors aware and appreciative of its significance. Involving visitors and volunteers in the interpretation of these sites will also enlist others in helping us to care for and defend these important features. The caution mentioned above concerning prehistoric resources must be considered for every cultural resource on a property.

Clearly a middle ground has to be sought between The Trustees’ two thrusts of protection and interpretation, and interpretive plans have to be carefully weighed against potential cultural resource damage. It is the opinion of this report that the visible cultural resources of Weir Hill are sturdy enough and simple enough, to withstand additional visitation and exploration and that the potential gains of interpretation outweigh the risks. Monitoring and reevaluation should be built into any final interpretive plan.

9.4 The Visitor Experience

Visitors to Weir Hill are exposed to a variety of landscapes and habitats. While waterfront trails are the most popular, others enjoy the rustic and “wild” feel of the barrens. For many, it’s the hill-top vistas that are important destinations. Regardless of

landscape or vista, visitors are primarily walking and hiking at Weir Hill. As such, trails and their condition are a critical component of the visitor experience and will be a major focus of management. While visitors undoubtedly appreciate their walks and the scenery, they most likely are unaware of Weir Hill’s significant history and ecology. Section 6 of this plan also noted that despite Weir Hill’s close proximity to Lawrence, few visitors seem to be visiting from this community. Thus, in keeping with the organization’s initiative to connect more people to the land and to make our properties meaningful to local communities, several of the recommendations below focus on education and outreach, taking advantage of the property’s long and interesting cultural history and the significant ecological resources, including their stewardship.

Visitor Experience Goals:

- Visitors will be connected to the local and regional landscape.
- Visitors to Weir Hill will find the property well maintained.
- Visitors will have a clear sense of arrival and be able to access the property clearly and easily.
- Visitors will leave with an understanding of the cultural, historical and ecological significance of the properties.
- Visitor safety will be paramount.
- Visitors will have opportunities to volunteer and participate in the stewardship of Weir Hill; volunteerism should be viewed as both a chance to get work done as well as to educate and engage visitors.

9.4.1 Education and Interpretation

Weir Hill’s rich natural and cultural landscape offers many opportunities to engage visitors in its stewardship. The overarching goal of education and interpretation is to inspire visitors to become more deeply engaged in efforts to care for the special features that characterize a property and the community as a whole. Programs that offer opportunities for participants to engage in hands-on activity and that engender further interest in caring for a special place are the most desirable.

Education and outreach may also provide one of several tools for inviting members of the Lawrence community to use, enjoy, and participate in the care of the property.

Because of the limited staffing resources available at Weir Hill, the following recommendations will rely greatly on volunteer assistance.

Recommended Actions:

Description/Rationale:

<p>23. Engage interested community members to develop a “Quest” for the property that reveals and interprets the special features of Weir Hill.</p>	<p>A Quest is a treasure hunt based on a 150-year old British model that encourages a visitor to explore and learn about a unique place. Developed through a collaborative effort with the community, Quests explore natural, historic, and culturally significant places which become the settings for discovery and learning. A Quest at Weir Hill would provide an opportunity to engage both regular visitors as well as members of the Lawrence community. The effort would accomplish many things:</p>
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	<ul style="list-style-type: none"> • it would in itself, be a meaningful opportunity for some visitors to become involved in the stewardship of Weir Hill; • this fun activity would provide the start of a discussion about how to understand and nurture and relationship between Weir Hill and the Lawrence community • it would produce a self-guided adventure for all visitors; • it would inform the development of additional interpretive activities, notably an annual event (see #28)
24. Post information about Weir Hill's special features on the website.	Weir Hill has significant natural and historical resources which characterize both the property and the surrounding area. Posting this information on the website will facilitate better understanding and stewardship of the property by our visitors.
25. Post interpretive information on ecological features and their management on bulletin boards.	<p>Topics should include:</p> <ol style="list-style-type: none"> 1)The barrens community and the role of fire 2)Watershed protection and the visitor's stewardship responsibility (pet etiquette, shoreline protection) 3)Exotic invasive species 4) Information on barrens clearing (before and after work) to inform visitors of the change.
26. Distribute natural and historical information to local repositories and institutions.	Weir Hill has significant natural and historical resources. Providing reports on these resources to local institutions (e.g., historical society, libraries) will facilitate better understanding and stewardship needs of the property by the North Andover community.
27. Identify selected cultural features on base/trail map.	Many of the current features are not easily identified, thus, identifying them on the base map will increase visitor awareness for these features.
28. Develop an annual event that appeals to the regional community and provides a memorable experience.	<p>While undefined at this time, the process to develop a Quest and other volunteer opportunities should answer the question, "what kind of signature event can The Trustees hold at Weir Hill?" A successful event would:</p> <ul style="list-style-type: none"> • Appeal to families with children who have strong local connections.. • Be place-based or rooted in the uniqueness of the property and would express the distinct character of Weir Hill. • Help to spread a single consistent message about The Trustees and our work. • Stimulate interest in Weir Hill, The Trustees, and/or conservation in general and provide opportunities to get involved in the care of this special place.

9.4.2 Visitor Access and Services

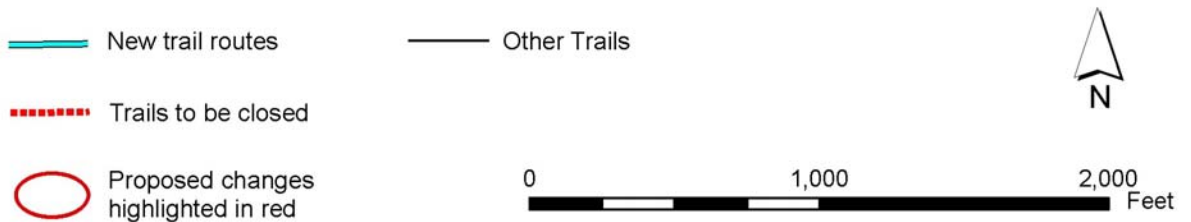
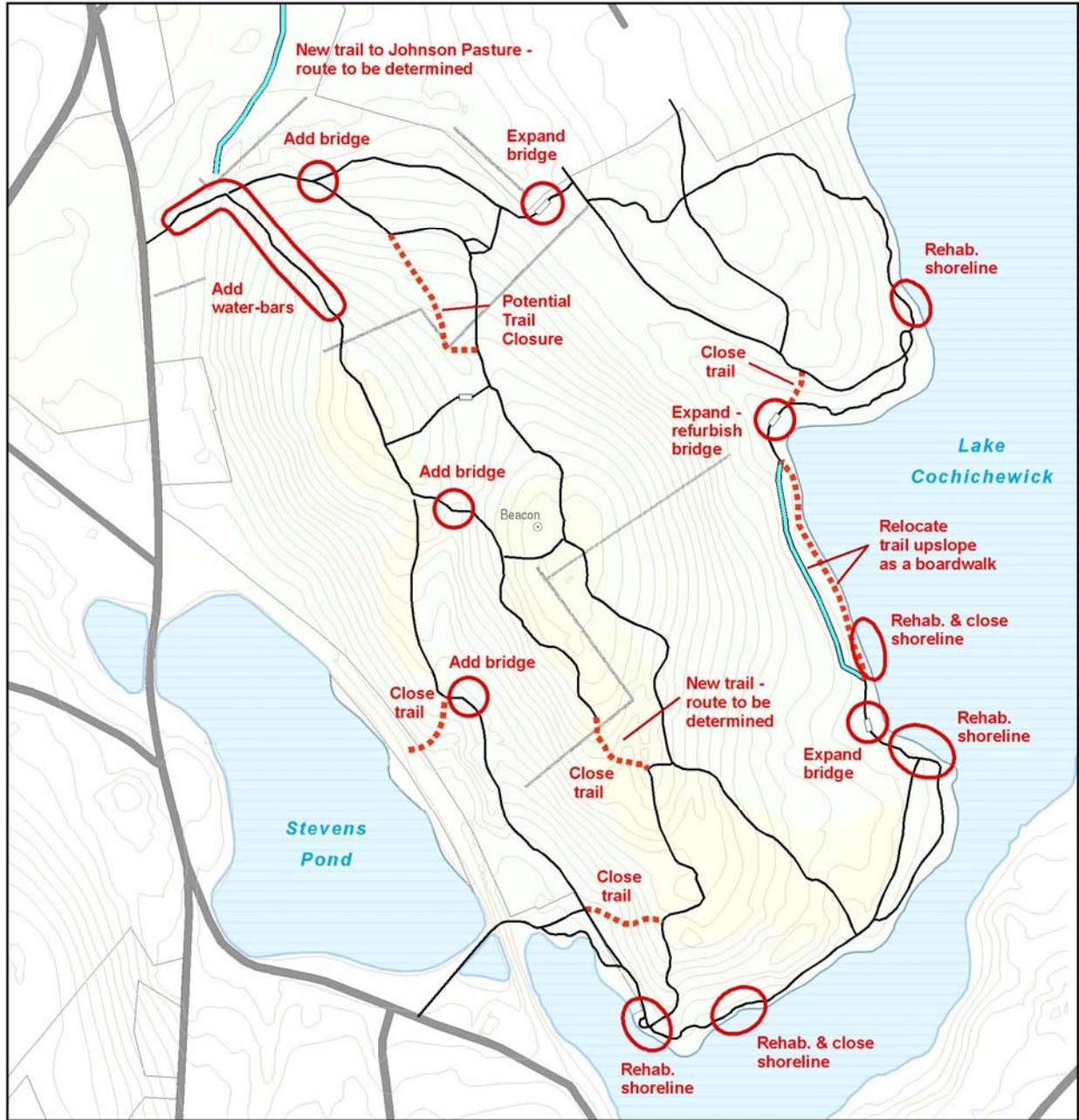
Recommended Actions:

Description/Rationale:

29. Install benches at key locations.	Benches would allow visitors a chance to rest and/or enjoy the setting, thus improving the visitor experience. Potential locations include: vista of Lawrence and along scrub oak trail. The number of benches should be carefully considered so that the landscape and important areas do not lose their natural feel or lead to visitor crowding at sensitive areas.
30. Develop and implement entrance plan for Stevens Street.	<p>The current entrance does not stress arrival clearly, is roadside parking only, presents a safety issue due to the volume and speed of traffic on Stevens St, and pull off areas are deteriorating. A redesigned entrance should include:</p> <ul style="list-style-type: none"> • off-street parking lot • provide a sense of arrival • allow better winter access • improve aesthetics

Map 13

Weir Hill - Proposed Trail Improvements



Map produced by The Trustees of Reservations March 15, 2006.

<p>31. Develop and implement trail restoration and maintenance plan based on identified needs (see Map 13: Proposed Trail Improvements).</p>	<p>Several trails may need to be closed and/or relocated due to erosion, steep slopes and water on trails. Map 13 identifies potential improvements to the trail system. This map should be viewed as a guide and may not reflect the exact needs (e.g., locations of trail reroutes may differ after specific site conditions are evaluated). The plan should identify all problem areas and strategies for restoration (e.g., install water bars every x feet). Many of these projects are ideal for volunteers (e.g., Boy Scouts). Note: some projects may require wetland filing. Projects include: •Rebuilding Edgewood Farm Trail boardwalk and extend. •Construction of a bridge at the intersection of Johnson and Edgewood Farm Trails •Possibly closing/rerouting the upper third of the Johnson Trail •Closing the short and steep trail connecting Cochichewick and Edgewood Farm Trails •Relocation of the Cochichewick Trail •Relocating and/or closing portion of the Scrub Oak Trail •Closing the borrow pit trail •Closing the trails from Stevens Trail to old railroad installing water bars on steep sections reroute trails across slope contour to minimize erosion extension of boardwalks/bridges as needed. Consider narrowing wider trails and promote vegetation recovery along trail’s edge.</p>
<p>32. Develop new trail from Stevens Street entrance to Johnson Pasture.</p>	<p>This would be a critical part of the trail from Weir Hill to Osgood Hill and expose visitors to another scenic area of the property currently inaccessible. This is a short term goal while the lake trail would be a long term goal.</p>
<p>33. Revise trail map to reflect closures and changes to trails.</p>	<p>Providing visitors with accurate trail information will help facilitate a positive visitor experience.</p>
<p>34. Develop education program for dog walkers and monitor for effectiveness.</p>	<p>This program would address proper dog walking etiquette pertaining to other visitors, swimming in the lake and disposal of waste. A program modeled after the program at Norris Reservation may be an excellent place to start. This program includes volunteer stewards and identification badges.</p>
<p>35. Implement entrance design improvements at the trail junction of the Hatch and Stevens Trails.</p>	<p>This entrance is one of two primary entrances and, thus, this area seems a logical location to provide visitors with a sense of arrival by: mowing adjacent trail sides, adding split rail fence to mark boundary with town land, installing a second bulletin board off to the side so both sides can be utilized, and a sign indicating that visitors have just entered the reservation.</p>
<p>36. Secure public access across Edgewood Farm CR.</p>	<p>Provides opportunity for trail connection to Osgood Hill.</p>
<p>37. Reroute Cochichewick Trail approximately 20 feet upslope and construct a boardwalk.</p>	<ol style="list-style-type: none"> 1) This trail becomes icy during winter and sloppy in wet weather. 2) To protect shoreline community and steep shoreline from erosion. 3) To protect seep community.
<p>38. Contain and stabilize high-use areas along lakeshore to prevent shoreline erosion and prevent further loss of vegetation caused by visitor activity at the water’s edge (see Map 13 for locations).</p>	<p>Lakeshore areas are becoming trampled and eroded. These areas are expanding and shoreline vegetation is being lost. Selected areas should be improved using fencing and signage to prevent further damage in these high use areas. Strategies include wooden fencing, replanting, steps with crushed stone, and interpretation. Areas subject to wave action should be hardened with stones.</p>
<p>39. Clearly mark trails and reservation boundary, and post trail maps at key trail junctions.</p>	<p>The visitor survey identified poorly marked trails as an issue and visitors frequently walk onto adjacent property.</p>

9.4.3 Scenery and Aesthetics

Recommended Actions:

Description/Rationale:

<p>40. Clear brush at selected locations along Osgood Street Field.</p>	<p>Exposes the stone walls and allows views into the property from Osgood Street, a busy roadway, providing marketing opportunity. Indicates stewardship.</p>
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41. Install old farm gates in stone wall openings along Stevens Street.	Gates will prevent unauthorized vehicle access to fields, provide a visual link to the cultural past, and enhance the approach to main entrance.
42. Plant oak trees in wet meadow fields.	The character of the wet meadow field is in part defined by the old, spreading oak trees. These trees are degenerating and unless replaced soon, these important features will be lost.
43. Replace failing culvert in wet meadow.	This culvert is failing, allowing water to backup, changing the species composition and preventing mowing due to wet conditions. A wetlands filing may be necessary.
44. Expand hilltop vista to expose more of the Merrimack Valley to the north.	Builds on existing vista and highlights Lawrence and the Merrimack Valley, features identified as important by the planning committee.
45. Clear an opening north of and adjacent to the herd walk.	Clearing this area will highlight the large trees and revives the cultural landscape. Clearing would provide additional early successional habitat important for butterflies by linking existing habitat, help control invasive plants, and help facilitate the visitor's sense of arrival by drawing people into the property.
46. Remove dying poplar stand at bottom of southern field.	This stand is impeding mowing which is allowing invasive to colonize barrens habitat.

9.5 Land Conservation

The following recommendations are intended to address landscape level preservation at Weir Hill, particularly the protection of undeveloped land that provides connections between protected areas, lands important for maintaining viewsheds (e.g., the Kittredge Farm) and significant ecological features.

Land Conservation Goals:

- Protect privately owned properties abutting or near Weir Hill that are important for connecting Weir Hill to nearby conservation land (e.g., Stevens-Coolidge Place and Osgood Hill).
- Protect parcels important for the visitor experience (e.g., views from the property).
- Advocate for appropriate use/development of abutting or nearby properties, including participation in regulatory or permitting processes.

Guidelines:

- Encourage owners of critical lands and parcels to contact The Trustees of Reservations land protection staff about land conservation options.
- Encourage owners of critical lands and parcels to utilize the conservation buyer site on The Trustees Website.
- Work with the town of North Andover on protection of critical lands.
- The Trustees should stay informed of planning and land use policies of the town as they may effect the reservation and abutting properties.

Recommended Actions:**Description/Rationale:**

47. Maintain periodic contact with owners of critical lands.	Maintaining a current listing of owners and their contact information, and using this information to periodically contact the landowners about upcoming events, land conservation options, etc. can help build important relationships.
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9.6 Administration and Resources:

This section addresses but is not limited to, safety management, volunteers, budget, staffing, committees, working with partners, marketing, equipment and general or day-to-day administration of the operation.

Administration Goals:

- Maintain an operation that meets or exceeds visitor expectations.
- Weir Hill management will be focused on implementing the vision outlined in the Executive Summary.

Recommended Actions:**Description/Rationale:**

48. Acquire a small chipper for management unit.	The large chipper is problematic to move around on site due to steep slopes and other access issues. A small chipper, a three point hitch style mounted on a tractor, would allow more flexibility with management for barrens, trails and scenic vistas at both Weir Hill and Ward Reservation.
49. Develop a property based volunteer program.	Due to the limited resources available for managing Weir Hill, volunteers will be necessary for implementing many of the recommendations within this plan. This program may include volunteer work days, recruiting local members and visitors via mailing and posted announcements, developing a list of ongoing and needed projects suitable for volunteers, and building an active and dedicated volunteer group. This program may be coordinated with other properties in management unit.
50. Establish a Weir Hill volunteer property advisory committee.	A property committee will help assist the superintendent with plan implementation and evaluation. The committee will also evaluate its own performance.
51. Determine if public has right of access along Lane to Pond Pasture.	Lane to Pond Pasture is a critical link for public access for a proposed trail connecting Weir Hill with Osgood Hill. As owner of abutting land, The Trustees has legal access for maintenance purposes.
52. Work with town to better manage town beach parking area and entrance.	This parking area receives considerable use and may be the primary access point for Weir Hill visitors. Developing a partnership between The Trustees and the town that improves the management of this area and would allow us to engage Weir Hill visitors at this point. In turn, the visitor experience would improve.
53. Work with New England Power Company on management and protection of significant natural resources and control of invasive species along the right-of-way.	This right-of-way is an integral part of the Weir Hill barrens community. It also supports rare species.

Section 10: Implementation

*The woods are lovely, dark, and deep,
But I have promises to keep,
And miles to go before I sleep,
And miles to go before I sleep.*
Robert Frost, from Stopping by Woods on a Snowy Evening

10.1 Introduction

In the preceding sections, we described and assessed the significant resources, visitor experience, and current management program at Weir Hill. Section 9 contained a list of recommended actions that were designed to improve the continued protection of the property's scenic, natural, cultural and historic features in addition to a high quality visitor experience. This implementation section:

- Prescribes a routine management program that is designed to ensure the most efficient and responsible allocation of staff and finances, protect significant resources, and ensure a high quality visitor experience; and
- Outlines an implementation schedule for new recommended actions.

Together, the prescribed routine management program and the implementation schedule of new actions will guide staff work plans, volunteer efforts, annual capital and operational budgeting, and fundraising strategies.

Financial resources permitting, these actions will be implemented over a 9-year period, broken into three 3-year phases with phase one beginning in 2007. Failure to secure necessary funding, additional staff or help from volunteers will result in certain recommendations not being implemented.

10.2 A Prescribed Routine Management Program

Section 7 described the current management program for the property, and made an initial, preliminary assessment of whether or not these tasks represent an appropriate investment of staff and financial resources. Based on this assessment, as well as the full understanding of the property's needs that has emerged from this planning effort, the planning team has developed a prescribed routine management program for the property, which is presented in Table 10-1.

This program is intended to guide the staff in developing annual work plans and budgets. In general, there are a number of solutions for building capacity to carry out routine management, which include:

1. engaging volunteers
2. securing additional operating funds for staffing, contractual work, or other out-of-pocket expenses; or
3. reallocation of staff resources within and/or beyond the management unit.

This management plan does not prescribe specific solutions for building capacity. It is expected that the Superintendent and the Regional Director will analyze the routine management program for each property within a management unit and work to address capacity shortfalls.

Routine management activities have been ranked using one of the six following categories:

New: The task is a new addition to the routine management program that has not historically been conducted.

Poor: The task is not being conducted at present *or* is conducted in a manner/at a frequency that is damaging to significant resources or the visitor experience.

Inadequate: The task is currently being conducted at a level that is threatening resources or the visitor experience.

Adequate: The task is currently completed at a level that falls short of the ideal management, but does not hinder resource protection or the visitor experience.

Strong: The task is completed in a manner/at a frequency that represents the ideal.

Excessive: A disproportionate amount of staff and/or financial resources are being invested in completing the task.

The Trustees recognizes that although it ultimately strives to be “strong” in all of its property and visitor management actions, given limited staffing and financial resources, there are some actions where an “adequate” ranking is sufficient. To set the expectation that staff can and will achieve a “strong” ranking in every task is unrealistic and does not demonstrate the exemplary stewardship for which the organization is known. Staff also recognizes that seasonal weather fluctuations, critical unplanned events, and a multitude of other factors may also influence several aspects of routine maintenance.

Table 10-1 Prescribed Routine Management Program for Weir Hill

Task	Action Type*	Current Frequency	Current Performance Level	Frequency to achieve "strong"	Acceptable Performance Level (APL)	Acceptable Frequency	Season	Who ?	Vol. Opp. ?	Current annual investment	Add'l hours needed to reach APL	Add'l funds needed to reach APL	Notes
Field / Barrens Mowing	NR	Annually	Strong	Annually	Strong	Annually	Fall	S	no	45	24	\$80	45 hours annually are needed and \$175 for fuel covered by MU budget. The 24 hours is for anticipated routine management as a result of 16 acres of barrens habitat being cleared and restored as a result of a LIP grant. Clearing is scheduled for the fall of 2006.
Brushsaw field margins	NR	Annually	Inadequate	Annually	Adequate	Annually	Fall	S	no	15	15	\$50	Although annual treatment is correct frequency, not all field margins are being treated annually due to current staffing capacity. \$ cost covers fuel and maintenance of equipment covered by MU budget.
Brushsaw shrublands	NR	Twice a year	Strong	Twice a year	Adequate	Annually	Fall	S	yes	12	12	\$50	\$ cost covers fuel and maintenance of equipment covered by MU budget. Additional hours and dollars are for anticipated routine management as a result of 16 acres of barrens habitat being cleared and restored as a result of a LIP grant. Clearing is scheduled for the fall of 2006. Volunteers can help assist staff with hand tools.
Invasive species management	NR	Not happening	New	Annually	Adequate	As needed	Spring, Summer & Fall	S	yes	0	24	\$50	\$ cost is for herbicide and staff time is for overseeing 2-3 volunteer work days annually. Invasive control work is dictated by the biology of target species,

Task	Action Type*	Current Frequency	Current Performance Level	Frequency to achieve "strong"	Acceptable Performance Level (APL)	Acceptable Frequency	Season	Who ?	Vol. Opp. ?	Current annual investment	Add'l hours needed to reach APL	Add'l funds needed to reach APL	Notes
													success of control efforts and frequency of new invasions.
Frosted elfin surveys	NR	Not happening	New	Annually	Adequate	Every other year	Spring	RE	no	0	8	\$40	Four hours of staff time needed on two days and \$40 for travel covered by NE Ecology Program budget.
Frosted elfin larval survey	NR	Not happening	New	Annually	Adequate	Every other year	Summer	RE	no	0	8	\$20	One day of ecologist's time and \$20 for travel covered by NE Ecology Program budget.
Bog orchid survey	NR	Not happening	New	Annually	Adequate	Every other year	Spring	RE	no	0	0	\$20	Staff time and \$20 for one day of travel covered by NE Ecology Program budget.
Barrens community monitoring	NR	Not happening	New	Every other year	Adequate	Once every three years	Summer & Fall	RE	no	0	16	\$40	Two days of ecologist's time and \$40 for two days of travel covered by NE Ecology Program budget.
Coordinate bow hunting	NR	Not happening	New	Annually	Strong	Annually	Fall	RE	no	0	4	\$20	Ecologist's time will be covered by NE Ecology Program budget.
Monitor butternut trees	NR	Not happening	New	Once every two years	Adequate	Once every five years	Summer	RE	no	0	0	\$0	Monitoring occurs when staff are present for other tasks for efficiency.
Monitor beetle population and plant community response.	NR	Not happening	New	Annually	Strong	Annually	Spring & Fall	RE	yes	0	16	\$40	Two days of ecologist's time and \$40 for two days of travel covered by NE Ecology Program budget. Beetles were released in July 2006.

Task	Action Type*	Current Frequency	Current Performance Level	Frequency to achieve "strong"	Acceptable Performance Level (APL)	Acceptable Frequency	Season	Who ?	Vol. Opp. ?	Current annual investment	Add'l hours needed to reach APL	Add'l funds needed to reach APL	Notes
Clear saplings away from priority cultural resources.	CR	Not happening	New	Annually	Adequate	Every other year	Any	S	yes	0	8	\$25	It is not practical to clear all cultural resources (e.g., stone walls). Priorities include the Herd Walk, country club foundation, "survivor oaks" and walls outlining Weir Hill Pasture.
Brushsaw vistas	SC	Annually	Strong	Annually	Adequate	Every other year	Fall	S	yes	2	0	\$0	This task typically requires two hours of staff time and minimal \$ costs for fuel.
Removing downed trees across trails	VM	As needed	Adequate	As needed	Strong	As needed	All	S	yes	6	4	\$0	Trees are removed as soon as staff are aware of the need. Response times could be better based on the popularity of the reservation. Although volunteers are not allowed to use power equipment needed to remove large trees volunteers can alert staff to downed trees and remove smaller trees not requiring power saws to improve response times.
Sign maintenance	VM	Monitored weekly, replaced as needed	Strong	As needed	Strong	As needed	All	S	no	6	0	\$0	\$150 for signs in current operating budget covers current need.
Bridge maintenance	VM	As needed	Inadequate	As needed	Adequate	As needed	All	S	yes	2	8	\$150	Bridges need regular monitoring and occasional repair. It is hoped volunteers will carry out both monitoring and repair in the future. Many of the current bridges are nearing the end of their life expectancy and will need replacing. Identified costs

Task	Action Type*	Current Frequency	Current Performance Level	Frequency to achieve "strong"	Acceptable Performance Level (APL)	Acceptable Frequency	Season	Who ?	Vol. Opp. ?	Current annual investment	Add'l hours needed to reach APL	Add'l funds needed to reach APL	Notes
													cover replacement costs for one bridge annually
Snow plowing	VM	As needed	Strong	As needed	Strong	As needed	Winter	S	no	4	0	\$0	Snow plowing is needed on an "as needed" basis when it snows.
Restock brochures	VM	Weekly	Strong	Weekly	Adequate	Bimonthly	All	S	yes	12	0	\$0	This task could be done by the trail steward.
Patrolling trails for problems	VM	Monthly	Inadequate	Weekly	Adequate	Bimonthly	All	S	yes	12	24	\$0	This is an ideal task for a trail steward.
Clean out waterbars	VM	Twice a year	Adequate	Quarterly	Strong	Quarterly	All	S	yes	2	2	\$0	Waterbars need to be monitored regularly and cleaned out "as needed." Both are good volunteer tasks.
Trail mowing and brush clearing	VM	Annually	Adequate	Twice a year	Adequate	Annually	All	S	yes	6	0	\$0	
Maintain trail markers	VM	Not happening	New	Annually	Strong	Annually	All	S	yes	0	8	\$0	Trails are not yet marked and design and material costs unknown at this time thus, additional \$ are unknown at this time. Hours needed are an estimate, actual hours may be more or less.
Update bulletin boards	VM	Not happening	Poor	Seasonally	Strong	Seasonally	All	E&O	no	0	20	\$50	Information is currently not updated and this represents missed opportunities to engage visitors in the property stewardship and add to their experience.

Task	Action Type*	Current Frequency	Current Performance Level	Frequency to achieve "strong"	Acceptable Performance Level (APL)	Acceptable Frequency	Season	Who ?	Vol. Opp. ?	Current annual investment	Add'l hours needed to reach APL	Add'l funds needed to reach APL	Notes
													Requires development of new material seasonally and approval by E&O. Costs are estimates for replacement material.
Litter Control	GM	Weekly	Adequate	Daily	Adequate	Weekly	All	S	yes	12	0	\$0	Nearly 29% of visitors surveyed identified litter as a small problem. Comments from some visitors suggest the conditions on the adjacent town land, a primary access to Weir Hill by visitors, are mainly responsible thus weekly patrols for litter on the reservation are believed to be adequate. More frequent collection may be possible with volunteer help.
Post and patrol boundary	GM	Annually	Adequate	Twice a year	Adequate	Annually	Winter	S	no	2	0	\$0	
Meet with property committee to review plan implementation	GM	Not being done	New	Quarterly	Adequate	two to three times a year	All	S	no	0	8	\$0	Committee not formed yet - anticipate eight hours annually.
Clean out culvert in wet meadow	GM	Not happening	Poor	Twice a year	Strong	Twice a year	Spring & Fall	S	yes	0	2	\$0	Failure to maintain water flow through this culvert results in standing water that prevents annual mowing of area.
Total										138	211	\$635	

***Action Type Codes:**

NR- Natural Resource Management
SC- Scenic Resource Management
CR- Cultural Resource Management

VM- Visitor Management
GM- General Property Management

10.3 Implementing New Actions

In addition to refining the routine maintenance for the property, Section 10 of this report describes the recommended new actions needed to meet the goals and objectives for protecting the property's natural, scenic and cultural resources while at the same time providing visitors with a high quality experience. Financial and human resources permitting, these actions will be implemented over a 9-year period, broken into three 3-year phases.

The Implementation Table (Table 10-2) that follows lists all of the recommended actions and their assigned phase, and identifies the human and financial resources that will be needed to implement the action steps. Several other guidelines were used to construct the implementation table, including:

1. Only items requiring new financial resources have been assigned a cost; costs are shown in 2006 dollars. Some ongoing recommendations do not represent new costs and, therefore, have not been assigned costs.
2. Each recommended action was assigned a priority rating, defined here:

Critical actions will address:

- Urgent safety issues
- Threats that are causing serious damage to significant resources
- Issues that are seriously degrading the visitor experience
- Regulatory requirements

Needed actions will address:

- Threats to resources that are not causing an imminent threat to their integrity
- Key Trustees' initiatives (such as expanded educational and interpretive programming)
- Basic improvements to visitor services

Desired actions will address:

- Enhancements that optimize the visitor's experience or Weir Hill's resources

3. Typically, these priority rankings coincide with phases 1, 2, and 3. However, there are many instances where "needed" or "desired" actions can be addressed

earlier in the process. Some of these actions may be “quick and cheap” fixes that advance our goals with little effort; some may be done sooner because of funding or volunteer opportunities.

4. All recommendations requiring out-of-pocket expenses for materials, outside labor, or additional staffing are assigned a cost. Those items assigned to the *operating budget* can be covered by the existing operating budget for Weir Hill; those items whose funding will come from either the *supplemental* or *capital* budget will require new funds, which may be accomplished through a variety of means, including fundraising, grants, and donations of volunteer or in-kind work.

Table 10-3: Summary of Implementation Costs
by Targeted Budget Type
(2007 – 2015)

Targeted Budget Type	Dollars
Operating	\$1,350
Supplemental	\$10,120
Capital	\$153,000
Total	\$164,470

Thus, the total dollar cost of implementing this plan over the next 9 years is \$164,470 (see paragraph 6 below for an important caveat). Of this total, we will need to find an additional \$163,120 in new funding and/or in-kind donations to complete all of the recommended actions (*total minus operating*).

Note: The short-term barrens management project represents \$113,000 of the total cost of this plan. The Trustees has secured more than \$84,000 from the Land Owner Incentive Program towards this project with the remainder being in-kind match from The Trustees. This work will commence in the fall of 2006.

5. The costs for implementing some major recommendations (e.g., prescribed fire as part of recommendation 12) are unknown. Therefore the estimated total for implementing this plan will undoubtedly be higher than what is indicated in the tally below (Table 10.4).

Table 10.4: Summary of Implementation Costs by Phases

<u>Phase</u>	<u>New \$ Costs</u>	<u>Additional Volunteer Hours</u>	<u>Additional Staff Hours</u>
1	\$130,450		1,189
2	\$21,620		686
3	\$12,400		517
Total	\$164,470	1,470	2,392

10.4 Plan Monitoring and Review

This management plan will inform the development of annual work plans for the staff that are responsible for managing Weir Hill. Likewise, it is anticipated that staff will review their respective progress on recommendations and will summarize progress and revisions within an annual supplement to this plan.

Section 10.4																					
Weir Hill Management Plan- Implementation																					
Type	Phase						Rank	Staff													
SRM- Structural Resource Management	Phase 1: FY2007- FY2009						C- Critical	S- Superintendent													
NRM- Natural Resource Management	(April 2006- March 2009)						N- Needed	AS- Ass't Superintendent													
V- Visitor Experience	Phase 2: FY2010- FY2012						D- Desired	SR- Director of Structural Resources													
E/I- Education and Interpretation	(April 2009- March 2012)							RE- Regional Ecologist													
Rec-Winter Recreation Program	Phase 3: FY2013- FY2015							E&O- Education and Outreach													
Adm- General Property Management	(April 2012- March 2015)																				
Number	Type	Recommended Action	Description/Rationale	Phase	Rank	Staff 1	Staff 2	Phase 1 Staff Time	Phase 2 Staff Time	Phase 3 Staff Time	Total Staff Hours	Volunteer Hours Needed	Phase 1 Costs	Phase 2 Costs	Phase 3 Costs	Total Plan Costs	Targeted Budget Type	Operating	Supp.	Capital	Notes
1	NRM	Continue to update the invasive species inventory initiated by Frances Clark in 2001.	Documentation and monitoring of invasive species presence and distribution is central to directing action and providing early detection of new threats.	1	N	RE		16			16		\$0	\$0	\$0	\$0	N				Staff time includes one day of ecologist's time in the field followed by one day to update maps. This action will inform recommendation # 2 - implementation of invasive species management plan.
2	NRM	Develop and implement a comprehensive invasive species management plan.	This plan will be used to direct management efforts. Initial phases of the program will likely include: • knotweed control at the northern end of the property • Spot herbicide within barrens and oak – hickory community to control buckthorn and honeysuckle (may not be necessary if we have the opportunity to use fire to maintain these area) • Removal of large fruit producing plants around property boundary. Additional efforts may include: • Beetle release for looestrife control in the wet meadow • Norway maple removal in pine forest • Barberry and buckthorn Control in the seep community	1	C	RE	S	40			40		\$0	\$0	\$0	\$0	N				

Number	Type	Recommended Action	Description/Rationale	Phase	Rank	Staff 1	Staff 2	Phase 1 Staff Time	Phase 2 Staff Time	Phase 3 Staff Time	Total Staff Hours	Volunteer Hours Needed	Phase 1 Costs	Phase 2 Costs	Phase 3 Costs	Total Plan Costs	Targeted Budget Type	Operating	Supp.	Capital	Notes	
3	NRM	Allow limited bow hunting in the remote portions of the property.	Weir Hill is well traveled and there are few areas remote enough to accommodate hunting given the property's high visitation, especially by dog walkers. However, there may be an opportunity to allow hunting within the wet meadow / upland field complex to the west of Steven's Street as well as in the swamp/marsh mosaic at the northern end of the property. This action will provide limited hunting pressure on the local deer population to help minimize negative impacts from over-browsing. Furthermore, limited unauthorized hunting appears to be occurring. Having hunting conducted under the auspices of The Trustees would be better.	1	D	RE	S	16			16		\$0	\$0	\$0	\$0	N					Request hunter be a TTOR member.
4	NRM	Create Frosted Elfin management plan for the property.	Due to specific larval microclimate requirements, barrens management has the potential to significantly reduce suitable larval habitat simply by removing a single tree. Therefore a management plan that takes into consideration findings from Gene Albanese's thesis work should be created to ensure frosted elfin protection. Specific elements of such a plan might include: 1) Inventory of potential breeding sites 2) Population inventories during breeding season 3) Promotion of Baptisia in appropriate areas 4) Moratorium of mowing host plants between May and August 1 (dates per. comm. with Gene Albanese – elfin researcher).	1	N	RE	S	25			25	2	\$0	\$0	\$0	\$0	N					25 hours for regional ecologist to research and write plan. Two hours of volunteer time for expert review.

Number	Type	Recommended Action	Description/Rationale	Phase	Rank	Staff 1	Staff 2	Phase 1 Staff Time	Phase 2 Staff Time	Phase 3 Staff Time	Total Staff Hours	Volunteer Hours Needed	Phase 1 Costs	Phase 2 Costs	Phase 3 Costs	Total Plan Costs	Targeted Budget Type	Operating	Supp.	Capital	Notes
5	NRM	Introduce Purple Needle Grass (<i>Aristida purpurascens</i>).	Introducing purple needle grass on The Trustees' property will reduce vulnerability of this state-threatened plant (introductions along trails which support suitable conditions may facilitate second objective of narrowing trials since this grass tolerates limited trampling and disturbance.)		3 D	RE				20	20		\$0	\$0	\$0	\$0	N				This effort would need to be coordinated with the Massachusetts Natural Heritage and Endangered Species Program. Staff hours include initial discussions with Heritage and collection and distribution of seed from local population.
6	NRM	Introduce New England Blazing Star (<i>Liatris scariosa</i>).	Habitat for this rare species is ideal at Weir Hill and establishing a population here will help secure this species regionally. Seed could be harvested from Appleton Farms, where a viable population occurs, to maintain regional genotype. This showy species will benefit the visitor experience and help provide a valuable nectar source for invertebrates, an important resource at Weir Hill.		3 D	RE				20	20		\$0	\$0	\$0	\$0	N				This effort would need to be coordinated with the Massachusetts Natural Heritage and Endangered Species Program. Staff hours include initial discussions with Heritage and collection and distribution of seed from local population.
7	NRM	Release the beetle (<i>Galerucella</i> spp.) within the wet meadow to control purple loosestrife.	Purple loosestrife is an exotic invasive plant that threatens the wet meadow community which supports rare species dependent on native plants vulnerable to competition from purple loosestrife.		3 D	RE				5	5	20	\$0	\$0	\$250	\$250	S		\$250		<i>Galerucella</i> beetles are not available commercially as of 2005. Staff hours are for overseeing volunteers that will be collecting and rearing the beetles. Dollar costs are an estimate for equipment needed for rearing. This project may make a good school group project.
8	NRM	Monitor Bog Orchid.	The bog orchid is a rare species and the Weir Hill population represents the only known Essex Co. population. Monitoring will establish the health and potential impacts from deer, invasive plants (e.g., purple loosestrife) and butterfly enthusiasts that walk the fields.	ongoing	N	RE		3	3	3	9		\$0	\$0	\$0	\$0	N				

Number	Type	Recommended Action	Description/Rationale	Phase	Rank	Staff 1	Staff 2	Phase 1 Staff Time	Phase 2 Staff Time	Phase 3 Staff Time	Total Staff Hours	Volunteer Hours Needed	Phase 1 Costs	Phase 2 Costs	Phase 3 Costs	Total Plan Costs	Targeted Budget Type	Operating	Supp.	Capital	Notes	
9	NRM	Locate, map, and monitor Butternut trees on property.	Several specimens of this watch-listed tree are located at the Town entrance and near the crest of Weir Hill within the mature deciduous forest. Future management (e.g., clearing and/or burning for barrens habitat) has the potential to threaten these trees.	ongoing	D	RE		3	3	3	9		\$0	\$0	\$0	\$0	N					
10	NRM	Develop mowing schedule for the fields, including Johnson Field that maintains grassland habitat. Note: this does not include the early successional habitats within the barrens.	The wet meadows and adjacent fields have a rich diversity of plants and invertebrates (e.g., butterflies). Rare species also occur in this habitat (e.g., Harris' Checkerspot). Without careful planning regarding the timing of mowing, some target species may be at risk.		1 N	S	RE	8			8		\$0	\$0	\$0	\$0	N					Superintendent and ecologist will work together to develop plan.

Number	Type	Recommended Action	Description/Rationale	Phase	Rank	Staff 1	Staff 2	Phase 1 Staff Time	Phase 2 Staff Time	Phase 3 Staff Time	Total Staff Hours	Volunteer Hours Needed	Phase 1 Costs	Phase 2 Costs	Phase 3 Costs	Total Plan Costs	Targeted Budget Type	Operating	Supp.	Capital	Notes	
11	NRM	Implement short-term improvements to barrens habitat.	The barrens habitat, especially the early successional habitat is significant. Its long-term viability is likely dependent on improvements that expand the early successional habitat. Implementing the following actions will greatly improve the long term viability of this habitat at Weir Hill. 1. Thin the canopy of the Oak-Hickory pocket on the lower slope of successional area -3 (see map 9-1) to promote forb diversity and extend the barrens community further down slope of succ-3 – perhaps in concert with small burn to mineralize soil and facilitate germination of target species. 2. Expand successional openings within the barrens community as proposed (see map 9-1). These early successional areas within the barrens provide critical habitat for several rare and uncommon species. <i>Continued in Notes.</i>	1	C	S	RE	870			870		\$113,000	\$0	\$0	\$113,000	C				\$113,000	The majority of this task will be completed by a contractor. \$84,780 is for contractor and \$28,315 is for prep work, hand work, monitoring, education and outreach, post cleanup of area. See 2006 LIP grant application for details. <i>Continuation of Description/Rationale:</i> 3. Create a mowing plan for successional area 3 that promotes the acorn production of Scrub Oaks, reduces sprouting of less desirable species, and has measurable goals. 4. Thin coppice growth within oak hickory matrix to promote understory diversity; target slope between succ-2 and 3. An experimental approach to maintaining diversity in forest understory – location is within the public's eye and may help to visually connect successional openings.

Number	Type	Recommended Action	Description/Rationale	Phase	Rank	Staff 1	Staff 2	Phase 1 Staff Time	Phase 2 Staff Time	Phase 3 Staff Time	Total Staff Hours	Volunteer Hours Needed	Phase 1 Costs	Phase 2 Costs	Phase 3 Costs	Total Plan Costs	Targeted Budget Type	Operating	Supp.	Capital	Notes	
12	NRM	Develop a barrens management plan that focuses on the long-term management of the 80 acres influenced by fire.	This plan should clearly state goals for community composition and address: <ul style="list-style-type: none"> •Consensus on the use of prescribed fire, including the development of a burn plan/program •Areas to be mowed and the frequency of mowing •Areas to be thinned •Areas where coppice growth will be cleared •Strategy for connecting cleared areas •Conservation targets need to be identified (e.g., rare species and community structure and composition) •Expansion of existing openings. Fire is a critical tool for maintaining and enhancing the ecological significance of the barrens at Weir Hill. Use of fire in open areas will promote germination of target plant species and improve capacity of openings as fire brakes by reducing fuels. 	2	C	RE	S		160		160		\$0	\$0	\$0	\$0	N					The development of a burn plan will likely be the most time consuming task and take one staff person approximately 3 weeks. An additional 40 hours should cover the time needed to identify and plan additional management needs.
13	CRM	Conduct a brief staff training session on recognizing what stone tools look like.	Weir Hill as well as many other reservations have produced Native American artifacts, including stone implements, in the past. It is probable other artifacts will surface. A staff training session could be in the context of the Land and Visitors Conference. Together with an injunction to report any suspected artifacts with their exact locations, should be sufficient to allow staff to identify stone artifacts as they conduct routine activities.	1	N	S		3			3		\$750	\$0	\$0	\$750	S		\$750			Might require consultant for 1.5 hour training session and prep time for training session at conference. Volunteer opportunity possible as well. This action is applicable to many properties. About three hours of staff time is needed to develop training description and find and work with qualified trainer.
14	CRM	Evaluate existing regulation on collecting to see if it addresses prehistoric artifacts at the appropriate level and modify as needed.	Due to the probability of artifacts occurring on the reservation this regulation will alert potential artifact hunters that excavation and collecting is illegal on all Trustees' properties.	1	N	S	HRM	2			2		\$0	\$0	\$0	\$0	N					

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15	CRM	Maintain (as necessary) large, old trees, especially the two large, old oak trees on the Bailey Wood Lot boundary.	The large old trees throughout Weir Hill indicate past land use history and some are probable historic boundary markers, and among the oldest trees on the reservation.	ongoing	D	S		2	2	2	6		\$0	\$0	\$0	\$0	N				It is anticipated that all old trees will be maintained through normal property management. The two old trees along the Bailey Wood Lot boundary may require some additional but, minimal, staff time to reduce competition from saplings and adjacent trees.
16	CRM	Clear saplings away from stone walls identified as priorities whenever feasible.	Stone walls are an important cultural feature and tree roots are among the major preventable causes of wall collapse.	ongoing	D	S							\$0	\$0	\$0	\$0	N				Clearing will be prioritized due to their abundance. Priorities will include highly visible walls such as those along roadways and those walls that have unique characteristic or are significant (e.g., Herd Walk) for interpretation. Saplings can not be cleared away from all of the stone walls. This will become a routine maintenance task augmented by volunteers.
17	CRM	Submit appropriate Area Form(s) to the Massachusetts Historical Commission, documenting the archeological and historic landscape elements of Weir Hill Reservation	These forms will then be available for local, regional and statewide planning purposes, for educational initiatives, and as research tools.	3	D	DHR	S			2	2		\$0	\$0	\$400	\$400	S		\$400		Historic report exists, thus, all that is required is a consultant to fill out two forms at \$200/each: Country Club and historic landscape of Weir Hill (stone walls, etc.) Staff hours is for Superintendent and Director of Historic Resources to review and oversee this process.
18	CRM	Promote comparative study of private and museum collections from Andover / North Andover or, more broadly, from the lower Merrimack Valley.	This study would provide valuable information on natural resource use from Archaic through Contact Periods.	3	D	HRM				5	5	300	\$0	\$0	\$0	\$0	N				Graduate study. Hours are an estimate only as a place holder.

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19	CRM	Identify the location of the prehistoric shoreline of Lake Cochichewick.	Identifying the prehistoric lake level would provide useful information for archeological prediction.		3 D	DHR	S			5	5	50	\$0	\$0	\$0	\$0	N				Graduate study. Hours are an estimate only as a place holder. The chief engineer that works for the N. Andover's water dept knows much about historic water levels. Deeds also have useful information on water levels.
20	CRM	Conduct a comparative study of The Trustees drumlin properties.	There are a number of apparent correlations between the natural structure and composition of drumlins, and features considered desirable for human occupation and agrarian use. Drumlins at Weir Hill, Holt and Boston Hills (Ward Reservation), World's End and others might define and explicate the correlations, providing new insight into the mental templates for land use employed by both prehistoric and historic occupant groups.		3 D	HRM				5	5	150	\$0	\$0	\$0	\$0	N				Graduate study. Hours are an estimate only as a place holder. It is estimated that it would require at least 3 days (24 hours) per property. If six properties were included it would require roughly 150 hours. It should be noted that this is not strickly a Weir Hill recommendation.
21	CRM	Maintain annual mowing schedule for the south end 'Sutton Pasture.'	The semi-cleared area conveys a sense of unexpected and welcoming openness in the middle of a largely wooded area – suggesting a good stopping place or camp site – without specifically identifying the area as prehistorically significant. Include in mowing schedule discussed in Section 9.4.3	ongoing	D	S							\$0	\$0	\$0	\$0	O				See barrens management plan.

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22	CRM	Expose and identify the herd walk as a cultural feature.	The herd walk is an important cultural feature. Saplings and small trees are establishing and beginning to obscure the feature and threaten the stonework.	2	D	S			32	6	38	50	\$0	\$0	\$0	\$0	N				Staff time includes organizing a volunteer work day for initial clearing work in phase two with annual staff time needed for maintaining area in subsequent years. Two staff for 8 hours to oversee workday and to cut trees with chainsaws. Six volunteers @ 8 hrs. to hand cut brush and to pile brush for burning or chipping by staff (2 staff/day).
23	E/I	Engage interested community members to develop a "Quest" for the property that reveals and interprets the special features of Weir Hill.	A Quest is a treasure hunt based on a 150-year old British model that encourages a visitor to explore and learn about a unique place. Developed through a collaborative effort with the community, Quests explore natural, historic, and culturally significant places which become the settings for discovery and learning. A Quest at Weir Hill would provide an opportunity to engage both regular visitors as well as members of the Lawrence community. The effort would accomplish many things: • it would in itself, be a meaningful opportunity for some visitors to become involved in the stewardship of Weir Hill; • this fun activity would provide the start of a discussion about how to understand and nurture the relationship between Weir Hill and the Lawrence community; • it would produce a self-guided adventure for all visitors; • it would inform the development of additional interpretive activities, notably an annual event (see #28)	2	N	E&O	S		40		40		\$0	\$500	\$0	\$500	S		\$500		The property committee is inteded to take the lead on implemetation.

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24	E/I	Post information about Weir Hill's special features on the website.	Weir Hill has significant natural and historical resources which characterize both the property and the surrounding area. Posting this information on the website will facilitate better understanding and stewardship of the property by our visitors.	1, ongoing	N	E&O	S	3	3	3	9		\$0	\$0	\$0	\$0	N				Minimal hours needed to post and update information.
25	E/I	Post interpretive information on ecological features and their management on bulletin boards.	Topics should include: 1)The barrens community and the role of fire 2)Watershed protection and the visitor's stewardship responsibility (pet etiquette, shoreline protection) 3)Exotic invasive species 4)Information on barrens clearing (before and after work) to inform visitors of the change.	2, ongoing	D	RE	E&O		100		100		\$0	\$2,000	\$0	\$2,000	S		\$2,000		Informing visitors of impending changes to the landscape will hopefully avoid visitor anxiety. 40 hours to create message and 40 hours to design and post. \$2000 for brochure on barrens management, if desired, and a few signs for other subjects.
26	E/I	Distribute natural and historical information to local repositories and institutions	Weir Hill has significant natural and historical resources. Providing reports on these resources to local institutions (e.g., historical society, libraries) will facilitate better understanding and stewardship needs of the property by the North Andover community.		D	S			4		4		\$0	\$0	\$0	\$0	N				
27	E/I	Identify selected cultural features on base/trail map.	Many of the current features are not easily identified, thus, identifying them on the base map will increase visitor awareness for these features.		D	S	GIS			2	2		\$0	\$0	\$0	\$0	N				Staff time is for GIS to modify map at time of next reprinting. This action may get implemented sooner if reprinting is needed before Phase 3.

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28	E/I	Develop an annual event that appeals to the regional community and provides a memorable experience.	While undefined at this time, the process to develop a Quest and other volunteer opportunities should answer the question, "what kind of signature event can The Trustees hold at Weir Hill?" A successful event would: <ul style="list-style-type: none"> • Appeal to families with children who have strong local connections.. • Be place-based or rooted in the uniqueness of the property and would express the distinct character of Weir Hill. • Help to spread a single consistent message about The Trustees and our work. • Stimulate interest in Weir Hill, The Trustees, and/or conservation in general and provide opportunities to get involved in the care of this special place. 		2 N	S	E&O							\$0	\$0	\$0	\$0	N				Until the event is defined staff hours and dollars are unknown. It is hoped the property committee will take a lead with implementation.
29	VM	Install benches at key locations.	Benches would allow visitors a chance to rest and/or enjoy the setting, thus improving the visitor experience. Potential locations include: vista of Lawrence and along scrub oak trail. The number of benches should be carefully considered so that the landscape and important areas do not lose their natural feel or lead to visitor crowding at sensitive areas.		3 D	S				16	16		\$0	\$0	\$1,000	\$1,000	S		\$1,000			Cost are for granite benches at \$500/bench. Staff time includes four hours (two staff each for 2 hours)per bench for installation.
30	VM	Develop and implement entrance plan for Stevens Street.	The current entrance does not stress arrival clearly, is roadside parking only, presents a safety issue due to the volume and speed of traffic on Stevens St, and pull off areas are deteriorating. A redesigned entrance should include: <ul style="list-style-type: none"> • off-street parking lot • provide a sense of arrival • allow better winter access • improve aesthetics 		1 C	S	SR	40			40	40	\$15,000	\$0	\$0	\$15,000	C			\$15,000	Design plan will be drafted by an engineer pro bono (40 hours). Implementation costs are estimated at \$15,000 for parking lot construction including fencing. Staff hours are for overseeing volunteer engineer and contractor for implementation.	

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31	VM	Develop and implement trail restoration and maintenance plan based on identified needs (see Map 13: Proposed Trail Improvements).	Several trails may need to be closed and/or relocated due to erosion, steep slopes and water on trails. Map 13 identifies potential improvements to the trail system. This map should be viewed as a guide and may not reflect the exact needs (e.g., locations of trail reroutes may differ after specific site conditions are evaluated). The plan should identify all problem areas and strategies for restoration (e.g., install water bars every x feet). Many of these projects are ideal for volunteers (e.g., Boy Scouts). Note: some projects may require wetland filing. Projects include: •Rebuilding Edgewood Farm Trail boardwalk and extend. •Construction of a bridge at the intersection of Johnson and Edgewood Farm Trails •Possibly closing/rerouting the upper third of the Johnson Trail •Closing the short and steep trail connecting Cochichewick and Edgewood Farm Trails <i>Continued in Notes</i>	1, ongoing	C	S		8			8		\$0	\$0	\$0	\$0	N					Staff hours are for developing the plan only, implementation costs are unknown. Volunteer program will implement. <i>Continuation of Description/Rationale: •Relocation of the Cochichewick Trail</i> •Relocating and/or closing portion of the Scrub Oak Trail •Closing the borrow pit trail •Closing the trails from Stevens Trail to old railroad installing water bars on steep sections reroute trails across slope contour to minimize erosion extension of boardwalks/bridges as needed. Consider narrowing wider trails and promote vegetation recovery along trail's edge.
32	VM	Develop new trail from Stevens Street entrance to Johnson Pasture.	This would be a critical part of the trail from Weir Hill to Osgood Hill and expose visitors to another scenic area of the property currently inaccessible. This is a short term goal while the lake trail would be a long term goal.		3 D	S				24	24	75	\$0	\$0	\$1,500	\$1,500	S		\$1,500			Estimated to be tackled in 2-3 volunteer workdays. One morning to cut the trail, one to bring in materials for bridges & start construction, and a final day to complete bridge work. Estimate 12-15 bridge sections @ \$100/section.
33	VM	Revise trail map to reflect closures and changes to trails.	Providing visitors with accurate trail information will help facilitate a positive visitor experience.		3 N	GIS	S			12	12		\$0	\$0	\$0	\$0	N					8 hours for GIS revisions and 4 hours for Outreach and Education. Additional hours may be necessary depending on the extent of revision for the text.

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34	VM	Develop education program for dog walkers and monitor for effectiveness.	This program would address proper dog walking etiquette pertaining to other visitors, swimming in the lake and disposal of waste. A program modeled after the program at Norris Reservation may be an excellent place to start. This program includes volunteer stewards and identification badges.		2 N	S			40	15	55		\$0	\$0	\$0	\$0	N				Superintendent will work with Director of Volunteers to identify and train volunteers. Additional staff hours are needed to implement and manage program were waste is collected and disposed of by dog-walking visitors. After initial 40 hours to establish program, an additional 5 hours will be needed annually to oversee program.
35	VM	Implement entrance design improvements at the trail junction of the Hatch and Stevens Trails.	This entrance is one of two primary entrances and, thus, this area seems a logical location to provide visitors with a sense of arrival by: mowing adjacent trail sides, adding split rail fence to mark boundary with town land, installing a second bulletin board off to the side so both sides can be utilized, and a sign indicating that visitors have just entered the reservation.		1 N	S		40			40		\$600	\$0	\$0	\$600	O	\$600			Costs are for fencing, bulletin board, trail map poster, and sign. Staff time is for the construction and installation of bulletin board, and installation of fencing. Costs will be spread out over multiple years due to limited operating budget.
36	LC	Secure public access across Edgewood Farm CR.	Provides opportunity for trail connection to Osgood Hill.	ongoing	D	LC	S						\$0	\$0	\$0	\$0	N				This will be an ongoing task that may be linked with CR monitoring needs. Staff hours and \$ costs, if and when an opportunity develops, are unknown.
37	VM	Reroute Cochichewick Trail approximately 20 feet upslope and construct a boardwalk.	1)This trail becomes icy during winter and sloppy in wet weather. 2)To protect shoreline community and steep shoreline from erosion. 3)To protect seep community.		2 N	S	DV		200		200	500	\$0	\$5,000	\$0	\$5,000	C			\$5,000	Will require working with town due to trail being with watershed zone. Volunteer hours include a crew of eight volunteers working 7 days. \$5,000 material cost is a place holder. Costs and materials will vary for future. 100 hours of staff time for research of material, permitting, delivery of material and construction.

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38	NRM	Contain and stabilize high-use areas along lakeshore to prevent shoreline erosion and prevent further loss of vegetation caused by visitor activity at the water's edge (see Map 13 for locations).	Lakeshore areas are becoming trampled and eroded. These areas are expanding and shoreline vegetation is being lost. Selected areas should be improved using fencing and signage to prevent further damage in these high use areas. Strategies include wooden fencing, replanting, steps with crushed stone, and interpretation. Areas subject to wave action should be hardened with stones.		2 C	S	RE		50	50	100	200	\$0	\$6,000	\$6,000	\$12,000	C				\$12,000	Costs require further investigation and sites will be addressed over many years and multiple phases. Engage volunteer and/or consultant for design plans. Estimates for up to 4 sites are \$2-3,000 per site. Four volunteer work days, one work day per site, using 4 6 volunteers each = approximately 200 hours. Staff hours will likely include 8 hours for prep (finding grants, permitting, and initial site prep), 8 hours for design/material research and 8 hours to oversee work day per site.
39	VM	Clearly mark trails and reservation boundary, and post trail maps at key trail junctions.	The visitor survey identified poorly marked trails as an issue and visitors frequently walk onto adjacent property.	2, ongoing	N	S			6	6	12		\$0	\$120	\$0	\$120	S		\$120			This action takes place after trail closures and rerouting in phase one. Counrty club , Sutton Pasture, Successional opening, and another (total of 4) for remote maps at \$30/each. Boundary signs are minimal and in stock. Need to work with field opps to develop standard for trail marking so costs for marking trails are unknown at this time. Staff time is for checking and relacing signs as needed annually.
40	SCM	Clear brush at selected locations along Osgood Street Field.	Exposes the stone walls and allows views into the property from Osgood Street, a busy roadway, providing marketing opportunity. Indicates stewardship.		3 D	S				72	72		\$0	\$0	\$0	\$0	N					Based on staff time to cut and chip brush (3 staff x 3 days)

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41	SCM	Install old farm gates in stone wall openings along Stevens Street.	Gates will prevent unauthorized vehicle access to fields, provide a visual link to the cultural past, and enhance the approach to main entrance.		3 D	S				32	32		\$0	\$0	\$750	\$750	O	\$750				Cost is for materials only, while staff time includes: construction, painting, and installation. \$ costs will be spread out over multiple years due to limited operating budget.
42	SCM	Plant oak trees in wet meadow fields.	The character of the wet meadow field is in part defined by the old, spreading oak trees. These trees are degenerating and unless replaced soon, these important features will be lost.		1 D	S		12			12		\$500	\$0	\$0	\$500	S		\$500			Many volunteer opportunities likely exist for implementation, such as engaging school groups for an Earth Day event or the Roots to Shoots program. Cost based on two trees @ \$250/ea.
43	GM	Replace failing culvert in wet meadow.	This culvert is failing, allowing water to backup, changing the species composition and preventing mowing due to wet conditions. A wetlands filing may be necessary.		1 N	S		8			8		\$600	\$0	\$0	\$600	S		\$600			\$ costs are for replacement.
44	SCM	Expand hilltop vista to expose more of the Merrimack Valley to the north.	Builds on existing vista and highlights Lawrence and the Merrimack Valley, features identified as important by the planning committee.		2 D	S			32		32	45	\$0	\$0	\$0	\$0	N					Volunteer work day.
45	SCM	Clear an opening north of and adjacent to the herd walk.	Clearing this area will highlight the large trees and revives the cultural landscape. Clearing would provide additional early successional habitat important for butterflies by linking existing habitat, help control invasive plants, and help facilitate the visitor's sense of arrival by drawing people into the property.		3 D	S	RE			200	200	30	\$0	\$0	\$2,500	\$2,500	S		\$2,500			This is currently listed as a staff and limited volunteer project, attacked over several years. Cost listed would allow for some stump grinding or other site work that would allow future mowing. Possible candidate for future LIP grant.
46	SCM	Remove dying poplar stand at bottom of southern field.	This stand is impeding mowing which is allowing invasives to colonize barrens habitat.		1 D	S		6			6		\$0	\$0	\$0	\$0	N					With 4wd tractor & chipper, staff should be able to complete task.

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47	LC	Maintain periodic contact with owners of critical lands.	Maintaining a current listing of owners and their contact information, and using this information to periodically contact the landowners about upcoming events, land conservation options, etc. can help build important relationships.	ongoing	N	LC	S	2	2	2	6		\$0	\$0	\$0	\$0	N				Contact needed only per phase, not annually.
48	GM	Acquire a small chipper for management unit.	The large chipper is problematic to move around on site due to steep slopes and other access issues. A small chipper would allow more flexibility with management for barrens, trails and scenic vistas at both Weir Hill and Ward Reservation.		N	S			2		2		\$0	\$8,000	\$0	\$8,000	C			\$8,000	Staff time is for researching and ordering chipper and pick-up if necessary.
49	GM	Develop a property based volunteer program.	Due to the limited resources available for managing Weir Hill, volunteers will be necessary for implementing many of the recommendations within this plan. This program may include volunteer work days, recruiting local members and visitors via mailing and posted announcements, developing a list of ongoing and needed projects suitable for volunteers, and building an active and dedicated volunteer group. This program may be coordinated with other properties in management unit.	1, ongoing	N	S	DV						\$0	\$0	\$0	\$0	N				No \$ costs are anticipated. Staff time, while critical to this task, is virtually impossible to predict at this time since there are no volunteers currently active at the property. It will likely take many years spanning multiple phases to build this program and its capacity. The strategy for developing a volunteer program will include: 1. an internal search of the general membership and active committee members (e.g., Conservation Council) for potential volunteers; 2. an external search that incl. abutters and interested volunteers from N. Andover and adjacent communities; 3. based on results of 1 & 2, sort out volunteers for appropriate tasks (e.g., property advisory committee vs. volunteer program); 4. volunteers work with Superintendent to prioritize tasks and implementation.

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50	GM	Establish a Weir Hill volunteer property advisory committee.	A property committee will help assist the superintendent with plan implementation and evaluation. The committee will also evaluate its own performance.		1 N	S		75			75		\$0	\$0	\$0	\$0	N				Staff hours are based on that needed to establish a committee for Bird Park. This action will be completed in conjunction with recommendation #48 - developing a volunteer program.
51	GM	Determine if public has right of access along Lane to Pond Pasture.	Lane to Pond Pasture is a critical link for public access for a proposed trail connecting Weir Hill with Osgood Hill. As owner of abutting land, The Trustees has legal access for maintenance purposes.		1 C	LC	S					8	\$0	\$0	\$0	\$0	N				Land Conservation volunteer could address this issue.
52	VM	Work with town to better manage town beach parking area and entrance.	This parking area receives considerable use and may be the primary access point for Weir Hill visitors. Developing a partnership between The Trustees and the town that improves the management of this area and would allow us to engage Weir Hill visitors at this point. In turn, the visitor experience would improve.	ongoing	D	S		6	6	6	18		\$0	\$0	\$0	\$0	N				Challenge is to identify who at the town is responsible for this area. Superintendent should contact Town Manager directly to address problems. The hope is to establish a dialouge by informing town of our progress and sharing information. Time may be more if meetings are needed.
53	NRM	Work with New England Power Company on management and protection of significant natural resources and control of invasive species along the right-of-way.	This right-of-way is an integral part of the Weir Hill barrrens community. It also supports rare species.	ongoing	D	S	RE	1	1	1	3		\$0	\$0	\$0	\$0	N				This primarily requires staying in contact with NEPC and trying to get them involved with any work proposed for the right-of-way (e.g., invasives control). It is estimated this will require no more than an hour per phase.
		TOTAL						1,189	686	517	2,392	1,470	\$130,450	\$21,620	\$12,400	\$164,470		\$1,350	\$10,120	\$153,000	