

Wilmington Town Forest Recreation & Management Plan



Prepared for the
Wilmington Conservation Commission

By



Ecological Extension Service
In Association with
**Phillip Benjamin Forestry Services and
Thomas Wirth Landscape Architects**

July 2004

Table of Contents

How This Management Plan Was Prepared	iii
Introduction.....	1
Size, Location, Access, and Surroundings.....	1
Natural Resources & Existing Conditions	1
Geology, Topography, Slope, and Soils	1
Water Resources	6
History.....	6
Natural Communities	7
Trail Inventory	15
Connections and Corridors	15
Current Uses, Administration, and Management Issues	17
Goals and Objectives	19
Protect and Enhance the Area’s Natural Resources.....	19
Insure the Quality of Experience for Visitors	19
Insure Relative Ease of Implementation and Maintenance.....	19
Forest Management Goals	20
Ecological/Forest Management Plan	20
Habitat Improvement for Wildlife	21
Recreation Management Planning	25
Opportunities for Creating Connections	25
Land Additions.....	25
Use Zones.....	27
Access Road and Parking.....	28
Proposed Trail System	30
Trail Design and Improvements.....	31
Other Management Issues.....	33
Roles of Volunteer Stewards	34
Potential Volunteer Projects	35
Costs.....	36
Annual Maintenance	36
Appendix I – Preliminary Plant List	1
Appendix II – Invasive Non-native Plants.....	4
Appendix III – Existing Trail Inventory	6
Appendix IV –Ecological Management and Forest Management Summary	21
Appendix V – Recommended Native Wildflowers, Shrubs, and Vines	31
Appendix VI – New Trails.....	34
Appendix VII – Design Details.....	37
Appendix VIII – Birdhouses.....	41
Appendix IX – Cost Estimates.....	49
Appendix X – Annual Maintenance Schedule.....	50

How This Plan Was Prepared

The Wilmington Conservation Commission, working with the Massachusetts Audubon Society Ecological Extension Service, prepared the Wilmington Town Forest Recreation and Management Plan. The Commission Chairman, James Morris, and a subcommittee headed by Jolene Lewis managed the project for the Town of Wilmington with assistance from Robert Douglas, Assistant Director of Planning and Conservation. Bill Giezentanner, park management consultant, headed a team assembled by the Mass Audubon Ecological Extension Service consisting of Philip Benjamin of Benjamin Forestry Services; Wynne Wirth of Thomas Wirth Associates, Landscape Architects; and Jeff Collins, naturalist and Director of the Ecological Extension Service. The Ecological Extension Service is a program through which Mass Audubon shares its expertise in land management with conservation partners such as land trusts, towns, and government agencies.

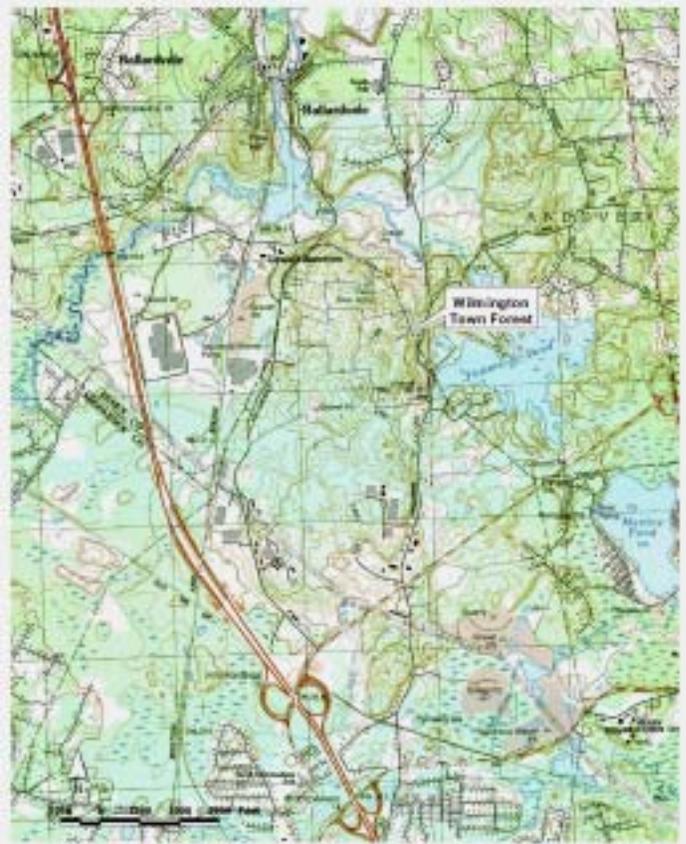
The plan is the result of an open process that involved citizens of Wilmington and representatives of the town's government. There were a variety of publicly advertised opportunities to have input into the management plan. On December 14, 2002 there was a walk at the Town Forest where neighbors, Conservation Commissioners, and interested residents reviewed a variety of aspects about the site's history, natural resources, and management. A session was held at the Wilmington Town Hall on December 18, 2002. About thirty interested residents attended. At this session a draft set of goals and objectives were presented and discussed. Other discussion subjects included new trails, ecological management, potential new parking areas, forest management, and appropriate recreational uses. A second public session was held at the Town Hall on May 14, 2003 with about thirty interested residents in attendance. At this session, the forest and natural resources inventory was presented, goals and objectives for forest and ecological management were discussed, an inventory and evaluation of existing trails was presented, and alternatives for locating a parking area were presented and discussed. At this session there was also an update of ongoing negotiations with Camp Forty Acres about potential land transfers and access.

A draft of the management and recreation plan was distributed to the Conservation Commission, interested residents, Department of Environmental Management, and a variety of town agencies in November 2003. On June 2, 2004 the public was invited to an evening presentation of the plan at the Camp Forty Acres pavilion. Comments from Commission members and the public have been incorporated in the final draft.

Wilmington Town Forest Recreation and Management Plan

Introduction

The Wilmington Conservation Commission, working with the Massachusetts Audubon Society's Ecological Extension Service; Phillip Benjamin Forestry Services; and Thomas Wirth, Landscape Architects has prepared this Recreation and Management Plan for the Wilmington Town Forest. With support from a grant from the Massachusetts Department of Environmental Management, the Recreation and Forest Management Plan will guide such proposed improvements as a general cleanup of the site; waste removal, relocation and expansion of the parking area; trail construction; signs; interpretive materials; and waysides and benches to enhance opportunities for environmental education and appreciation of the site's resources.



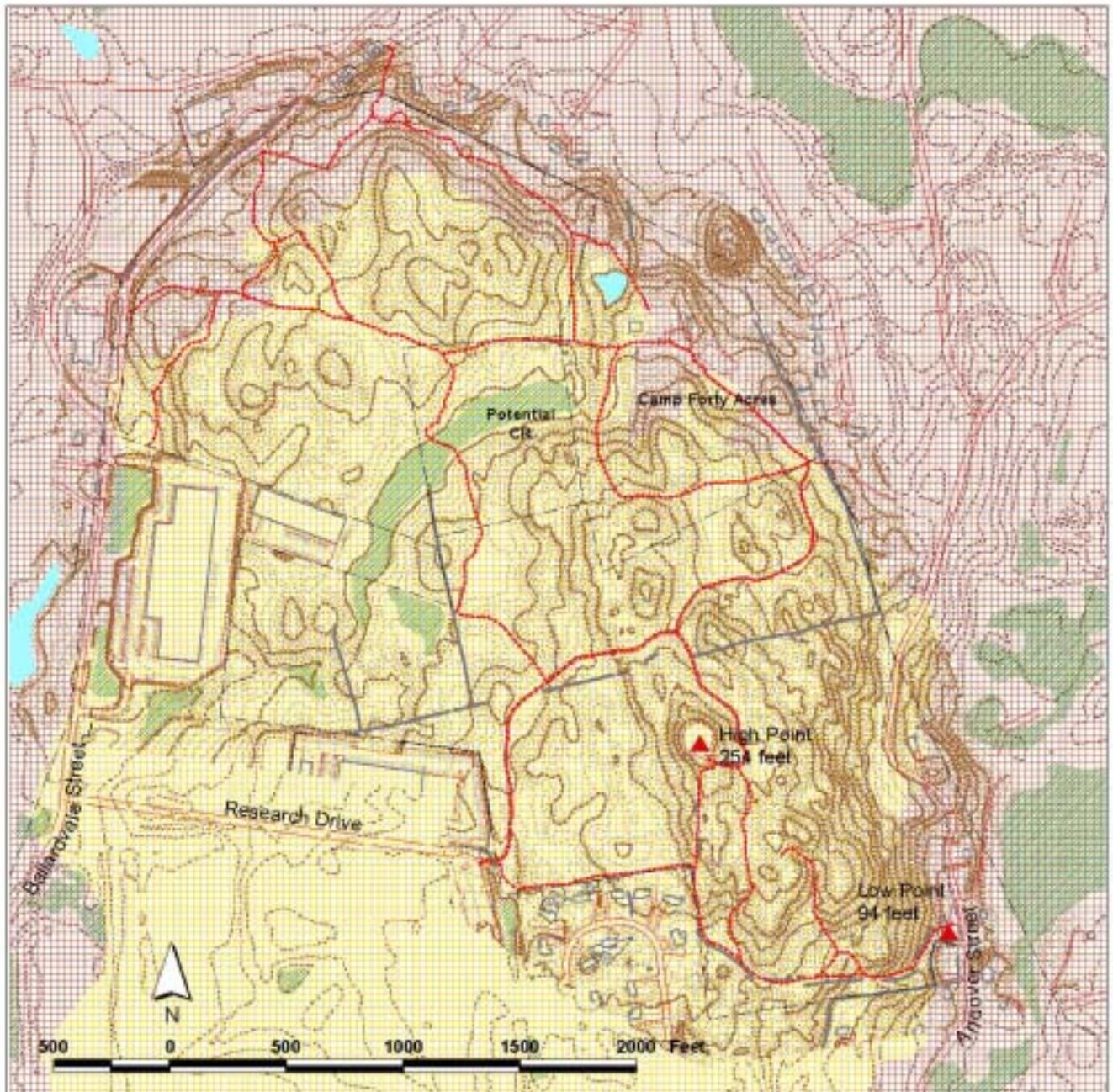
Size, Location, Access, and Surroundings

The Town of Wilmington acquired this 154-acre site in 1975. It is located at the town's northern boundary, just south of the Shawsheen River. Andover Street and residential areas bound the Town Forest on the east, on the north it is bounded by residential areas in Andover, on the west it is bounded by office and light industrial development along Ballardvale Street, residential areas and light industrial development are along its southern boundary. The top of the Forest's highest hill provides spectacular distant views and is dominated by a water supply tank. It draws much of its importance as habitat for wildlife and as an opportunity for Wilmington residents to learn about nature from being an island of nature surrounded by recent residential and commercial/industrial land uses.

Natural Resources and Existing Conditions

Geology, Topography, Slope, and Soils

Surficial geology is the underlying basis for both natural systems and human use and provides important information about an area's environmental potentials and vulnerabilities.



Wilmington Town Forest Surficial Geology

Source: VHB 2003 Survey, MapGIS
 Contour interval = 2' within Town Forest
 10' outside of Town Forest

-  Wellands
-  Existing Trail
-  Sand & Gravel
-  Till or Bedrock

7/30/2008

The glaciers that covered New England more than 12,000 years ago left their mark on Wilmington and the Town Forest. As the two-mile thick layer of ice moved south it scraped the solid rock beneath it and carried along rocks and soil. After about 19,000 years ago, the temperature began to rise and the ice slowly retreated, leaving behind this glacial till. Many of the boulders in the Town Forest were deposited at this time and areas of ledge were exposed. As the ice melted, it and the melting water also deposited sand and gravel referred to as outwash. Much of Wilmington is either part of this outwash material or till that has been further modified by erosion and human use. In general, the outwash materials are more highly susceptible to erosion.

Most of the Town Forest lies over glacial till materials or bedrock. It is surrounded on the north, east and west by outwash deposits of sand and gravel. Much of Camp Forty Acres and the northern edge of the Town Forest are also over these sand and gravel deposits. The Town Forest's highest point is about 254 feet at the site of the water tower and the lowest point is about 94 feet along Andover Street. The high point in the Town Forest is also the highest point in Wilmington.

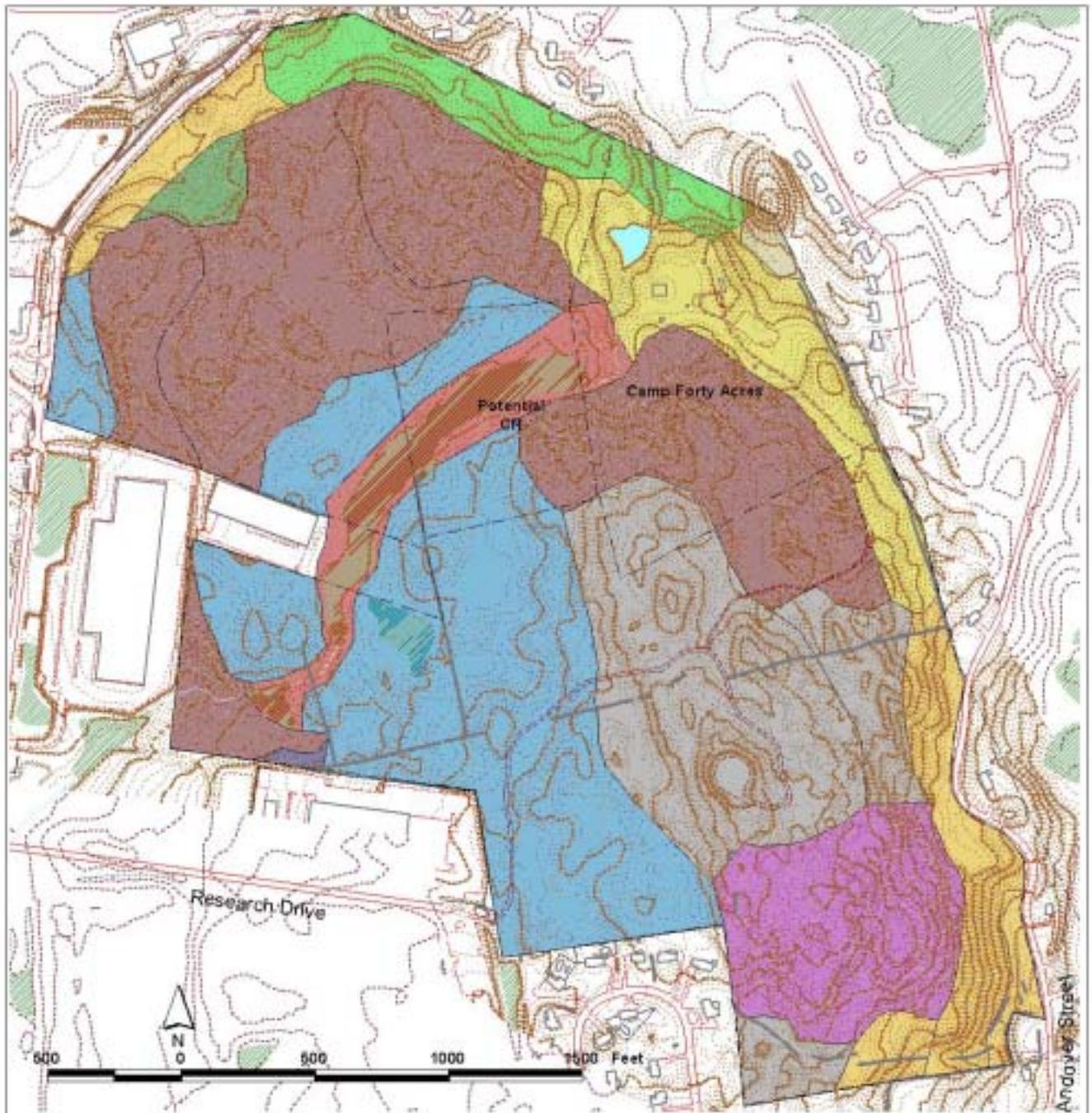
Steep slopes some more than 25% occur between Andover Street and the water tower and along the northern boundary of the property. There are also some steep slopes along Ballardvale Street. The majority of the site has hilly and gently rolling topography.

The site includes nine soil types—Canton, Charlton-Hollis rock outcrops complex, Hollis rock outcrops-Charlton complex, Hollis-rock outcrops complex, Montauk, Hinkley, Windsor, Paxton, Scarboro, and areas of former gravel extraction and other man-altered soils.

Canton Soils: Located in an area that runs through the center of the Town forest, this very deep, nearly level, well-drained soil formed in a loamy mantle underlain by sandy, loose-to-firm till. Canton soils are on slopes of uplands, ground moraines, ice contact deposits, and adjacent to plains and stream terraces. They are well suited for farming and woodlands. There are no major limitations associated with Canton soils. Large surface and subsurface stones and boulders may hinder excavation. Erosion may be a problem during disturbance. Canton soils are mapped in ice contact areas that generally consist of variable deposits. These areas may have a slowly permeable layer that may result in slow percolation rates for on-site sewage disposal systems.

Montauk Soils: Located along the eastern edge of the Town Forest, this very deep, well-drained soil formed in compact glacial till derived primarily from granitic materials. Montauk soils are on upland till plains, drumlins and moraines. They are generally well suited for farming and woodlands. Major limitations for development are related to slow permeability in the dense till substratum. Large surface and subsurface stones and boulders may hinder excavation.

Hinckley Soils: Located along the southeastern and northwestern edges of the Town Forest, this very deep, excessively drained soil formed in gravelly fluvial deposits. Hinckley soils are on terraces, deltas, kames, eskers and large, broad areas on outwash plains. Poorly suited for agricultural and woodland productivity due to droughtiness. Hinckley soils have few limitations for development. They are often associated with aquifer recharge areas and measures should be taken to protect the aquifer if present.



Source: VHB 2015 Survey, MassGIS, Soil Survey
 Contour interval = 2' within Town Forest
 10' outside of Town Forest

Wilmington Town Forest Soils

Wetlands

- | | |
|--|--|
| ■ Canton fine sandy loam | ■ Paxton fine sandy loam |
| ■ Chariton-Hollis-Rock out | ■ Rock outcrop-Hollis comp |
| ■ Gravel Pits | ■ Scarborough loamy sand |
| ■ Hinkley loamy sand | ■ Udarthents Loamy |
| ■ Hollis-Rock outcrop-Char | ■ Windsor loamy sand |
| ■ Montauk fine sandy loam | |

9/2003

Charlton-Hollis-Rock outcrop complex: Located in large areas in the northern half of the Town Forest, this complex consists of gently sloping soils where the relief is affected by the underlying bedrock. The very deep, well drained Charlton soil is in low pockets. The shallow, excessively drained Hollis soil is on the tops of hills and ridges or near rock outcrops. In many areas stones and boulders 10 inches to 10 feet in diameter cover 0 to 10 percent of the surface. A typical map unit is about 47 percent Charlton soil, 18 percent Hollis soil, 10 percent Rock outcrop, and 25 percent other soils. These soils and areas of exposed bedrock are intermingled so closely that it is not practical to separate them at the scale used for mapping. These soils are poorly suited to cultivated crops and to pastureland because of the exposed bedrock and stones on the surface. They are moderately well suited for woodlands. The Charlton soil is often well suited to use as sites for dwellings and for septic tank absorption fields. The Hollis soil is poorly suited to use as sites for both dwellings and septic tank absorption fields because it is less than 20 inches deep to bedrock.

Hollis-Rock outcrop-Charlton complex: Located in two large areas running north-south through the center of the Town Forest, this complex consists of moderately steep soils and areas of exposed bedrock on hills and ridges where relief is controlled by the underlying bedrock. In a typical area it is about 30 percent Hollis soil, 30 percent Rock outcrop, 25 percent Charlton soil and 15 percent other soils. The soils and areas of exposed bedrock in this complex are intermingled so closely that it is not practical to separate them in mapping at the scale used for mapping. The shallow, somewhat excessively drained Hollis soil is on the tops of ridges or is near rock outcrops. The very deep, well-drained Charlton soil is on side slopes and foot slopes. Stones and boulders 10 inches to 10 feet in diameter cover 0 to 15 percent of the surface. See the description for the Charlton-Hollis-Rock outcrop complex for suitability.

Rock outcrop-Hollis complex: Located in the southern portion of the Town Forest, this soil consists of areas of exposed bedrock and nearly level to steep, shallow, somewhat excessively drained Hollis soil. It is on tops and along ridgelines of steep upland hills. In a typical area it is about 55 percent Rock outcrop, 40 percent Hollis soil, and 5 percent other soils. This complex has moderate suitability for woodland and is poorly suited for development.

Scarboro Soils: Located in the wetland that runs through the central portion of the town forest, this very deep, level, very poorly drained soil formed in glacial fluvial and glacial lacustrine deposits. Scarboro soils are on flat low-lying areas and depressions on glacial outwash plains, deltas, and terraces. This soil is poorly suited for agriculture, development, and woodlands due to wetness.

Paxton Soils: Located along the northern edge of the Town Forest, this very deep, well-drained soil formed in compact glacial till derived mostly from schist, gneiss and granite. Paxton soils are on smooth convex side slopes and top slopes of glaciated hills and drumlins. This soil is generally well suited for agriculture and woodland. Major limitations for development are related to slow permeability in the dense till substratum. Large surface and subsurface stones and boulders may interfere with excavation. Erosion hazards are also likely during construction; measures should be taken to prevent erosion. This is the official State Soil of Massachusetts

Windsor Soils: Located in the northwestern corner of the Town Forest, this very deep, excessively drained soil formed in sandy glacial outwash. Windsor soils are on glacial outwash plains, deltas, and on the tops of glacial stream terraces. They are generally well suited for agriculture with irrigation and for woodland. Windsor soils have few limitations for development. They are often associated with aquifer recharge areas and measures should be taken to protect the aquifer if present.

Water Resources

According to MassGIS water resource information, the Wilmington Town Forest is not over any known aquifer or ground water resource. It is not near any public water supply wells—the nearest being in North Reading on Route 125 near Martins Pond. The Wilmington Water Department maintains a water storage tank on the high point of the Town Forest. It also owns land to the southeast of the Town Forest, just north of Route 125. Wetlands with an intermittent stream and a small pond on Camp Forty Acres land are the site’s only surface water features. There are a couple of suspected vernal pools on the property and at Camp Forty Acres.



Pond at Camp Forty Acres

History

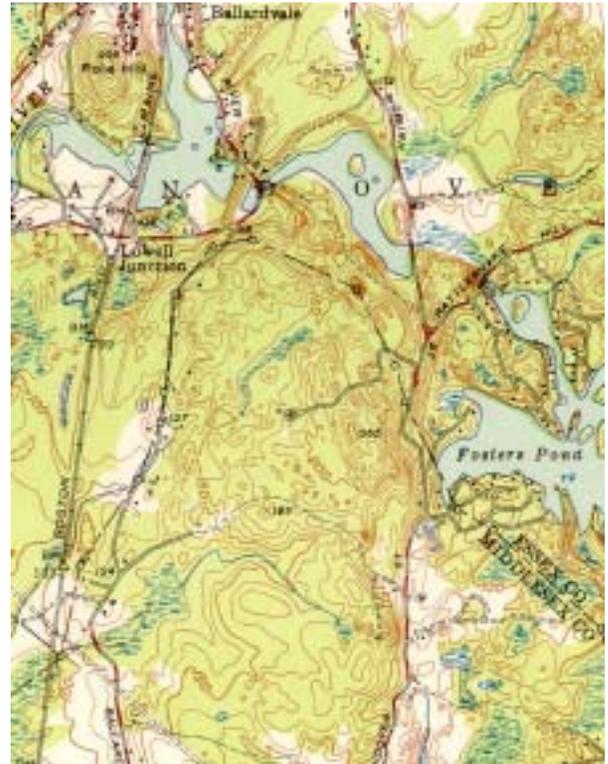
For nearly 12,000 years the rivers and uplands in Wilmington and the surrounding region provided a favorable ecological setting for local hunters and gathers. The rivers provided access to estuarine resources, smaller streams, and lakes and ponds that teemed with fish and other aquatic species. Various anadromous fish, like alewives and shad, were particularly important subsistence resources since, on their spring spawning runs, a surplus of food could be harvested with little effort. The region's wetlands and forested uplands provided adequate food and cover for a wide range of resident and transient wildlife throughout the year. Sometime between 3,000 and 1,700 year ago, during what is called the Early Woodland Period, rich alluvial soils along the rivers were found to be suitable for raising newly domesticated maize, beans and squash (sometimes referred to as “the Three



Town Forest Area in 1890

Sisters”). This led to more permanent settlements and a growth in population spurred by a more reliable food supply.

Hundreds of prehistoric sites in the Boston area attest to the region's ecological viability throughout prehistory. Clearly the indigenous inhabitants recognized the region's potential and took advantage of the opportunities it offered. The existing archaeological record documents the resilience of the local peoples; it is a nearly 12,000-year old record of changing climates and ecological settings to which they responded by adjusting and adapting their cultural systems. In so doing they were enormously successful at living in harmony with their environment. After the arrival of the first European ships to the Bay Colony, it took only a few short years for those 12,000 years of cultural adaptation to come to an end. The local Native American populations were ravaged by a series of devastating plagues (1616-1617, 1633-1634) and further cultural disruption was caused by conflicts with the European settlers, and finally internecine warfare, which, combined left much of Massachusetts depopulated of its indigenous people by the end of the 17th century.



Town Forest area in 1950s

Ballardvale Road and Andover Street date back to well before the 1890s. Ballardvale, just north of the Town Forest in Andover, was an important manufacturing site from the early 1800s. As early as 1700, an ironworks was established on the Shawsheen River. It is likely that trees on the site of the Town Forest supplied charcoal for the manufacture of iron.



Once part of Woburn, Wilmington became a separate town in 1730. Poor soils and stonewalls attest to the Town Forest's use as pasture after its trees were harvested as the town was settled in the 18th and 19th centuries. By the mid-twentieth century, forest had reclaimed the land.

Natural Communities

Wilmington is fortunate to have a Town Forest that offers its residents the potential for a diverse experience of nature. The forest has a variety of forest types including stands of mixed oak forest, white pines white pine-oak forest, red maple

forest, early successional stands of aspen and gray birch, and some small areas of grasslands. A small brook and its associated forested wetlands runs through the site on its way to the Shawsheen River.

A natural community is an assemblage of plants and animals that coexist in the same locale and interact with each other and such environmental factors as climate, geology, soil, fire, and human influence. The following descriptions of natural communities in the Wilmington Town Forest are based on the forest stand descriptions prepared by forester Phillip Benjamin and on the “Classification of Natural Communities of Massachusetts” by Patricia C. Swain and Jennifer B. Kearsley of the Massachusetts Natural Heritage and Endangered Species Program. In the following descriptions species of plants and animals that were found during our inventory are listed in bold. Invasive non-native species are listed in bold italics. There is also a list of both the common name and Latin name of the plant species found in the Town Forest with its value for wildlife in the appendix.

Mixed Oak Forest

Stand numbers: 2, 3, 4, 6, 7, 9, 10, 13, 14, 16, 19, 23, 24, 25, 27, 30, 34, and 40.

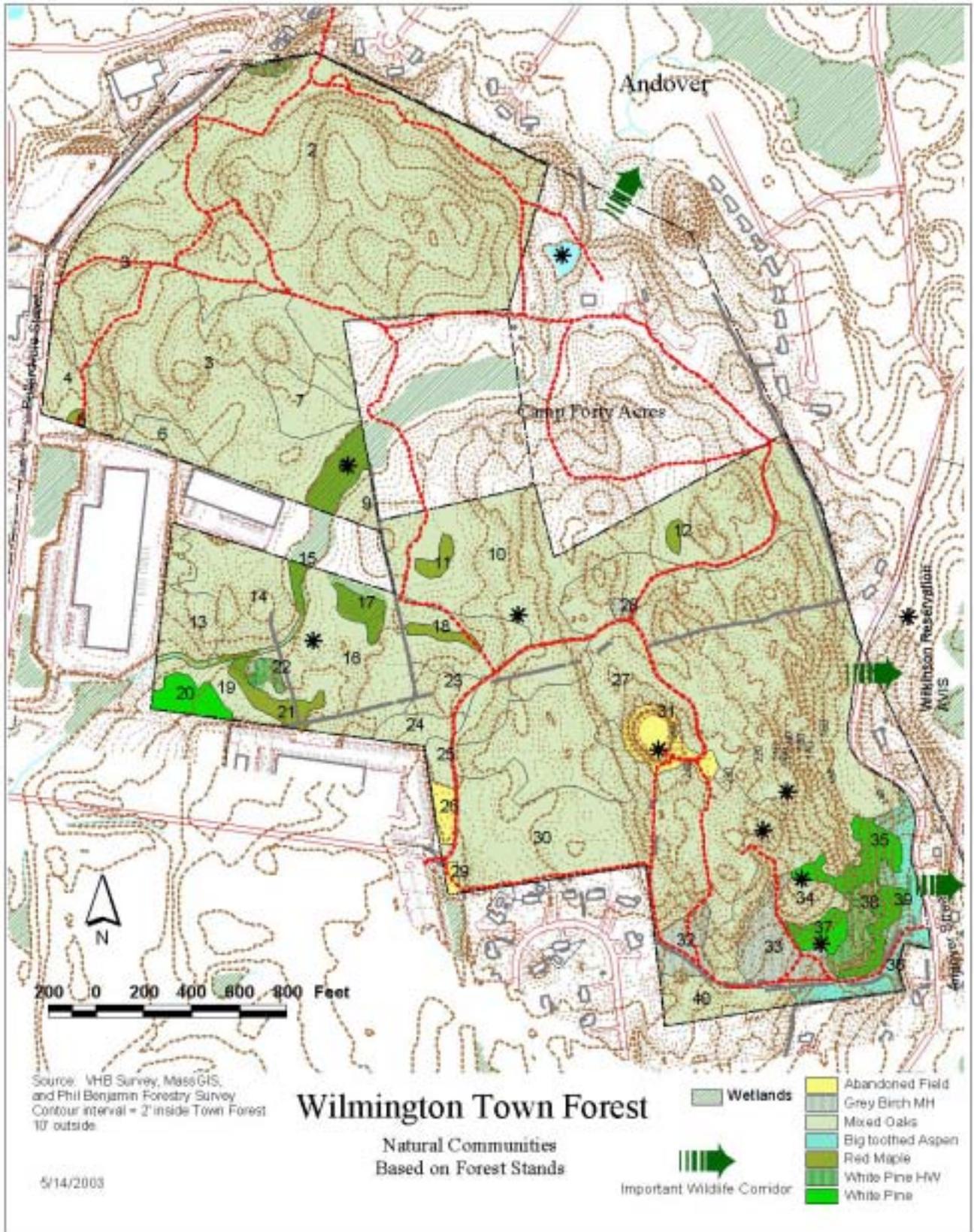
Total area: 134 acres.

Percent of total area: 88%.

Mixed oak forest is the predominant natural community type found at the Town Forest. This broadly defined community is common on dry soils and exposed slopes like the majority of those found at the Town Forest. Often this community also occurs in areas that regularly burn.

The vegetation typically consists of a variable mix of oak species that dominate the canopy including **black oak**, **red oak**, and **white oak**. **Scarlet oak** and **chestnut oak** can also occur. A variety of other species can reach into the canopy including **white pine**, **hickory**, **gray birch**, **paper birch**, **black cherry**, **tupelo**, **American elm**, **white ash**, **pitch pine**, and **red cedar**. The canopy is generally somewhat open. The understory consists of saplings of the canopy species as well as **gray birch**, **aspen**, **sassafras**, **big-toothed aspen**, black birch, **red maple**, and chestnut is sometimes in dense patches. **Blueberries**, **huckleberry**, **witch hazel**, **raspberry**, **sweet fern**, **chokeberry**, **maple-leaved viburnum**, **wild raisin**, **wild indigo**, **arrow-wood**, **buckthorn**, **honeysuckle**, **multiflora rose**, **bittersweet**, **grapes**, and **scrub oak** are also often found in the understory. **Sheep laurel** and mountain laurel are also often found in dense patches. **Sweet pepperbush** and **swamp azalea** can occur in wetter areas. A patchy herbaceous layer often includes Pennsylvania sedge, wild sarsaparilla, **ferns**, poverty grass and other **grasses**, **goldenrods**, **whorled loosestrife**, **pipsissewa**, **creeping dewberry**, **wild strawberry**, **partridgeberry**, **wintergreen**, **princess pine**, **Indian cucumber**, **ground cedar**, **pink lady’s slipper**, pinweed, and pale corydalis.

This deciduous community with its supply of acorns is often preferred habitat for a wide diversity of wildlife including such indicator species as **white-tailed deer**, **gray squirrels**, northern flying squirrels, **eastern chipmunks**, **white footed mice**, and other small rodents, **blue jays**, **red-eyed vireos**, **hermit thrush**, **wood pewee**, **ovenbirds**, black and white warblers, **great crested flycatchers**, **downy woodpeckers**, hairy woodpeckers, red-bellied woodpeckers, **wild turkeys**, **scarlet tanagers**, **Baltimore oriole**, **warbling vireo**, rose-breasted grosbeaks. Typical amphibians include northern redback salamanders and spotted salamanders. Ringneck snake and garter snake would also be expected. Cavities in dead



trees or dead limbs are especially valuable for wildlife. More generalist species such as **black-capped chickadees, American robin, northern cardinal, goldfinches, and white-breasted nuthatches** are also likely to occur here along with a large variety of other birds and mammals such as **coyotes, raccoons** and skunks that will occasionally pass through this and neighboring habitats.

American chestnuts would have made up a significant portion of the canopy of this type of forest prior to the arrival of the chestnut blight fungus in 1906. The fungus kills the above ground portion of the tree while the roots continue to sprout. These sprouts may reach 20 feet or so before they are attacked by the blight and killed.

White oaks, with their rounded leaf lobes, produce huge numbers of acorns every 4 to 10 years. In a good year a single tree may produce 2,000 to 7,000 acorns. However, an individual tree may go several years with virtually no acorn production. Acorns and other nuts and fruits provide a rich resource for roving flocks of blue jays as well as for gray squirrels and chipmunks. Wild turkeys are becoming more common and also use this resource. Local variations in the abundance of these species are clearly tied to acorn production. White oaks can reach 150 feet in height (though 100 feet is more common) and four feet in diameter, living to an age of 600 years.

Northern red oak, black oak and scarlet oak have leaves with sharply pointed lobes. Red oak and black oak can hybridize and be confusing to identify. Northern red oak is less shade tolerant than white oak but more tolerant than either black or scarlet oak. Consequently, both black and scarlet oak are generally more abundant in more open woodlands. Black oak can often occur in pure stands on drier, more exposed sites, where both northern red oak and white oak are at a disadvantage.

This natural community is the predominant type in the Wilmington Town Forest and it provides an interesting example of variation within a single forest type. Variation between the stands in this forest type is a result of differences in fire history, soils, land use history, snow damage, insect damage, and other factors.

Stands 7, 30 and 34, consist of small, mostly young trees with an average diameter of less than 3.5 inches. Stand 7 appears to have experience a very intense fire about 15 years ago and stand 30 appears to have experienced an intense fire about 30 years ago. These stands provide early and mid-successional habitat adding to the site's diversity for wildlife.



Early successional clearing in stand 30

Stand 3 also shows a history of past fires with many scarred trees and standing dead trees or snags that provide valuable denning sites for wildlife. However, it includes many larger trees (and larger snags) and an average diameter of 8.4 inches.

Stand 23, 24, and 27 also contain larger trees and snags. Trees in stand 23 have an average diameter of 7.7 inches with several large oaks. Trees in stand 24 have an average diameter of 7.2 inches and in stand 27 the average is 6.4 inches. Stand 27 also shows a history of past fires with many scarred trees and snags while some trees in stand 24 show signs of snow damage.

Stands 10, 25, and 40 have average diameters of 7.2 inches while the trees in stand 13 average 7.6 inches. These stands show fewer signs of fire damage. The southern and eastern sections of stand 10 show that they have been lightly burned. Consequently, these stands have fewer snags.

Stands 14 and 2 have average diameters of 8.6 inches and 8.4 inches, respectively. Stand 2 shows signs of gypsy moth damage and use by abutters (trails) as well as what appears to be random cutting of firewood.

Stands 9 and 16 both have trees with average diameters of 10.6 inches and show some signs of storm damage. They are adjacent to forested wetland and grade into moister soils with more red maples and good stands of white pine saplings.

Stands 4, 6, and 19 have a mixture of good-sized oaks and white pines. The trees in stands 4 and 6 average 7.2 inches, and those in stand 19 average 9.3 inches.

Stands 2, 10, and 23 all have signs of former human habitation including areas with planted apple trees and invasive non-native plants such as bittersweet and buckthorn.



Open character of much of Mixed Oak Forest

White Pine-Oak Forest

Stand numbers: 1, 22, and 38.

Total area: 1.6 acres.

Percent of total area: 1%.

The white pine-oak forest exists as small transitional areas in the Town Forest. This broadly defined community is common on dry moraine or till soils. Often this community also occurs in areas that regularly burn.

White pine and oak species, including **black oak**, **red oak**, and **white oak**, are the dominant trees of the canopy. Scarlet oak and chestnut oak can also occur. **Pitch pine**, **red maple**, **gray birch**, hickory, **sassafras**, white birch, and black birch also occur regularly in low numbers. The understory consists of saplings of the canopy species as well as **black cherry**, **aspen**, **big-toothed aspen**, and often includes chestnut sprouts. There is also a prominent shrub layer with **lowbush blueberries**, **huckleberry**, mountain laurel, wild raisin, sheep laurel, **sweet fern**, **raspberry**, **black raspberry**, and **spirea** or meadowsweet. A sparse herbaceous layer often consists of bracken fern, wild sarsparilla, Canada mayflower, **wintergreen**, partridgeberry, **goldenrods**, **bittersweet**, pink lady's slipper, **princess pine**, whorled loosestrife, and grasses.

Most animals in this forest are widespread generalists. **Gray squirrels** and **eastern chipmunks** are both abundant. Typical birds are **pine warblers**, **eastern towhees**, **chipping sparrows**, **common flickers**, **brown thrashers**, great horned owls, **blue jays**, and **mourning doves**. More generalist species such as **black-capped chickadees** and **American robin** are also likely to occur here along with a large variety of other birds and mammals that will occasionally pass through this habitat.

Red Maple Swamp

Stand numbers: 5, 8, 11, 12, 15, 17, 18, and 21.

Total area: 4.1 acres.

Percent of total area: 2.5%.

Red Maple Swamp is the most common forested wetland in Massachusetts. It occurs in a variety of hydrogeologic settings, including areas along streams or lakes, areas with high ground water, hillside seeps, and areas of overland water flow. At the Wilmington Town Forest the largest areas occur along the stream that flows through the site and through Camp Forty Acres.

Red maple is usually strongly dominant in the canopy often providing more than 90% of the cover. Other canopy trees include a mix of **oaks**; especially **swamp white oak**, **tupelo**, **white ash**, **white pine**, **pitch pine**, **gray birch**, **sassafras**, and **American elm**. The understory is often dense and consists of saplings of the canopy species as well as **sweet pepperbush**, **swamp azalea**, **common winterberry**, spicebush, **arrow-wood**, **highbush and lowbush blueberry**, **huckleberry**, **elderberry**, **buckthorn**, **Japanese barberry**, **poison ivy**, **chokeberry**, **alternate-leaved dogwood**, **wild raisin**, **grapes**, **sheep laurel**, speckled alder, **nannyberry**, and **poison sumac**. **Sedges**, **ferns**, **skunk cabbage**, **princess pine**, **swamp dewberry**, **false hellebore**, **spotted touch-me-not**, **marsh marigold**, and **grasses** occur in the herbaceous layer.

Yellow warblers, Louisiana waterthrushes, alder flycatchers, blue-gray gnatcatchers, and barred owls are typical of this forest type. More generalist species such as **red-winged blackbirds, black-capped chickadees, common grackle,** and **tufted titmouse** are also likely to occur here along with a large variety of other birds and mammals that will occasionally pass through this habitat.

White Pine Forest

Stand numbers: 20, 35, 37, and 39.

Total area: 3.6 acres.

Percent of total area: 2.5%.

Also known as Successional White Pine Forest and Old-field White Pine Forest. This community type develops on abandoned agricultural land, usually pasture. The forest floor in is typically carpeted with needles, often with only a sparse layer of herbaceous plants. **White pine** dominates the canopy but a variety of other scattered species can include **white oak, red oak, tupelo, black cherry, pitch pine, gray birch, big-toothed aspen,** and **red maple**. The shrub layer can vary in density from sparse to thick. It may include saplings of the canopy species and **huckleberry, blueberries, witch hazel, sheep laurel, bayberry, sweet fern,** elderberry, maple leaved viburnum, and often non-native species such as buckthorn, honeysuckle, and/or multiflora rose. A variety of blackberry vines (often forming thickets), and poison ivy often covers the ground near openings or in formerly open disturbed areas. The herbaceous layer is variable; large patches of Canada mayflower, and starflower with **clubmosses** or **princess pine** are particularly common on formerly plowed soil. Bracken fern is often common on drier sites. **Partidgeberry, wintergreen, ferns,** fringed polygala, **grasses,** and **pink lady's slipper** grow in many longer established sites. This community type, if large enough, is often a preferred habitat for blackburnian warblers, **ovenbirds,** yellow warblers, and Cooper's hawks. **American crows,** a variety of hawks, and great-horned owls are likely to use large white pines as roosting perches or nesting sites. More generalist species such as **black-capped chickadees, pine warblers,** and red-breasted nuthatches are also likely to occur here along with a large variety of other birds and mammals that will occasionally pass through this habitat. Stand 20 consists of larger trees with an average diameter of 16.1 inches while stands 35, 37, and 39 have smaller trees with an average diameter of 4.6 inches and are the result of clearing and gravel removal that occurred several years ago.

Successional Northern Hardwoods

Stand numbers: 28, 32, 33, and 36.

Total area: 6 acres.

Percent of total area: 4%.

These stands of gray birch and big-toothed aspen are early successional communities. They are the results of disturbance or the process of succession from abandoned fields. Stand 36 is the result of clearing and gravel removal a few decades ago. It has a canopy dominated by **big-toothed aspen** with **gray birch, red maple, mixed oaks, black locust, black cherry, white pine,** and **pitch pine**. The understory includes saplings of the canopy species along with **huckleberry, lowbush blueberry, sweet fern, sheep laurel, buckthorn,** and **pussy willow**. Stands 28, 32, and 33 are dominated by **gray birch**. Other canopy species include **red maple, big-tooth aspen, black cherry, pitch pine, mixed oaks, sassafras,** and **Scotch pine**. Their understories include **huckleberry, Canadian rockrose, steeple-bush,**

blackberry, pussy willow, smooth sumac, hay-scented fern, sweet fern, wild indigo, wild sarsaparilla, spreading dogbane, whorled loosestrife, winterberry, chokeberry, elderberry, buckthorn, autumn olive, and sheep laurel. Their herbaceous layers include **goldenrods, pink lady's slipper, bluets, poison ivy, grasses, wintergreen,** and a small patch of **cranberry.** Both stand 32 and 33 appear to be long abandoned gravel pits.

The structure of successional communities changes quickly and the animals that use them change as the vegetation grows. For the first 10 years trees may be dense but small with an understory of blackberry. Chestnut-sided warblers and mourning warblers prefer these early stages. Grouse and woodcock are also often found in this community type. **New England cottontail** is a mammal that is often found in this community. More generalist species such as **black-capped chickadees, brown-headed cowbird, and gray catbird** are also likely to occur here along with a large variety of other birds and mammals that will occasionally pass through this habitat.

Abandoned Field

Stand numbers: 26, 29, and 31.

Total area: 2.2 acres.

Percent of total area: 1.5%.

These three areas are former fields that are in an early stage of transition into forest. Stand 31 surrounds the water tower and being maintained as field. They are too early in this process to be easily classified but are most similar to the Successional Northern Hardwoods community. Young **gray birch, black cherry, red maple, mixed oaks, quaking aspen, red cedar,** and **white pine** dominate. Several **pears** and **apples** are present as well. The understory is light and includes **honeysuckle, blackberry, buckthorn, autumn olive, white mulberry, sweet fern, bittersweet, grapes, silky dogwood, smooth sumac, common mullein, birdsfoot trefoil, common stitchwort, cow-vetch, wild madder, pigweed, mugwort, rough-fruited cinquefoil, tower-mustard, white campion, goldenrods, common ragweed, milkweed, cleavers, raspberry, dandelion, bittersweet nightshade, tall buttercup, clammy ground cherry, red clover, yarrow, alfalfa, common wintercress,** and **grasses.**

The structure of successional communities changes quickly and the animals that use them change as the vegetation grows. For the first 10 years trees may be dense but small with an understory of blackberry. Chestnut-sided warblers and mourning warblers prefer these early stages. Grouse and woodcock are also often found in this community type. **New England cottontail** is a mammal that is often found in this community. More generalist species such as **black-capped chickadees** are also likely to occur here along with a large variety of other birds and mammals that will occasionally pass through this habitat.

Trail Inventory

The Wilmington Town Forest provides a variety of trails and wood roads. Some of the four miles of trails date back to the time that the land was used as pasture and some are more recent. Several of the trails begin at informal parking areas or in neighbor's backyards. Several miles of trails are the result of unauthorized All Terrain Vehicle use.

A detailed inventory of the existing trails is included in the Appendix. The map of existing trails illustrates trails, wood roads, and trails used by ATVs. It also shows the lack of a central parking area and trailhead and several dead end trails.

The trail beginning at the existing parking area (Trail A) on Andover Street is very steep and on soils that can be easily eroded. Most of the other trails are more gently sloped and offer a variety of experiences. Several of the trails have views into adjacent backyards that detract from the visitor's experience and invade the privacy of the abutters.

The trails on wood roads provide a basis for a network of multiple use trails that can accommodate diverse uses such as horseback riding, cross-country skiing, and trail biking. Many of the trails that have been created by ATV use are also suitable for multiple uses. However one of the ATV trails (Trail F) has caused considerable damage to the wetland. Another ATV trail (Trail H) dead ends in a wet area at the Town Forest boundary.

In summary many of the existing trails provide good access to many of the site's interesting areas but some are haphazard and poorly located. Some of the site's potential destinations are not on any of the existing trails. Because of dead ends and lack of a central trailhead the existing trails don't constitute a trail system that facilitates the visitor's ability to easily find their way.

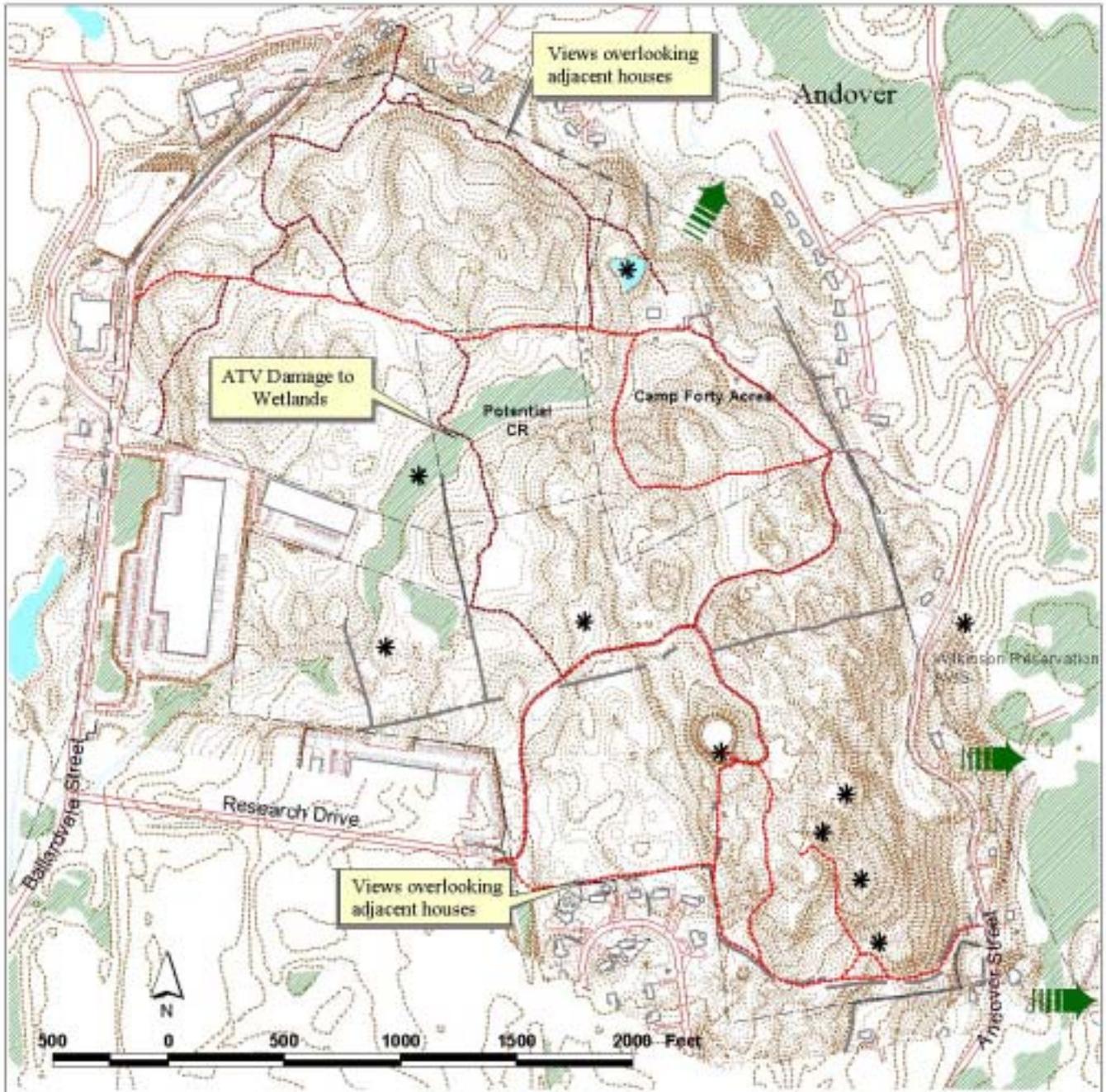
Connections and Corridors

The Existing Trails map also shows important wildlife corridors that link the Town Forest to other habitat areas—the Shawsheen River and its extensive wetlands; the Wilkinson Reservation (23 acres), managed by the Andover Village Improvement Society (AVIS); and Fosters Pond. The Bay Circuit Trail, a 200-mile long regional trail that passes through 50 towns forming a “necklace” of open spaces from Plum Island to Kingston Bay, runs through Andover just three miles north or east of the Town Forest. One can reach the Bay Circuit Trail by walking either north along Andover Street or by walking east around Fosters Pond and then connecting to Harold Parker State Forest by Gould Road in Andover. The trail runs through the State Forest. The AVIS Goldsmith Woodlands (170 acres) is also located nearby on the east side of Fosters Pond. AVIS, a local land trust, has protected more than 1,000 acres in Andover and helps maintain a town-wide network of more than thirty miles of trails, boardwalks, and bridges.

These potential trail connections and wildlife corridors greatly enhance the Town Forest. They make it a potential starting point for exploring other areas or a destination for those who may want to begin a walk in one of the adjacent towns. The corridors also increase the wildlife diversity that uses all of these “wild” areas as part of their territory.

Current Uses, Administration, and Management Issues

The Town Forest was created by a town vote in 1975 and its management was transferred to the Conservation Commission in 1985. The high point in the forest also serves as an elevated location for a Wilmington Water Department water tower. There are several points from which users enter the site. These include a parking area for five or six cars on Andover Street at the southeast corner of the site, a private parking area at the end of Research Drive



Wilmington Town Forest Existing Trails

- Wetlands
- Existing Trail
- Existing ATV Trail
- Woodroad Trail
- * Destinations
- Important Wildlife Corridor

Source: VHB 2001 Survey, MassGIS
Contour interval = 2' within Town Forest
10' outside of Town Forest

8/14/2003

and a couple of trail ends without parking along Ballardvale Street in the northwest corner of the site.

Current Uses

Primarily four groups currently use the forest:

- o Neighborhood residents
- o Workers in the area
- o Camp Forty Acres
- o Residents from other parts of town and adjacent towns

Neighborhood Residents

Many neighborhood residents use the trails in the Town Forest and greatly enjoy the exercise they offer and the natural beauty that changes with each passing season. Some of the neighbors access the Town Forest trails via trails from their abutting land. Some of these informal trails attract and confuse visitors that are trying to follow the Town Forest trails. Developing and making an “official” trail system will reduce this potential source of confusion and help assure the privacy of abutters.

Some abutters misuse the Town Forest and its resources. Some dump their lawn clippings or other debris across their boundary onto the Town Forest. At least one abutter has trespassed onto the Town Forest in an All Terrain Vehicle and created several trails and done considerable damage to the wetlands. See further discussion in the Management Plan section.

Workers in the Area

Many of the people who work in the businesses along Ballardvale Street and Andover Street take a break by visiting the Town Forest. Some jog or walk on the trails and others eat their lunch while enjoying the trails and views.

Camp Forty Acres

Perhaps one of the most active uses of the Town Forest is Camp Forty Acres. The Wilmington Junior Youth Group, Inc. was formed in 1948 to provide an opportunity for the town’s children to enjoy camping and the outdoor life. The 39-acre camp encourages camping, hiking, walking/jogging, picnicking, nature observation, cross-country skiing, and horseback riding. The trails of the Town Forest and Camp Forty Acres are interconnected. In the summer they run a camp program that uses both their site and the Town Forest. They have begun a program to improve and upgrade their facilities and have been working cooperatively with the Conservation Commission.

Other Users

There are a variety of other users who visit and use the trails at the Town Forest. These users include residents from other parts of Wilmington and from adjacent or nearby towns. They come to enjoy the trails for hiking, walking/jogging, picnicking, cross-country skiing, horseback riding, mountain biking, nature observation, bird watching, and just enjoying being out-of-doors.

Administration and Legal Restrictions

The Conservation Commission was assigned the responsibility for management of the Town Forest in 1985. Management practices for lands under its care are based on Section 8c of the Massachusetts General Laws, Chapter 40. This section states that lands under the care of the

Conservation Commission are to be “maintained in their natural, scenic or open condition; retained predominately in such condition to protect the water supply or potential water supply; used for public recreational use; or preserved to maintain their historical value in perpetuity.” Many towns have found it necessary to adopt and post additional regulations for the use of their conservation lands. These regulations typically deal with the following:

- Hours of use: For example the areas are open to the public from dawn to dusk except by Special Permit obtained from the Conservation Commission.
- Permitted uses: For example the areas are to be used for passive recreation only including but not limited to: hiking, fishing, canoeing, bird watching, photography, picnicking, etc., and where site approved, camping, and horseback riding.
- Areas are to be left undisturbed in their natural state. For example, practice *Leave No Trace* principles. See www.lnt.org.
- Prohibited uses: For example no dirt bikes, all-terrain vehicles, or snowmobiles are permitted on conservation land (See www.state.ma.us/legis/laws/mgl/266-121A.htm). No automobiles are permitted off designated roads or parking areas. No person shall remove vegetation, soil or stones from the area or dig or disturb any artifacts or archaeological remains. No alcohol or illegal substances are permitted on conservation land.
- Control of pets: For example all dogs must be leashed in accordance with the local Canine Control Law. Owners are to promptly and properly remove dog wastes.
- Other management issues: For example use of conservation land is free of charge; the user however, is liable for any damage to town property.

Management Issues

The guidelines for use listed above cover most management situations that will revolve around public use once the Town Forest is more accessible. Most of the site’s users will follow common sense guidelines. Many people will be frequent visitors to the Town Forest and care for it as an island of nature and beauty in their lives. Still, several management issues can be expected to develop. The following is a listing and short description of the issues that can be expected.

- After hours use. Most parks, especially ones as accessible to a neighborhood as the Town Forest, experience occasional illicit use between dusk and dawn.
- Control of the prohibited uses listed above.
- Dog control and removal of dog wastes. Many parks also experience problems with uncontrolled dogs and owners who do not remove dog wastes.
- Safety will also be an occasional concern.
- Vandalism of signs, facilities, etc.
- Trash removal and litter are frequent problems associated with public use. If picnicking is allowed there will be a desire to leave trash.

These issues will be addressed in the Management Plan Section.

Goals and Objectives

The Wilmington Town Forest Management Plan responds to the following general goals and specific objectives.

Protect and Enhance the Area's Natural Resources

- Protect and encourage the biological diversity of the site. Consider steps to increase the site's diversity, such as creating open grasslands within the forest, maintaining some areas in a state of early succession, and plantings to attract wildlife.
- Protect and improve linkages to the Shawsheen River, Fosters Pond, and other natural areas including the nearby Andover Village Improvement Society lands.
- Design and implement a forest management program that will serve as a basis for ongoing care and management of the Town Forest.
- Protect fragile vegetation areas.
- Periodically control invasive exotic vegetation.
- Protect steep slopes.
- Protect the site's water resources.

Insure the Quality of Experience for Visitors

- Interpret the site's natural history. Provide appropriate interpretive materials (signs, brochures, etc.) to allow visitors to learn about the natural history of the site and its approved uses.
- Provide an attractive entrance and parking area with centralized trailheads and other visitor orientation facilities, such as a picnic area, interpretive kiosk, etc.
- Provide attractive facilities (paths, picnic areas, etc.) for visitor uses. Consider improving existing trails and/or adding trails for specific uses, such as cross-country skiing, bridle trails, mountain bike trails, self-guiding nature trails, handicapped accessible trails, etc.
- Encourage use of the site by children and students so that they can learn about the area's cultural and natural history.
- Develop a set of use regulations to assure safety and compatibility of uses. These regulations may include the prohibition of hunting, ATVs and snowmobiles, control of pets, and the limiting of certain uses such as camping and fires. Periodically review and revise these regulations as necessary.
- Periodically provide on-site stewards to help interpret the site's history and its use regulations.

Insure Relative Ease of Implementation and Maintenance

- Design facilities for long-term sustainability and ease of maintenance.
- Provide a detailed, season-by-season maintenance schedule with specific tasks for Town and volunteer labor.

Forest Management Goals

The Conservation Commission discussed goals for forest management at one of their regular meetings. The following is a synopsis of their consensus.

Goal	High	Medium	Low	?
Generate Immediate Income			X	
Enhance Future Timber Products			X	
Improve Public Access for Walking/skiing/recreation	X			
Preserve/Enhance Scenic Beauty	X			
Produce Firewood			X	
Enhance Bird Habitat	X			
Enhance Small Mammal Habitat	X			
Enhance Large Animal Habitat (Deer)				X
Improve Hunting & Fishing				X
Protect Water Quality	X			
Improve Learning Opportunities	X			
Preserve/Increase Biodiversity	X			
Protect Special/Unique Areas	X			

Ecological/Forest Management Plan

A general goal for ecological management of the Town Forest is to encourage biological diversity by making the site attractive to as wide an assortment of native wildlife (birds, mammals, reptiles, amphibians, insects, etc.) as feasible within the constraints of the site's size and reasonable management and cost limitations. Specific objectives for ecological management are to:

- Increase wildlife food sources.
- Increase the diversity of cover types.
- Provide a variety of nesting or denning sites.

Many of the methods for achieving these objectives involve relatively simple measures that entail little expense or on-going maintenance.

Habitat Improvement for Wildlife

All animals have five basic requirements—food, water, cover, nesting sites and space. In addition to providing these basic requirements a site will attract a larger diversity of wildlife species if it provides a diverse set of habitat components. These components can include both vegetative and structural diversity.

Habitat Components

Vegetative Components

Conifers
Grasses & legumes
Butterfly, bee and moth plants
Hummingbird plants
Summer plants
Fall plants
Winter plants
Nut and acorn trees

Structural Components

Water
Dead snags
Cut banks, cliffs, or caves
Dust beds, sand and grit
Brush and rock piles
Nest boxes
Feeding stations
Salt or other mineral licks

The Town Forest already has a fairly rich diversity of vegetative components, including a variety of conifers; small areas of grasses, legumes, and wildflowers that will attract butterflies, bees, moths, and hummingbirds; and oaks to produce acorns. It also has a diversity of structural components including small areas of water in its wetlands; areas of exposed soil that provide sand, grit, and dusting areas; and small areas of cut banks; it also has the potential for creating other vegetative and structural components.

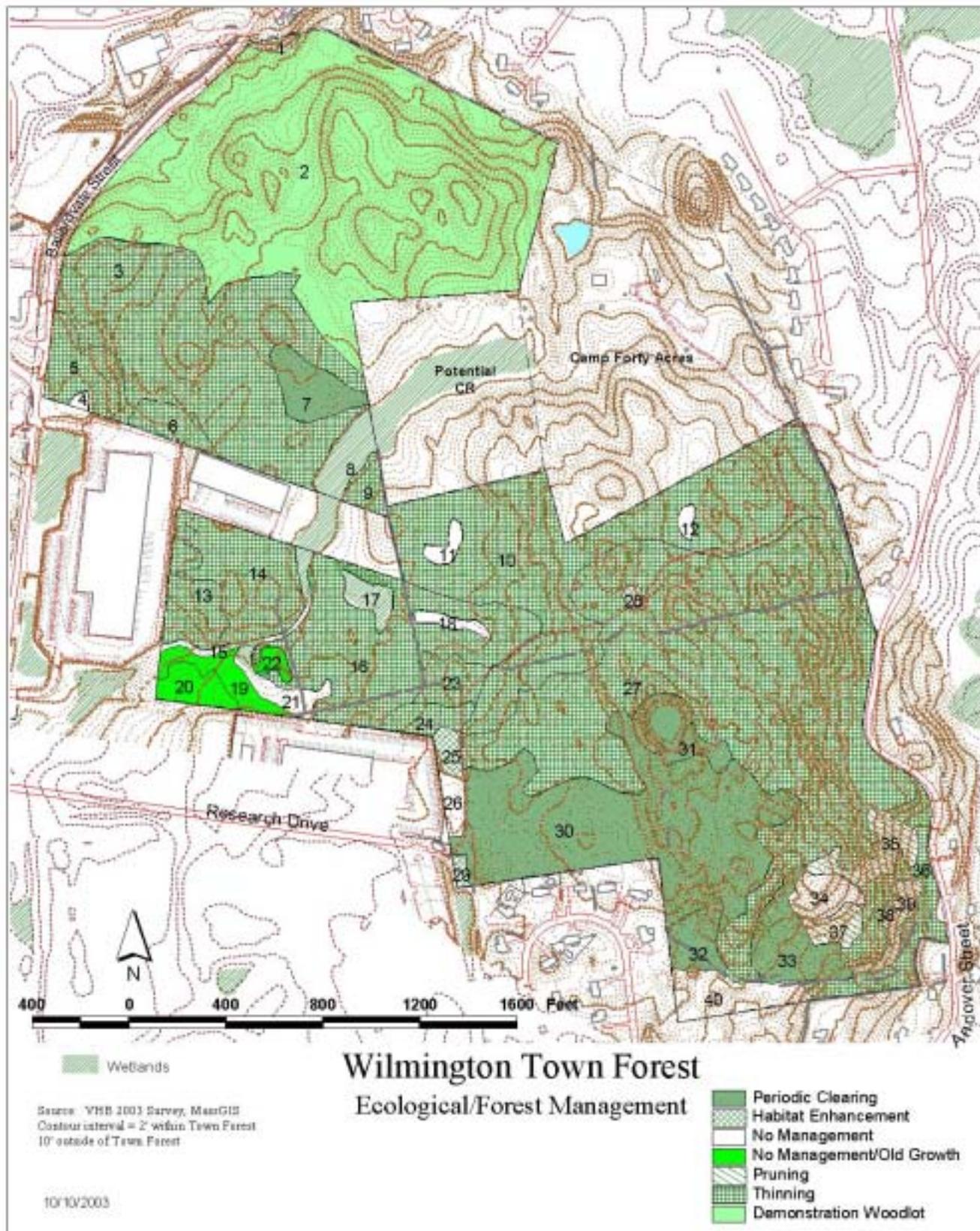
This plan recommends increasing the diversity of these habitat components by selected forestry treatments and adding several simple structural components including brush piles, nest boxes, rock piles, and dead snags.

The Forestry Management Plan recommends four basic management actions:

- 1) No treatment/old growth,
- 2) Thinning/ woodlot management,
- 3) Habitat enhancement/ periodic clearing, and
- 4) Pruning.

Appendix IV includes a chart showing the management goal, management concerns, management recommendations, and management actions/priority for each stewardship unit (forest stand). The following map shows a summary of the management actions for the entire Town Forest.

No Treatment/Old Growth. No management actions are recommended for several of the forest stands. Stands 5, 8, 11, 12, 15, 17, 18, and 21, are seasonally wet or potential vernal pools and require no treatment. Stands 19, 20, and 22 have access problems, are adjacent to wetlands, and/or provide a buffer between the forest and adjacent development. These three stands have the potential to develop naturally and provide an “old growth” example in the future. Stands 26, 36, and 40 provide a buffer between the Town Forest and adjacent development and should be left to develop naturally. Stand 34 has too little economic value to warrant treatment at this time.



Thinning/Demonstration Woodlot. The Forest Management Plan recommends two types of thinning—improvement thinning and pre-commercial thinning. Stands 2, 4, 6, and 23 are candidates for a thinning to improve the growing conditions of the better-formed and faster growing trees by removing competition from poor quality hardwoods. Stand 2 could also be a demonstration woodlot and provide firewood on a managed basis if desired. The treatment in stand 23 would focus on highlighting the larger, older hardwoods and improve the forest aesthetics. Stands 3, 9, 10, 13, 14, 16, 24, 27, 36, and 38 are recommended for a thinning to encourage white pine saplings and poles that are beginning to flourish. These trees could provide a value for a commercial cut at some point in the future. An effort to eliminate bittersweet in stands 23 and 24 should be done before the commercial cut or at the same time. This non-native invasive has the potential to overwhelm these stands and kill trees. Slash from these treatments would be chipped or left to lie as close to the ground as possible. Some of the slash could be used to create several brush piles per acre to enhance the area for wildlife. Several cavity trees or dead trees per acre should also be left or created by girdling poor quality trees. Many birds and small animals use brush piles and snags for roosting, nesting, and feeding.

Habitat Enhancement/Periodic Clearing. The Forest Management Plan recommends two types of habitat enhancement—maintaining early successional stands and periodic clearing. The main treatment in stands 1, 25, 28, and 29 would be the control of non-native invasive species in favor of native shrubs and saplings with higher wildlife values. Over time these stands will evolve into more mature forest as trees grow. Mowing or clearing patches in stands 7, 30, 31, 32, and 33 would maintain the diversity of wildlife values of these areas and provide the Town Forest more variety of habitat types. Stand 7 should be cleared on a 15-year rotation. Stand 30 would be cleared at the same time as stand 7 and then after 10 years it would be divided into thirds and one third would then be cleared every five years or a 15-year rotation. Stand 31, around the water tank, would be mowed every three years in early spring or after the nesting season in the fall. Expanding this frequently mowed area into stand 30 would provide a larger area for wildflowers, grasses, and legumes and attract more butterflies, hummingbirds, and insects. Stands 32 and 33 would be cut on a 5 to 7-year rotation. Again, some of the slash could be used to create several brush piles per acre to enhance the area for wildlife.

Pruning. The Forest Management Plan recommends “Crop Tree Pruning” for stands 35, 37, and 39. The pruning would be designed to improve views and the forest aesthetics of the area and improve the timber quality of selected trees. Approximately 59 white pines per acre would be pruned to 17 feet, leaving no less than one third of the total tree height in green crown. Again, some of the slash could be used to create several brush piles per acre to enhance the area for wildlife.

Other methods to improve wildlife habitat include nest boxes, brush piles, logs, rock piles, dead snags, and planting native wildflowers and shrubs.

Nest Boxes A scarcity of suitable nest sites often prevents many birds from occupying what is otherwise excellent habitat. Artificial nest boxes can dramatically increase populations of a variety of birds. When these structures are designed and located to repel predators and resist weather elements, they can provide birds with a more secure nest than natural sites. Chickadees, titmice, nuthatches, bluebirds, tree swallows, woodpeckers, flickers, screech owls, and American kestrels can all be attracted to closed nest boxes in the

woodland habitats. Different types of nest boxes could be located in different parts of the Town Forest. Small nest boxes in the cleared areas around the water tower and in stand 30 would attract tree swallows and blue birds. They would also attract house sparrows, a non-native species that take over many nest boxes and prevent nesting of our native cavity nesters. Wildlife managers usually recommend the removal of house sparrow nest material from March to July to give the native species an opportunity to use the boxes. Larger nest boxes for screech owls could be located on some of the larger trees surrounding these clearings. Three-foot metal predator guards should be placed around the trunk of the trees used for these nest boxes to protect the hatchlings from raccoons. Nest box entrances should face east or southeast to catch the morning sun. Old nest material should be left in the nest box over the winter and removed in early spring. Appendix VII includes plans and dimensions for building birdhouses.

Logs and Brush Piles Brush piles are recommended in the clearings and in several of the forested areas. Brush piles provide important cover for cottontail rabbits, weasels, woodchucks, striped skunks, garter snakes and many other species, especially birds. They should be constructed with a foundation of rocks or relatively large logs or stumps on the bottom and small brush on top to keep the pile from decomposing too quickly. They should be about 12 feet in diameter and 4 to 5 feet high. Hollow logs or old sections of concrete culvert in the foundation of the pile can serve as animal den sites. Decay is vital for wildlife communities and is especially critical in a woodland. Many organisms depend on decay for their food and a web of other insects and small animals depend on these decay organisms. Leaf-litter and wood-chip mulch in the forest will boost the habitat for the organisms that live in decay. Leaving logs from storm damage and other tree maintenance to rot in carefully selected areas around the woodland can further enhance the woodland habitat. Many of the wood-boring insects have a winged stage in their life cycle and can seek out new supplies of rotting wood. In almost no time this increase in material on the forest floor will attract birds, which will kick through the litter and probe into the rotting logs to feed on these insects. In general logs should be left to rot in more remote sections of the forest.



Rock Piles Rock piles serve many of the same purposes as brush piles. Boulders up to 3 feet can be used in the foundation with smaller rocks on top. The spaces between the boulders will become den sites for a variety of animals, especially chipmunks. Several 6-foot diameter rock piles could be located in the forest.

Dead Snags As old trees die they should be left to provide both food and nest sites for a diverse set of insects, birds and other small animals. Naturalists often refer to these dead snags as "apartment houses" for wildlife.

Wildlife Plantings The area around the water tower, the access road, and proposed parking lot and some of the clearings in stands 7, 30, 32, and 33 would be appropriate areas

for planting some wildlife plantings. A list of recommended native plants is included in the appendix.

Recreation Management and Trail Improvement Plan

The section on management issues identified several issues that need to be addressed in order to meet the above stated goals. Many of these issues revolve around existing and anticipated uses when the Town Forest is more accessible and open for more public use. Many of the following management recommendations have design and construction implications.

Opportunities for Creating Connections

The section on Existing Trails noted that there were important wildlife corridors that currently link the Town Forest to the habitats associated with the Shawsheen River, the Wilkinson Reservation, Fosters Pond and the Harold Parker State Forest. It also noted the potential to make trail connections to the Bay Circuit Trail as it passes through Andover. In fact it is possible to make a 12-mile loop trail from the Town Forest connecting to the Bay Circuit Trail in the Harold Parker State Forest and following the Bay Circuit Trail through the Skug Reservation and the Hammond Reservation to the Ward Reservation and Phillips Academy to Pumps Pond and down Woburn Street to Andover Street and back to the Town Forest. A proposal for this connection is shown on the following page. The Bay Circuit Trail is shown in red and connecting trails (some on roads) are shown in white. The wildlife corridor linking the Town Forest to Fosters Pond also makes a link to the Scirappa Farm, the Chisolm Tree Farm, and Water Department land to the south. As mentioned, these connections and wildlife corridors greatly enhance the Town Forest. Future management efforts should promote these and other trail connections and strive to protect the wildlife corridors.

Land Additions

There are limited opportunities to add land to the Town Forest. The Conservation Commission recently purchased a 2.7-acre parcel, know as Camp Oman, with frontage on Ballardvale Street from Camp Forty Acres and has been engaged in discussions about conservation restrictions on a 12-acre parcel, also owned by the camp, and a smaller parcel owned by another abutter. These two parcels nearly divide the Town Forest in two. The wooded wetland that runs through the Town Forest also runs through these parcels and their protection would help enhance the future biological diversity of the forest.

Use Zones

Some of the site is well suited to public uses while other parts are less suited to these or other uses. The following map zones the site into three levels of use. The white area is suitable for the uses that will be encouraged on the site. The light green area is suitable for most encouraged uses. It serves as a buffer to the neighborhood and protects steep slopes. Trails and other facilities in these areas should be carefully located to protect the privacy of neighbors and prevent soil erosion. The darker green areas are unsuitable for most uses



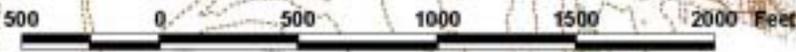
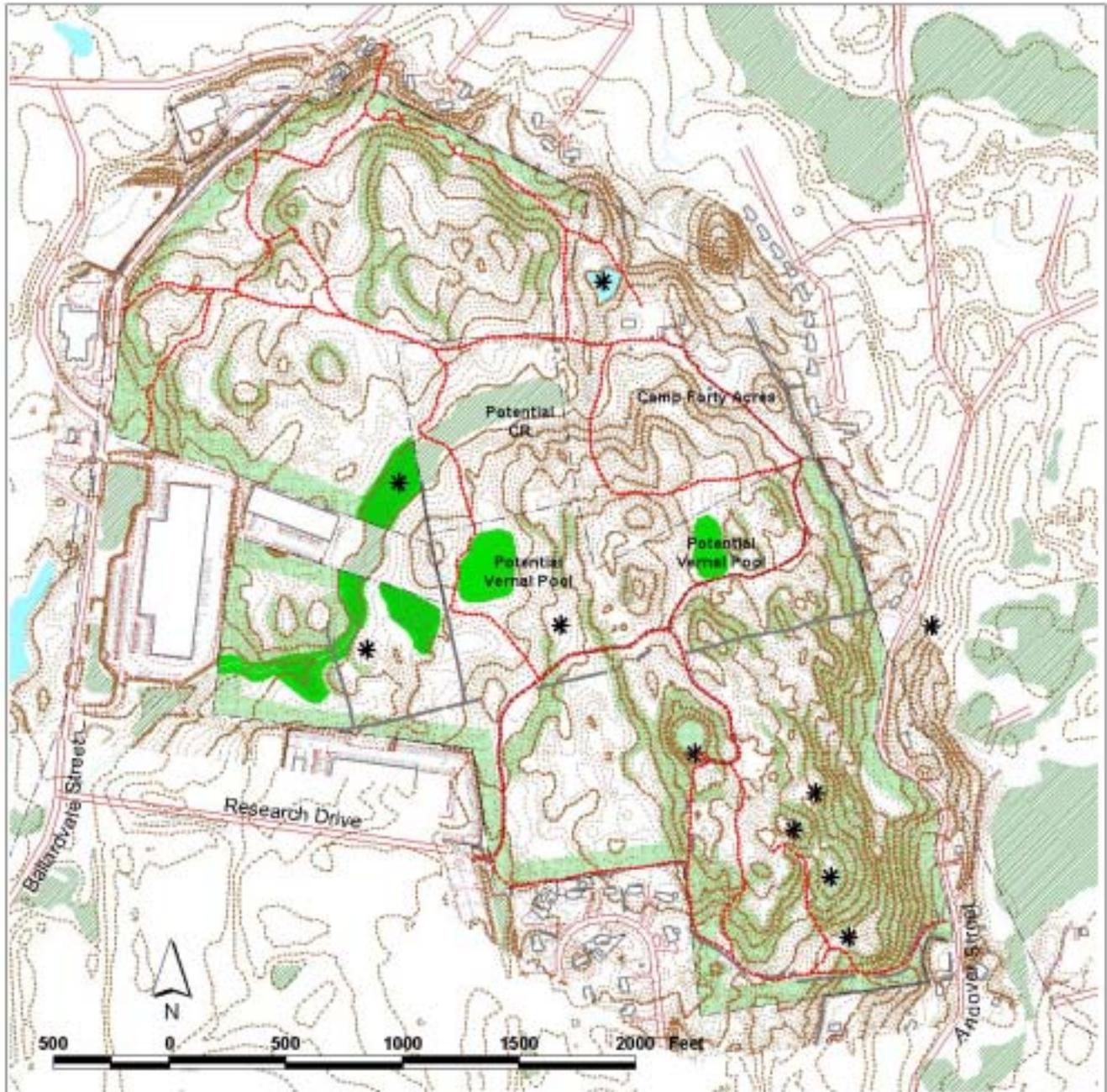
Source: MassGIS

Wilmington Town Forest

Connections
& Corridors

-  Open Space
-  Wildlife Corridors

10/6/2003



 Wetlands
 Existing Trail

Wilmington Town Forest Use Zones

Source: YHB 2003 Survey, MapGIS
 Contour interval = 2' within Town Forest
 10' outside of Town Forest

 Suitable for Most Uses
 Limited Use Zone
 Unsuitable for Most Uses

 Potential Destinations

10/10/2003

because of wet soils and more fragile vegetation. A trail across one of these areas on land owned by Camp Forty Acres should be on a boardwalk or bridge to protect the wetlands and allow year-round crossings. Two of the darker green areas are potential vernal pools and should be monitored for vernal pool species. These management zones are based on the information about the site that has been presented in the preceding section.

Access Road and Parking

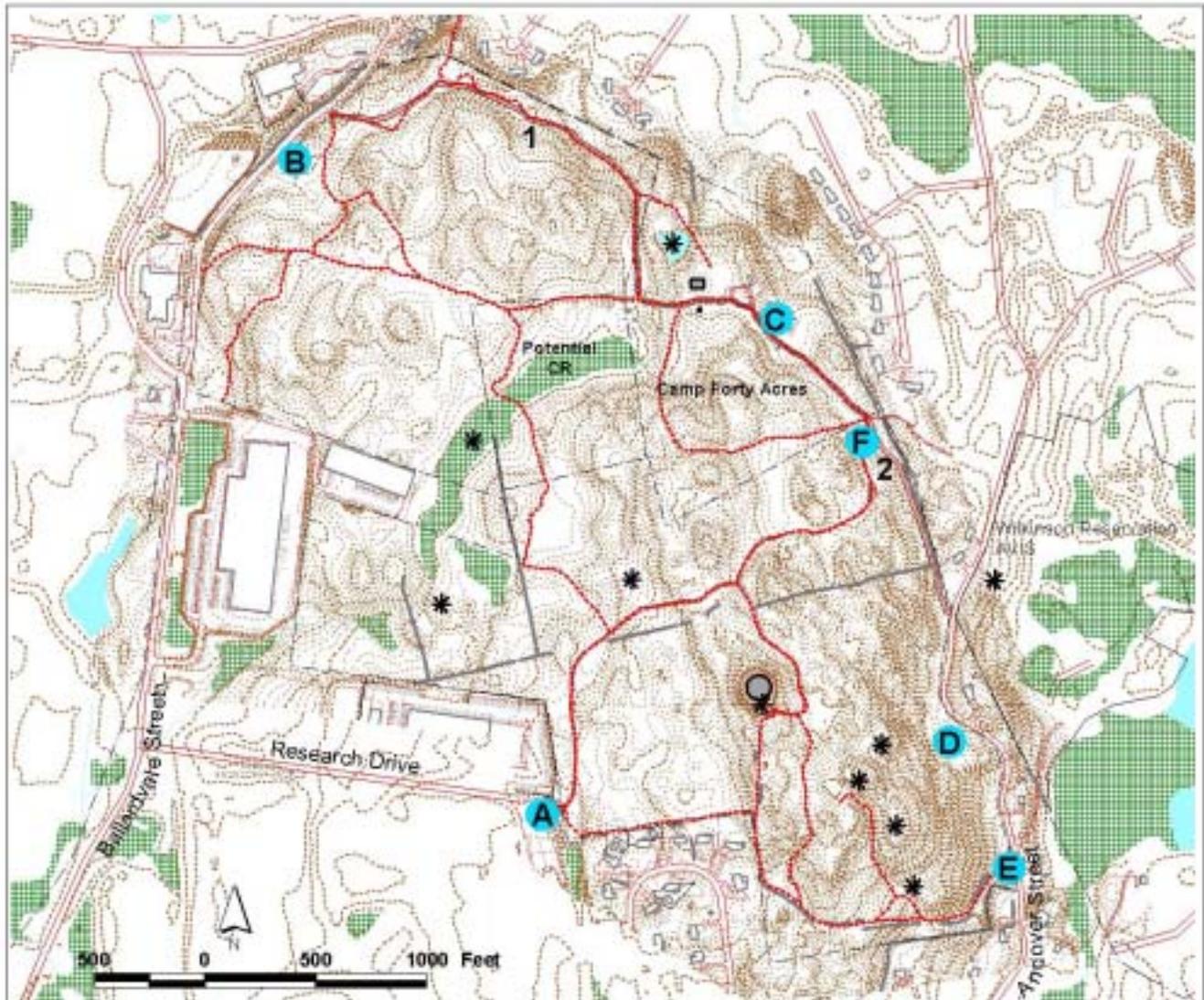
As noted in the trail inventory there is no central parking area or access point for the Town Forest. Instead, several access points are used, some with parking along the road or on private land and with no parking. One of the goals for insuring the quality of experience for visitors is to provide an attractive entrance and parking area with a centralized trailhead and other visitor orientation facilities. Several alternatives for the location of an access point and parking area were examined. Access for Camp Forty Acres has also been an ongoing issue. The entrance to their access road is in Andover and they asked the Town of Wilmington to explore providing a combined entrance as part of an understanding that also offered a conservation restriction on a 12-acre portion of their land. The following map shows the evaluation of two access road and six potential parking areas. Criteria for this evaluation included the following:

- Arrival – compatibility with the experience of the town forest and neighborhood, impact on traffic, and ease of providing security.
- Construction Ease – impacts on the natural resources of the Town Forest.
- Access To Trail System – ease of making connections, proximity to destinations, and topography.
- Handicap Access – ease of developing handicapped trail and topography.
- Aesthetics – overall quality of experience.
- Management – overall ease of managing the Town Forest.
- Relative Cost – relative costs of developing parking and access road.

The alternative with the highest summary score would involve an access road along the eastern boundary of the Town Forest and a parking area at “F” on the map. This alternative would provide a central access point where a trailhead and other visitor facilities could be developed. It would provide an attractive arrival sequence and be centrally located. It would also offer the possibility of some cooperative management between the Town Forest and Camp Forty Acres. For example, the Camp Forty Acres restrooms could be made available to Town Forest visitors and the coming and going of Camp Forty Acres staff and campers would provide some security for visitors to the Town Forest.

The access road would leave Andover Street near the boundary between Andover and Wilmington and follow behind a stonewall along the Town Forest’s eastern boundary. For most of its length it would be screened from the houses along Andover Street by topography, the stonewall, and vegetation. It would be a narrow gravel road, approximately 12 feet wide with several turnouts to allow passing in both directions.

The sketch (below) for the access road and parking lot is an illustration of these elements. It shows a one-way loop around existing boulders and trees and a continuing access road to Camp Forty Acres. The old Camp Forty Acres access road could be maintained as a fire lane



Parking Lot Alternative	Arrival	Construction Ease	Access To Trail System	Handicap Access	Aesthetics	Management	Summary Score	Relative Cost
"A"	--	+++	+++	+++	--	-	4	\$
"B"	-	++	+	+++	+	-	5	\$
"C1"	+	++	++	++	+	++	10	\$\$\$
"C2"	++	+	++	++	++	++	11	\$\$
"D"	+++	++	++	-	+++	+	10	\$
"E"	++	++	-	--	+	+	3	\$
"F"	+++	+	++	++	+++	++	13	\$\$

Wilmington Town Forest

Parking Lot Alternatives

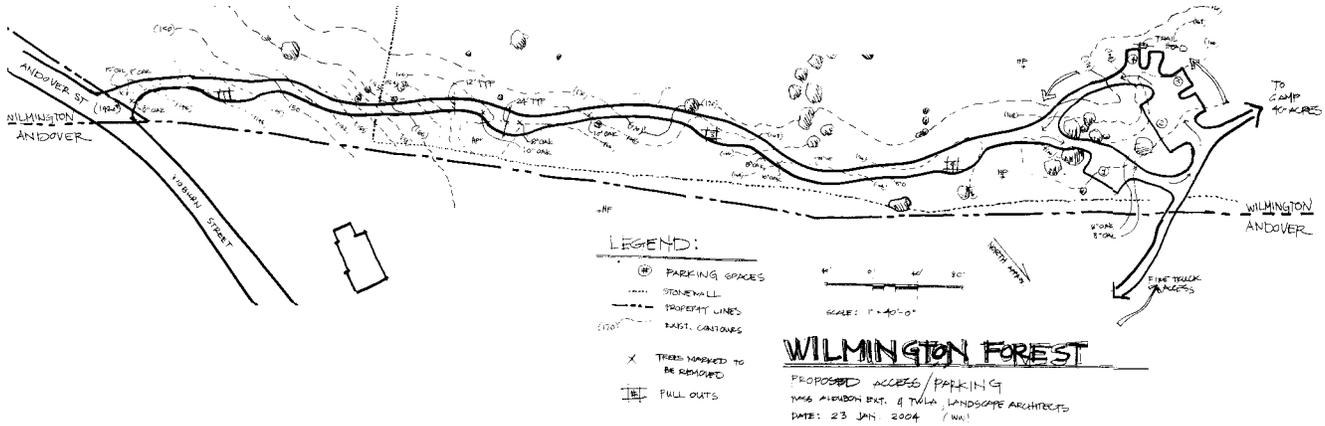
- Wetlands
- Potential Access Roads
- Existing Trails
- Potential Parking Area
- Destinations/Views

Arrival = compatibility, traffic, & security
 Construction Ease = impacts on Town Forest
 Access To Trail System = connections, proximity, & topography
 Handicap Access = ease & topography
 Aesthetics = overall quality of experience
 Management = ease of management
 Relative Cost = cost of parking & access road

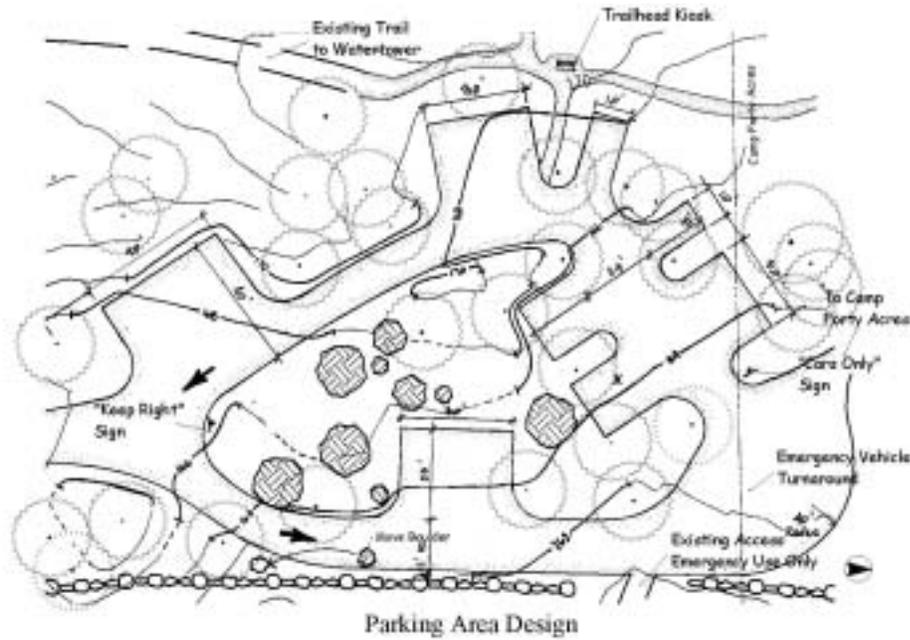
Source: VHB 2003 Survey, MassGIS
 Contour interval = 2' within Town Forest
 10' outside of Town Forest

7/23/2003

and emergency access by relocating it between parking bays and providing a locked bollard or chain. The access road itself could serve as a pleasant trail linkage to the Wilkerson Reservation and other connecting trails.



The detail of the parking area shows eighteen parking bays separated by trees and the one-way drive through the boulder field. A visitor orientation kiosk at the trailhead would provide information about the trails and upcoming events. The layout through the large boulders and the naturalistic parking bays will provide a dramatic arrival to the Town Forest.



Proposed Trail System

The Proposed Trail System includes three levels of trails: Multi-Purpose Trails, Hiking Trails, and a short Accessible Trail. All of the trails would begin at a trailhead located at the proposed parking area. Most of the proposed trails are based on the existing trails. However, one existing trail would be abandoned. The existing trail located along the southern boundary of the Town Forest, near the residential area off of Fiorenza Drive, would be

relocated and a buffer area along that boundary would be allowed to grow up to provide more privacy for the nearby residences.

All Purpose Trails, located primarily on existing gravel roads or well-established existing trails, would be five to eight feet wide and suitable for walking, hiking, jogging, and cross-country skiing. They would also be suitable for mountain bike use and horse riding. Hiking Trails would be narrower (3 to 4 feet wide) and some would traverse some steeper slopes. These trails would be suitable for walking, snowshoeing, and hiking only. The short Accessible Trail would also be eight feet wide and provide gentle slopes and a stabilized surface that would support wheelchairs. It would include rustic benches and pull-offs for pausing and enjoying the forest setting. It should also be suitable for use by blind and hearing-impaired visitors and could have interpretive materials developed to accommodate those limitations. A trailhead at the parking area would provide direct access to two Multi-Purpose Trails and the Handicapped Trail. A boardwalk/ bridge would be required to cross the wetland.

Trail Design and Improvements

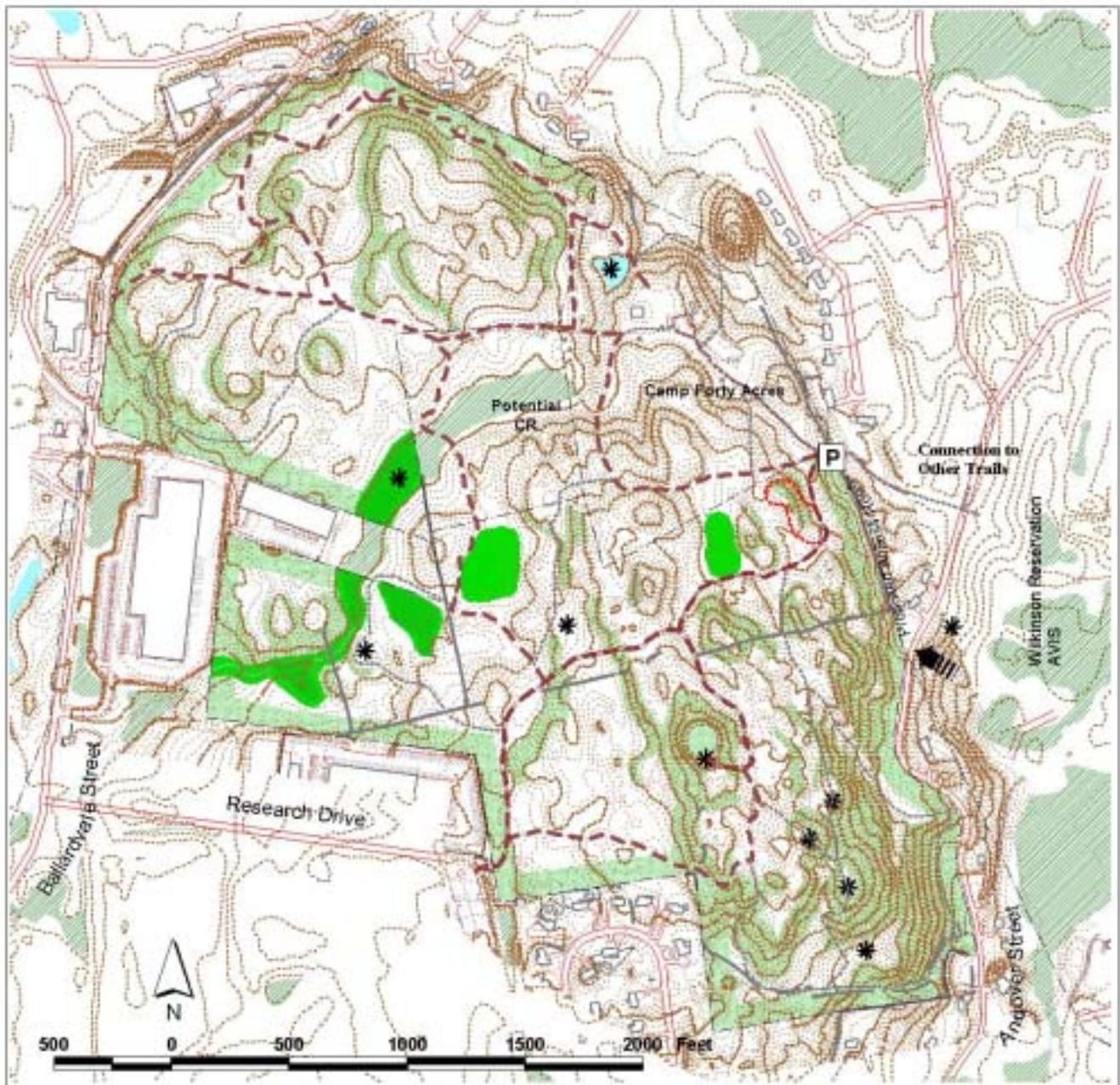
Many of the “Multi-Purpose Trails” are located on pre-existing gravel roads and are already used as part of the existing trail system. In general these “wood roads” do not need improvement. There is one area on “Trail B” where the trail splits and is eroded. This area of about one hundred feet needs some relocation to accommodate the Accessible Trail and drainage improvements to prevent further erosion and restoration of vegetation to eliminate one of the “splits”. Drainage improvements would include some minor regarding to assure that water would be directed off of the trail surface, installation of a new base course and a crowned top course. Vegetation restoration would include adding topsoil, an erosion control net and seeding with a mixture of native plants.

The relocated trail along the boundary with the neighborhood at Fiorenza Drive would be a new trail. It would be built on existing subgrade and coved with a 6-inch layer of processed gravel. It should have a 2-inch crown for drainage. The abandoned trail can be blocked with brush and left to regenerate naturally. See Appendix for design details.

Many of the “Hiking Trails” are also located on pre-existing trails. In some cases they are located on old roads and some are located in areas that do not currently have an existing trail. Most of these trails can be built on the existing grade and subgrade with minimal effort. They can be blazed, cleared and grubbed to level and remove rocks. Tree removal should be minimized. The trails can weave their way around most trees. Several of these hiking trails provide access to some of the Forest’s destinations—high points and views. See Appendix for design details.

The 8-foot wide “Accessible Trail” would be built on a compacted subgrade, a 4-inch prepared base course, and topped with a 3-inch mixture of crushed stone containing a psyllium stabilizer. This trail would be one thousand feet long. See Appendix for design details.

An one hundred and thirty foot long 8-foot wide boardwalk/ bridge is proposed at the wetland crossing. It would be built on a foundation system designed to minimize disturbance to the wetland. See Appendix for design details.



Wilmington Town Forest Proposed Trail System

Source: VHB 2003 Survey, MapGIS
Contour interval = 2' within Town Forest
10' outside of Town Forest

11/2003

- | | | | |
|---|--------------------------|---|-------------------|
|  | Suitable for Most Uses |  | All Purpose Trail |
|  | Limited Use Zone |  | Handicapped Trail |
|  | Unsuitable for Most Uses |  | Hiking Trails |
| | |  | Wetlands |
| | |  | Destinations |
| | |  | Entrance |
| | |  | Proposed Parking |

Other Management Issues

There are several other management issues including control of access, control of prohibited uses, control of pets, trash and litter, fire and safety, and vandalism.

Control of Access

There needs to be good control of the access to the site. The methods for gaining control of access include:

- Gated Entrances
- Cooperation with Camp Forty Acres
- Boulders, Heavy Timber Fences, or Earth Mounds Placed to Prevent Access
- Signs
- Enforcement of Trespass Violations
- Visitor Orientation

A combination of all of these methods is recommended. Having a gated parking area is one method of limiting unwanted and after hours use. Having an access road that is shared with Camp Forty Acres may provide an opportunity to have a higher level of control than having separate roads. A single leaf gate (see appendix) can be installed at the entrance to the access road. The Town can have a cooperative relationship with camp staff to open and close the gate to the access road at dawn and dusk. Police vigilance, especially on spring, summer, and fall weekends, will also be helpful. Volunteer stewards and neighbors can also be part of the deterrence for unwanted uses.

Control of Prohibited Uses

All-terrain vehicles, dirt bikes, and snowmobiles are generally prohibited uses on conservation land. Informing users of these regulations, the potential for a two hundred and fifty dollar fine, and warning them of the Town's intention to enforce the regulations is a first step. Continued trespass with these vehicles would have to be followed up with a citation from a police officer.

Control of Pets

Control of pets can be a difficult problem. Uncontrolled pets can be a danger to each other and to visitors. Wilmington requires that dogs be restrained and/or leashed at all times. It is also becoming common to see responsible dog owners picking up and removing their dog's wastes. A plastic bag dispenser and disposal bin may also be installed at the Town Forest entrance to remind visitors of their responsibility for their pets. Attractively designed dispenser/receptacles are becoming common in many parks as the public becomes more aware of this source of water pollution and annoyance for other park visitors.

Addressing Other Management Issues

A covered information board will help orient visitors and provide information about the site and its uses.

Trash and Litter. In general it is good to encourage "carry in – carry out" practices. If there is a picnic area associated with the parking lot there will be a desire to leave trash. A trash receptacle at the parking lot could be picked up and emptied on a regular basis.

Fire and Safety. Emergency response personnel should develop a plan for dealing with fire and injury at the Town Forest. As noted above, fire has been a frequent occurrence in this

dry oak forest and it has generally been a benefit to the quality of the Town Forest. Protecting nearby homes and business should be the fire-fighting objective.

Vandalism. Vandals will occasionally target signs, benches, and other facilities. Design of these facilities should be based on the expectation that mischief will occur. Materials and finishes can help, but there are no “vandal-proof” designs. Vandalism seems to attract more vandalism. So rapid repair or replacement is the best strategy for minimizing an outbreak of this sort of bad behavior. Having a ready supply of replacement signs and other items and paint will speedup repairs.

Once the Town Forest is developed and open for more public use there are bound to be some management issues that will occur as a result of experience. For this reason it is advisable to review this management plan from time to time and make adjustments based on this experience.

Roles of Volunteer Stewards

Wilmington has residents who care about their open land. A program to organize volunteers could be sponsored by the Conservation Commission or a friends group. These volunteer stewards and friends can provide valuable services that help safeguard and interpret the natural and cultural resources of the site and the safety of visitors. Neighbors and abutters of the Town Forest are logical “eyes and ears” who can help interpret the values of the site, report problems, lock gates, monitor public use, mow fields or other grass areas, record presence of wildlife, and call the police or Conservation Commission to discuss local issues. Many of these stewardship roles will also help assure the quality of the visitor experience. Organization, education and training are key to an effective volunteer program. Unreliable or untrained volunteers can be a drain on an organization and can produce more damage than benefit. Such training and organization take time but are essential for a successful program. Recognition is also important for rewarding good volunteers. The stewardship group needs a chairman or key contact person, who serves as the primary liaison between the Conservation Commission, police, other town services, and the other stewards. The group needs to establish a schedule of who does what and when, and there also needs to be a level of training provided for each volunteer. The following is a list and short description of possible roles.

- Each volunteer needs to be familiar with the site’s boundaries, natural and cultural history, surrounding uses, and the regulations governing its use. They should also be aware of the basic contacts for reporting problems.
- Site Monitors—as mentioned above this site will require an on-going effort to manage use once it is developed and open. Site monitors would be designated representatives of the Park Commission and carry identification. They would pass through the park on peak use days. They would provide information about the history of the site and its use regulations.
- Natural/Cultural History Walk Leaders—The Town Forest offers many opportunities for interpretation. It has a rich natural history that can be an exciting subject. It is also an excellent site for guided natural history walks. Scheduling and advertising a series of community walks throughout the year could be a popular activity for both

- individuals and families with children. Such walks could also be offered to local school classes in conjunction with learning about local cultural and natural history.
- **Maintenance Workers**—a group spring-cleaning day could be an event that attracts a group of stewards and other volunteers. In addition to picking up litter and sprucing up the other facilities to be developed in the park, these days could also be used to work on controlling non-native invasive species.

Potential Volunteer Projects

There are numerous projects that can be advanced by volunteers. Garden clubs, scout groups, school classes, and others can participate in implementing this plan and improving the Town Forest. The following is a listing of potential volunteer projects. All projects need to be coordinated with the Conservation Commission.

Trail Work

(See section on Trail Design and Improvements and Appendix VI – Design Details)

Blocking/removal of existing trails to be closed

Clearing/marking of proposed hiking trails

Botanical Inventory

Continue development of Plant List (See Appendix I – Preliminary Plant List)

Identification and Certification of Vernal Pools

Potential vernal pools need to be examined in spring for indicator species

Vernal pools can then be certified (forms to fill out and file, see www.vernalpool.org)

Invasive Species

(See Appendix II – Invasive Non-native Plants)

Monitoring of Non-native Invasive Species

Periodic Removal of Non-native Invasive Species

Site Improvements

Development of picnic area near parking lot

Construction of Trailhead Kiosk

Native plantings around parking area (See Appendix V – Recommended Native Wildflowers, Shrubs and Vines)

Habitat Enhancement

(See Ecological/Forest Management Plan and Appendix IV – Ecological Management and Forest Management Summary)

Periodic clearing in specified areas

Pruning for views and “Crop Tree Management” of white pines

Bird nest boxes

Log and brush piles

Rock piles

Wildlife plantings (See Appendix V – Recommended Native Wildflowers, Shrubs and Vines)

Regional Trail Connections

Confirm and mark routes

Prepare trail map and guide

Periodic Clean-up

Litter removal, etc.

Volunteer Stewards

Site monitors

Natural/cultural history walk leaders

Costs

The appendix includes a table of cost estimates.

Annual Maintenance

The appendix includes a table of recommended annual maintenance tasks.

Appendix I – Preliminary Plant List

The following is a preliminary list of plants found at the Wilmington Town Forest. Inventory work was done from the winter of 2002 through the summer of 2003. Still many species, especially ephemeral wildflowers and other herbs could have been missed. Efforts to identify plants and animals in the forest should continue. Potentially invasive non-native species are indicated in bold type. Abundance is indicated in five categories with five as abundant. Wildlife value is an indication of the number of animal species that utilize the plant for food or shelter if the information is known.

Common Name	Scientific Name	Abundance	Wildlife Value
<i>Tree Layer</i>			
white pine	Pinus strobus	2	47
pitch pine	<i>Pinus rigida</i>	1	Cover
red cedar	<i>Juniperus virginiana</i>	1	Food & Cover
white oak	<i>Quercus alba</i>	5	75
black oak	Quercus velutina	5	75
scarlet oak	Quercus coccinea	1	75
chestnut oak	Quercus prinus	1	75
red oak	Quercus rubra	5	75
swamp white oak	<i>Quercus bicolor</i>	5	75
red maple	<i>Acer rubrum</i>	2	18
American beech	<i>Fagus grandifolia</i>	2	?
white ash	<i>Fraxinus americana</i>	1	8
green ash	<i>Fraxinus pennsylvanica</i>	1	11
black locust	<i>Robinia pseudoacacia</i>	1	?
hickory	<i>Carya spp.</i>	2	34
tupelo	<i>Nyssa sylvatica</i>	1	
yellow birch	<i>Betula alleghaniensis</i>	2	9
gray birch	<i>Betula populifolia</i>	2	9
paper birch	<i>Betula papyrifera</i>	1	9
big-toothed poplar	<i>Populus grandidentata</i>	3	7
aspen	<i>Populus spp</i>	2	7
black cherry	<i>Prunus serotina</i>	3	81
American elm	<i>Ulmus americana</i>	1	
Scotch pine	<i>Pinus sylvestris</i>	1	?
pears	<i>Pyrus communis</i>	1	?
apples	<i>Malus pumila</i>	1	?
<i>Shrub Layer</i>			
black cherry	<i>Prunus serotina</i>	1	81
scrub oak	<i>Quercus ilicifolia</i>	1	75
poplars	<i>Populus spp.</i>	2	4
gray birch	<i>Betula populifolia</i>	1	9
sassafras	<i>Sassafras alabidum</i>	2	?

Common Name	Scientific Name	Abundance	Wildlife Value
buckthorn	<i>Rhamnus spp.</i>	2	?
common green briar	<i>Smilax rotundifolia</i>	1	?
red maple	<i>Acen rubram</i>	1	?
honeysuckle	<i>Lonicera morrowii</i>	1	18
Oriental bittersweet	<i>Celastrus orbiculatus</i>	5	15
blackberries	<i>Rubus allegheniensis</i>	4	49
raspberry	<i>Rubus spp.</i>	4	97
huckleberry	<i>Gaylussacia baccata</i>	4	12
blueberries	<i>Vaccinium spp.</i>	5	53
witch-hazel	<i>Hamamelis virginiana</i>	1	
chokeberry	<i>Aronia spp.</i>	2	12
wild indigo	<i>Baptisia tinctoria</i>	2	Butterfly
elderberry	<i>Sambucus canadensis</i>	1	Butterfly
alternate-leaved dogwood	<i>Cornus alternifolia</i>	1	?
silky dogwood	<i>Cornus amomum</i>	1	?
maple-leaved viburnum	<i>Viburnum acerifolium</i>	1	10
arrow-wood	<i>Viburnum dentatum</i>	1	10
wild raisin	<i>Viburnum nudum</i>	2	31
wild sarsaparilla	<i>Aralia nudicalulis</i>	1	?
spreading dogbane	<i>Apocynum androsaemifolium</i>	1	43
spice-bush	<i>Lindera benzoin</i>	1	15
sheep-laurel	<i>Kalmia angustifolia</i>	1	?
sweet pepper-bush	<i>Clethra alnifolia</i>	1	8
swamp azalea	<i>Rhododendron viscosum</i>	1	?
winterberry	<i>Ilex verticillata</i>	2	9
sweet fern	<i>Comptonia peregrina</i>	2	?
spirea, meadowsweet	<i>Spiraea alba</i>	1	8
steeple-bush	<i>Spiraea tomentosa</i>	1	8
smooth sumac	<i>Rhus glabra</i>	1	50
grapes	<i>Vitis spp.</i>	1	75
poison sumac	<i>Toxicodendrol vernix</i>	1	?
skunk cabbage	<i>Symplocarpus foetidus</i>	1	?
bayberry	<i>Myrica pensylvanica</i>	1	22
pussy willow	<i>Salix discolor</i>	1	10
Canadian rockrose	<i>Helianthemum canadense</i>	1	18
hay-scented fern	<i>Dennstaedtia punctilobula</i>	2	?
Japanese barberry	<i>Berberis thunbergii</i>	1	?
multiflora rose	<i>Rosa multiflora</i>	1	18
autumn olive	<i>Elaeagnus umbellata</i>	1	?
white mulberry	<i>Morus alba</i>	1	44
<i>Herb Layer</i>			
common dandelion	<i>Taraxacum officinale</i>	2	?
plantain	<i>Plantago spp.</i>	2	?

Common Name	Scientific Name	Abundance	Wildlife Value
poison ivy	<i>Toxicodendron radicans</i>	2	?
whorled loosestrife	<i>Lysimachia quadrifolia</i>	1	?
pipsissewa	<i>Chimaphila umbellata</i>	2	?
wintergreen	<i>Gaultheria procumbens</i>	2	?
princess pine	<i>Lycopodium obscurum</i>	2	?
Indian cucumber-root	<i>Medeola virginiana</i>	1	?
pink lady's slipper	<i>Cypripedium acaule</i>	1	?
ground cedar	<i>Diphasiastrum digitatum</i>	1	?
cinquefoil	<i>Potentilla spp.</i>	3	9
bluets	<i>Houstonia caerulea</i>	2	11
cranberry	<i>Vaccinium macrocarpon</i>	1	53
creeping dewberry	<i>Rubus hispidus</i>	1	49
wild strawberry	<i>Fragaria sp.</i>	1	5
partridge-berry	<i>Mitchella repens</i>	1	?
birdsfoot trefoil	<i>Lotus corniculatus</i>	1	Food & Cover
common stitchwort	<i>Stellaria graminea</i>	1	?
cow-vetch	<i>Vicia cracca</i>	1	14
wild madder	<i>Rubia tinctoria</i>	1	?
pigweed	<i>Chenopodium album</i>	1	?
mugwort	<i>Artemisia vulgaris</i>	1	?
tower-mustard	<i>Arabis glabra</i>	1	Caterpillar
white campion	<i>Silene latifolia</i>	1	?
common ragweed	<i>Ambrosia artemisiifolia</i>	1	?
cleavers	<i>Galium aparine</i>	1	?
bittersweet nightshade	<i>Solanum dulcamara</i>	1	?
milkweed	<i>Asclepias spp.</i>	1	42
tall buttercup	<i>Ranunculus acris</i>	1	?
clammy ground cherry	<i>Physalis heterophylla</i>	1	?
red clover	<i>Trifolium pratense</i>	1	?
yarrow	<i>Achillea millefolium</i>	1	3
alfalfa	<i>Medicago sativa</i>	1	5
common wintercress	<i>Barbarea vulgaris</i>	1	?
pokeweed	<i>Phytolacca americana</i>	2	?
mullen	<i>Verbascum thapsus</i>	1	?
evening primrose	<i>Oenothera biennis</i>	2	?
goldenrods	<i>Solidago spp.</i>	2	18
cardinal flower	<i>Lobelia cardinalis</i>	1	?

grasses
sedges

~~Grasses~~
~~Carex spp.~~

~~Pogonaceae~~
~~Carex spp.~~

grasses?
sedges?

~~Poaceae~~
~~Carex spp.~~

~~Poaceae~~
~~Carex spp.~~

Appendix II – Invasive Non-native Plants

Invasive Non-Indigenous Plants in Massachusetts

Scientific Name	Common Name	Likely Invasive	Invasive
<i>Aegopodium podagraria</i>	Goutweed		X
<i>Ailanthus altissima</i>	Tree-of-heaven		X
<i>Alliaria petiolata</i>	Garlic mustard		X
<i>Berberis thunbergii</i>	Japanese barberry		X
<i>Cabomba caroliniana</i>	Carolina fanwort		X
<i>Celastrus orbiculatus</i>	Oriental bittersweet		X
<i>Cynanchum louiseae</i>	Black swallow-wort		X
<i>Eleagnus umbellata</i>	Autumn olive		X
<i>Frangula alnus</i>	Glossy or European buckthorn		X
<i>Glaucium flavum</i>	Sea or horned poppy		X
<i>Hesperis matronalis</i>	Dame's rocket		X
<i>Iris pseudacorus</i>	Yellow iris		X
<i>Lepidium latifolium</i>	Broad-leaved pepperweed		X
<i>Lonicera x bella</i>	Bell's honeysuckle		X
<i>Lonicera japonica</i>	Japanese honeysuckle		X
<i>Lonicera morrowii</i>	Morrow honeysuckle		X
<i>Lysimachia nummularia</i>	Moneywort, Creeping Jenny		X
<i>Lythrum salicaria</i>	Purple loosestrife		X
<i>Myriophyllum heterophyllum</i>	Variable water-milfoil		X
<i>Myriophyllum spicatum</i>	Spiked water-milfoil		X
<i>Phragmites australis</i>	Phragmites, common reed		X
<i>Polygonum cuspidatum</i>	Japanese knotweed		X
<i>Potamogeton crispus</i>	Curly or crisped pondweed		X
<i>Rhamnus cathartica</i>	Common buckthorn		X
<i>Robinia pseudoacacia</i>	Black locust		X
<i>Rosa multiflora</i>	Multiflora rose		X
<i>Trapa natans</i>	Water-chestnut		X
<i>Centaurea maculosa</i>	Spotted knapweed	X	
<i>Cynanchum rossicum</i>	Pale swallow-wort	X	
<i>Egeria densa</i>	Brazilian water-weed	X	
<i>Epilobium hirsutum</i>	Hairy willow-herb	X	
<i>Euphorbia cyparissias</i>	Cypress spurge	X	
<i>Hydrilla verticillata</i>	Watertyme	X	
<i>Microstegium vimineum</i>	Japanese stilt grass	X	
<i>Myosotis scorpioides</i>	Forget-me-not	X	
<i>Najas minor</i>	Lesser naiad	X	
<i>Ranunculus repens</i>	Creeping buttercup	X	
<i>Tussilago farfara</i>	Coltsfoot	X	

Source: The Evaluation of Non-native Plant Species for Invasiveness in Massachusetts, Leslie J Mehrhoff, University of Connecticut, March 2003. Source is available on the New England Wildflower Society webpage.

http://www.newfs.org/conserve/docs/evaluation_for_invasiveness1.pdf

Appendix III – Existing Trail Inventory

The following inventory shows each major trail at the Town Forest. A green dashed line indicates the trail being described. Other nearby trails are shown in red. Desirable views are also indicated in green while views of developed areas are shown in blue. Potential destinations are indicated with a *. The trail profiles exaggerate the vertical dimension in order to more easily show the steepness of the trail.

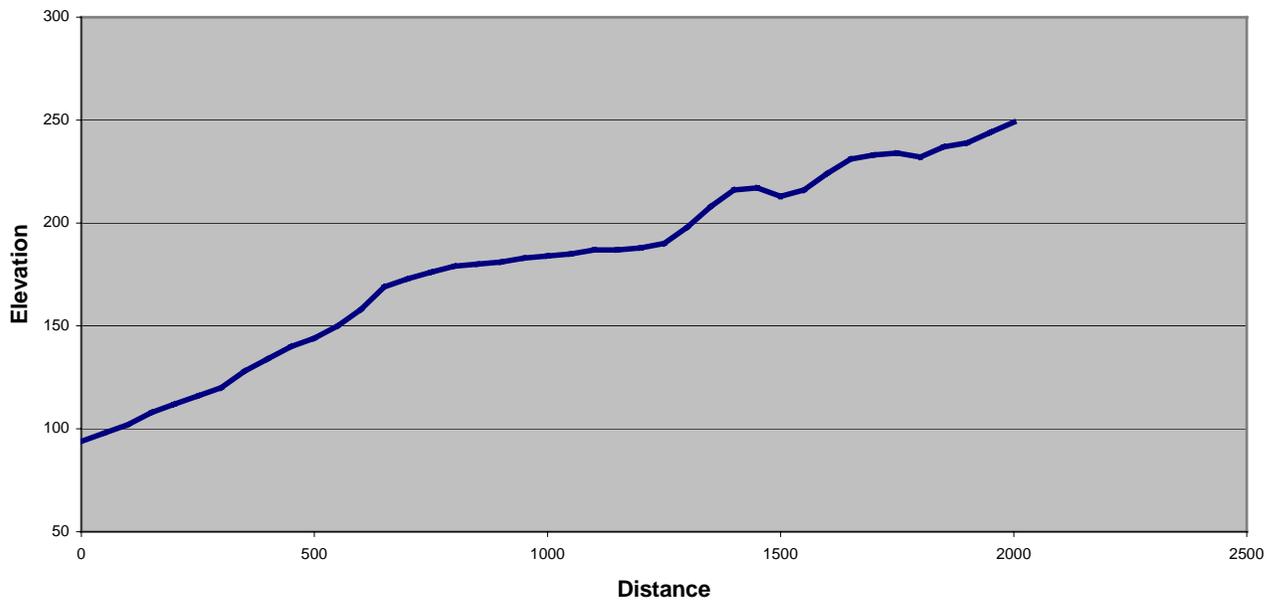
Trail "A"



Trail "A" is located in the southeast corner of the site. It runs just over 2,090 feet from the existing parking area on Andover Street uphill through a disturbed area that was used as a gravel source, along stonewalls and to the water tower. It varies in width, sometimes following an old woods road. It climbs 162 feet, beginning at 94 feet, the site's lowest point, and rising rapidly to its highest point, 256 feet. As such it has some of the steepest and most erosion-prone sections of trails in the Town Forest. It has several sections with a slope of more than 15% and one section more than 20%. It passes close to the backyards of two homes on Fiorenza Drive. A poorly defined side trail (Trail J) to the right leads past several points that offer exceptional views over Fosters Pond to the east. Another side-trail (Trail L) runs along the boundary between the Town Forest and the

residences on Fiorenza Drive.

Trail A

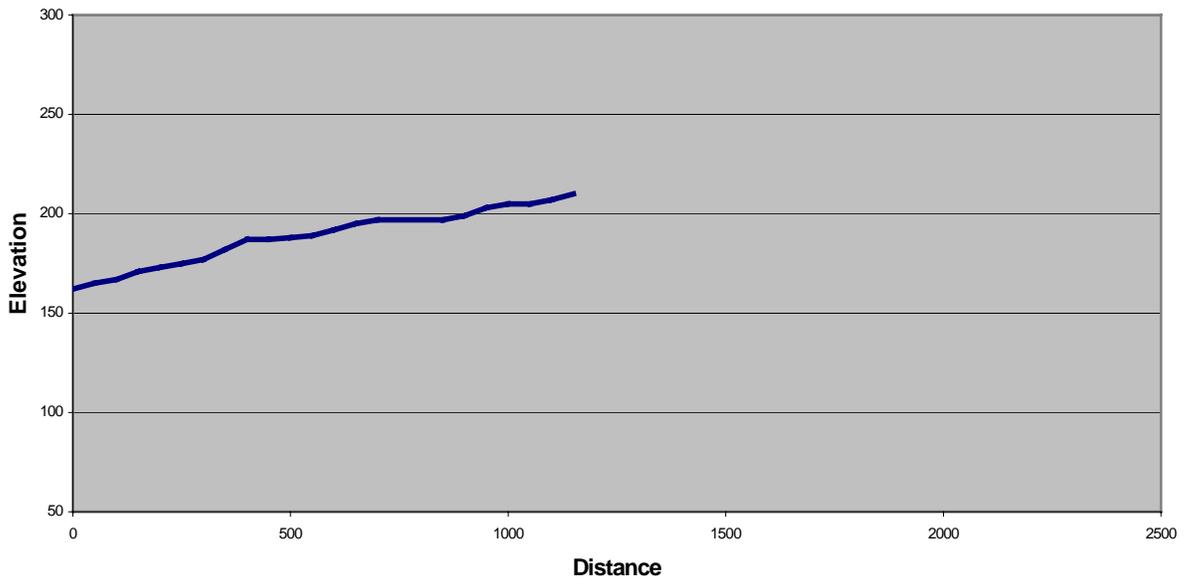


Trail "B"



Trail "B" is located near the center of the site. It runs 1,172 feet from the access road to Camp Forty Acres to Trail "C". It is a well-established woods-road. It climbs 48 feet, beginning at an elevation of 162 feet and rising to its intersection with trail "C" at 210 feet. It is a gentle trail with no slopes greater than 10%. It passes through an attractive mixed oak forest with many large boulders. A relatively small area of erosion is located at the first sharp bend in the trail. This eroded area appears to be due to ATV use. The trail splits for a short distance before rejoining itself at this eroded area. It passes through young mixed oaks interspersed with several appealing large boulders.

Trail B

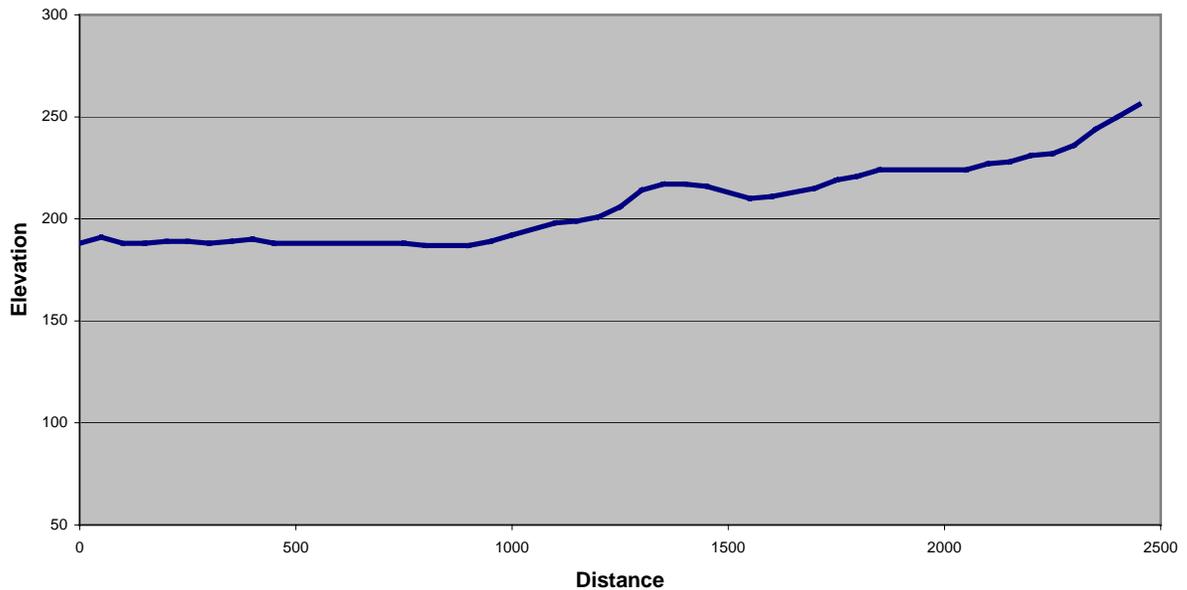


Trail "C"



Trail "C" is located in the center of the site. It begins at a parking area at the end of Research Drive. It runs just over 2,469 feet from the parking area to the water tower. It is also a well-established woods-road. It climbs 68 feet, beginning at an elevation of 188 feet, and rising to the water tower at 256 feet. Along the way it meets Trail "B" and joins Trail "A" at the water tower. The trail is nearly level for its first 1,000 feet. It has two steep areas where slopes are between 10% and 16%. It runs past an abandoned field near the end of Research Drive and passes through young mixed oaks. It passes the remains of an old farm building as it begins the rise to the water tower.

Trail C

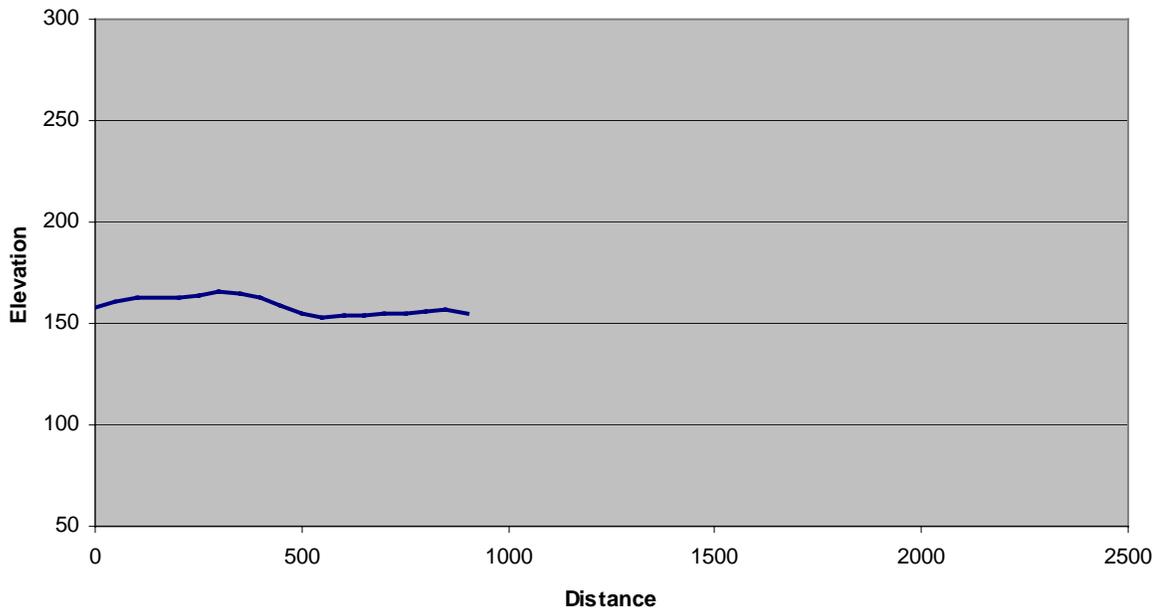


Camp Forty Acres Access Road



The Camp Forty Acres access road crosses a corner of the Town Forest and joins Trail “B”. This gravel road runs about 826 feet from the Town Forest boundary to a turn-around and the camp’s parking area. The access road is nearly level. It rises from an elevation of 158 feet to 166 feet and then declines to 155 feet. The road has gentle slopes that never exceed 10%. A new restroom facility has been built near the camp’s parking area. The road runs through predominately young mixed oaks.

Camp Forty Acres Road

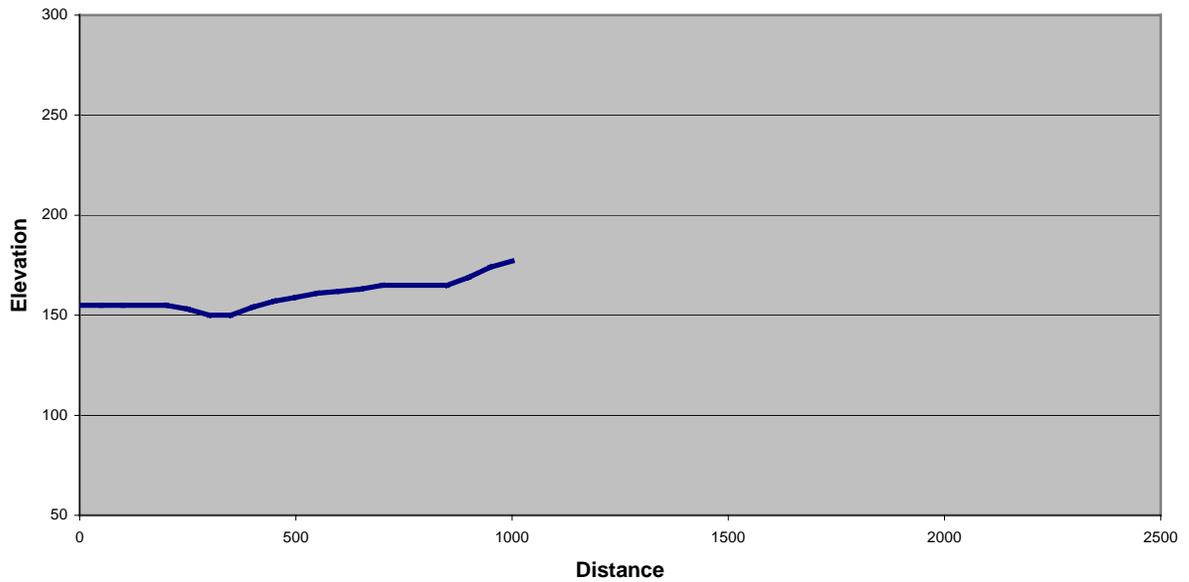


Trail D1



Trail "D1" begins at the turn-around in Camp Forty Acres and runs 1,000 feet to the west where it continues as Trail "D2" and meets Trail "F". It is totally on Camp Forty Acres property. At a distance of 325 feet it crosses the brook that flows from the wetland to the pond. It begins at an elevation of 155 feet, declines to less than 150 feet and then rises to 177 feet.

Trail D1

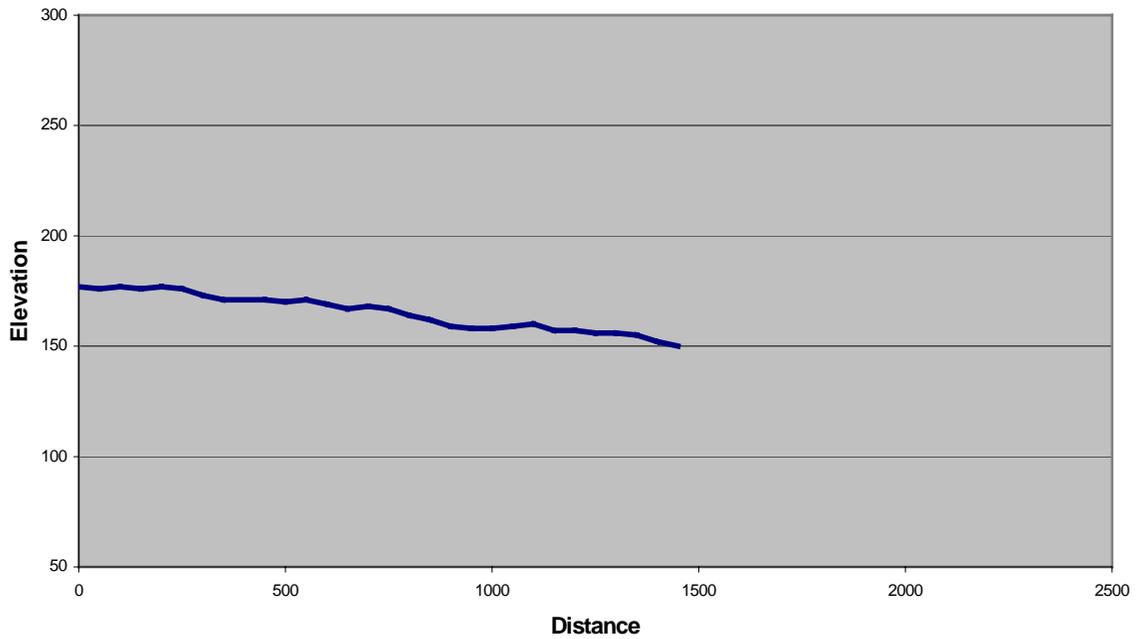


Trail "D2"



Trail "D2" is the continuation of trail "D1". It begins at the intersection of Trail "D1" and Trail "F" inside the Camp Forty Acres property. It runs 1,466 feet to Ballardvale Street. It gently descends from 177 feet to 150 feet or a total of 27 feet. No slopes along this trail exceed 6%. The trail passes through young mixed oaks. There are a few small piles of trash located along this trail, especially closer to Ballardvale Street.

Trail D2

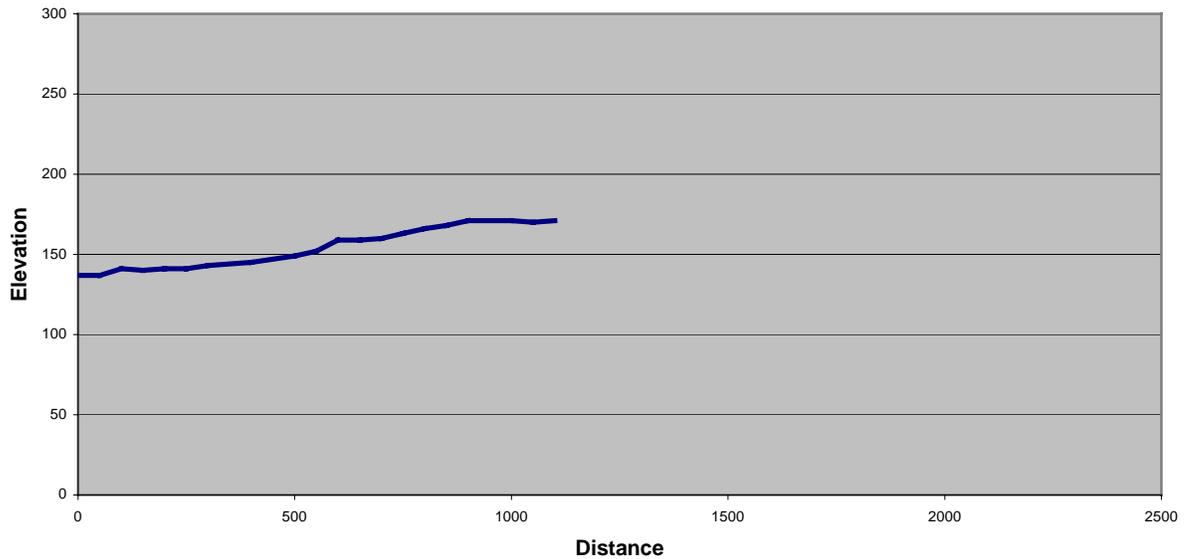


Trail "E"



Trail "E" is located in the northwest corner of the Town Forest. It runs 1,100 feet from Ballardvale Street to the intersection with Trail "D2". It gently climbs from 137 to 171 feet or a total of 34 feet. It does have one fifty-foot rise that has a slope of 14%, but for most of its length it has gentle slopes. Side trails (874 feet total) connect to Trail D2 at a lower elevation and to Trail G. This trail and several others in this area have been created by ATV use. Traffic noise from Ballardvale Street can be heard along much of the length of this trail. Informal access to the trail is available from Ballardvale Street up a steep slope.

Trial E

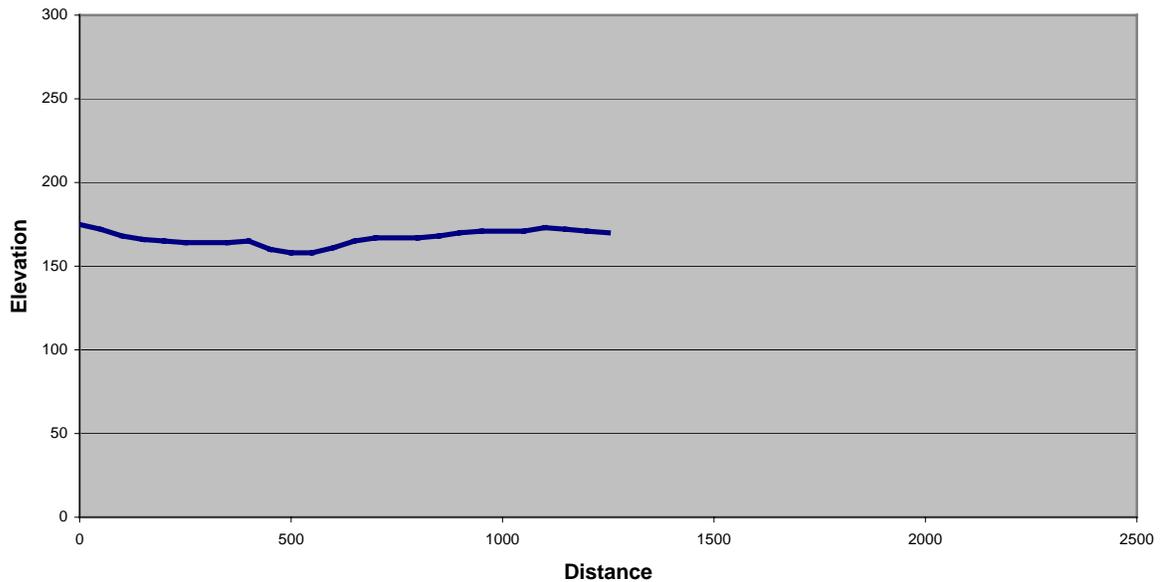


Trail "F"



Trail F begins at the intersection of Trail "D1" and "D2" and runs 1,873 feet to a connection with Trail "C". It descends from 175 feet at the intersection with "D1" and "D2" to the red maple wooded swamp at 158 feet and then climbs to 173 before it descends again to 170 feet. This trail has gentle slopes with only one fifty-foot area with a slope of 10%. This trail is apparently the result of use by an all-terrain-vehicle that has done considerable damage to the wetland. The remainder of the trail runs through young mixed oaks and gently rolling terrain.

Trail F

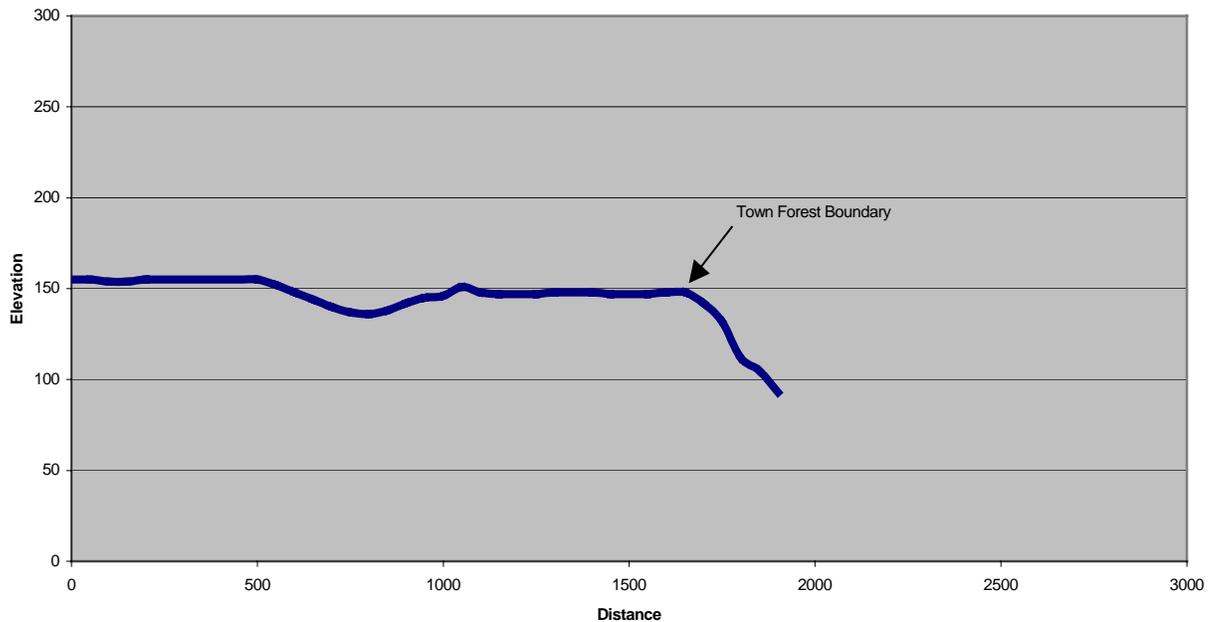


Trail "G"



Trail "G" runs from Trail "D1" in Camp Forty Acres to the backyard of a home on River Street in Andover. It is 1,650 feet from its intersection with Trail "D1" on Camp Forty Acres land to the Town Forest Boundary. It runs another 250 feet down a steep slope to the backyard. The trail is nearly level at 155 feet in elevation for its first 500 feet and then dips down to 136 feet before rising again to 148 feet. It is gently sloped with only one fifty-foot length with a slope of 10%. From the Town Forest boundary it steeply descends 40 feet in 250 feet. This trail is the result of ATV use originating at the backyard of 100 River Street in Andover. The trail passes through young mixed oaks and offers views overlooking houses in Andover. Its total length, including the two forks is 2,580 feet.

Trail G

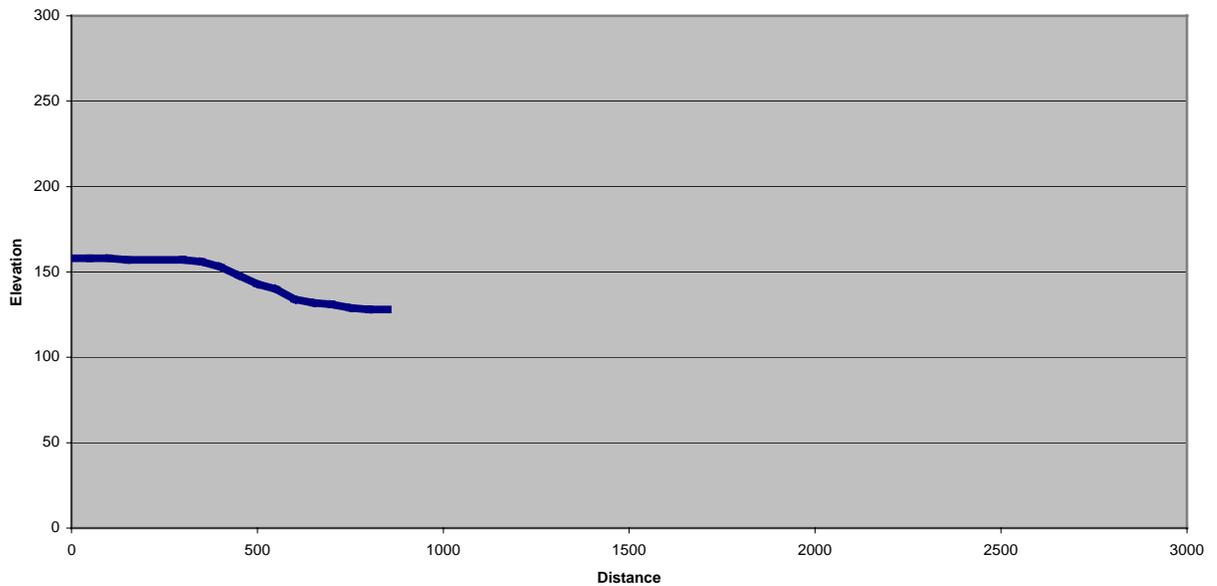


Trail H



Trail H is another ATV created trail leading from Trail D2 to the Town Forest boundary near Ballardvale Street. It runs 814 feet and begins at an elevation of 158 feet. It is nearly level for the first 370 feet and then it descends to an elevation of 128 and dead-ends in a wet area for a total drop of 30 feet. In general the trail has very gentle slopes with just three short areas with slopes of 10% to 12%. The trail passes through young mixed oaks. Traffic from Ballardvale Street can be heard but the road is not visible until the trail's end.

Trail H

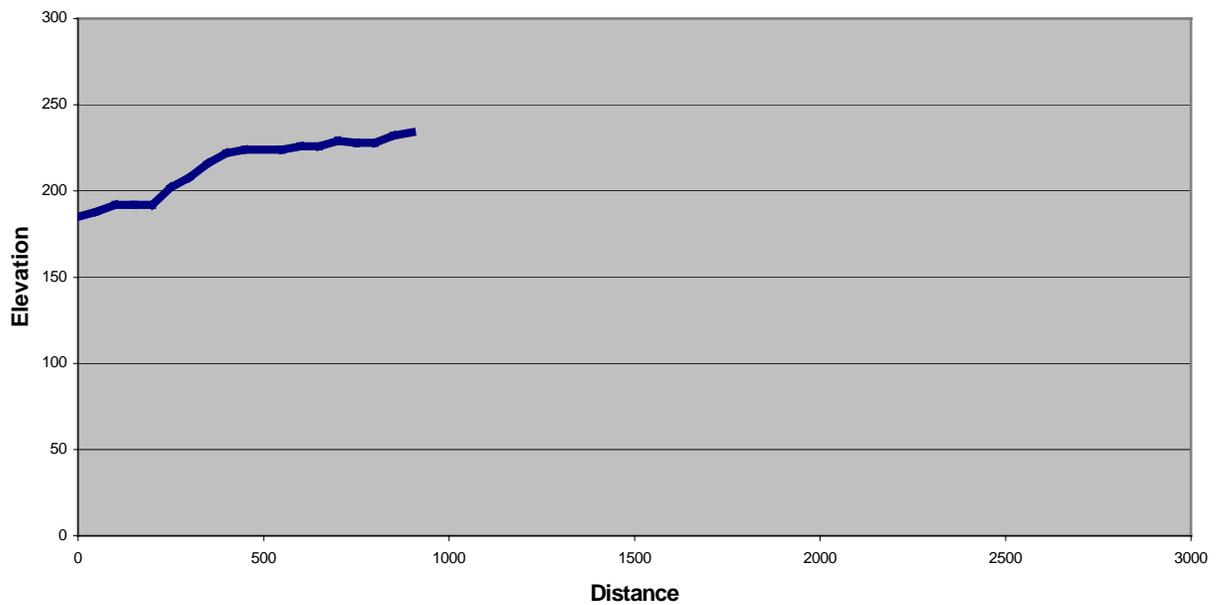


Trail I

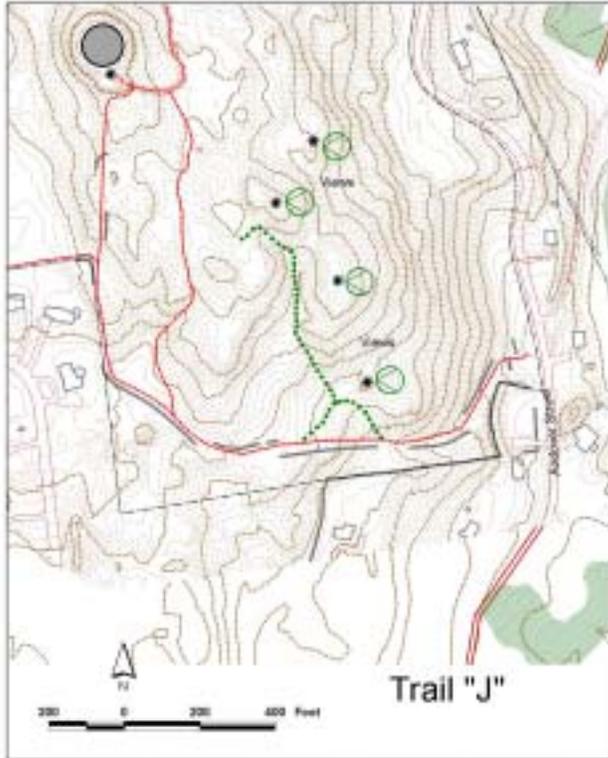


Trail "I" runs from Trail "A" to Trail "C" near the water tower. It is 940 feet long and rises from 184 feet to 238 feet at its intersection with Trail "C" for a total rise of 54 feet. This trail has one steep section of 200 feet with slopes from 12% to 20%.

Trail I

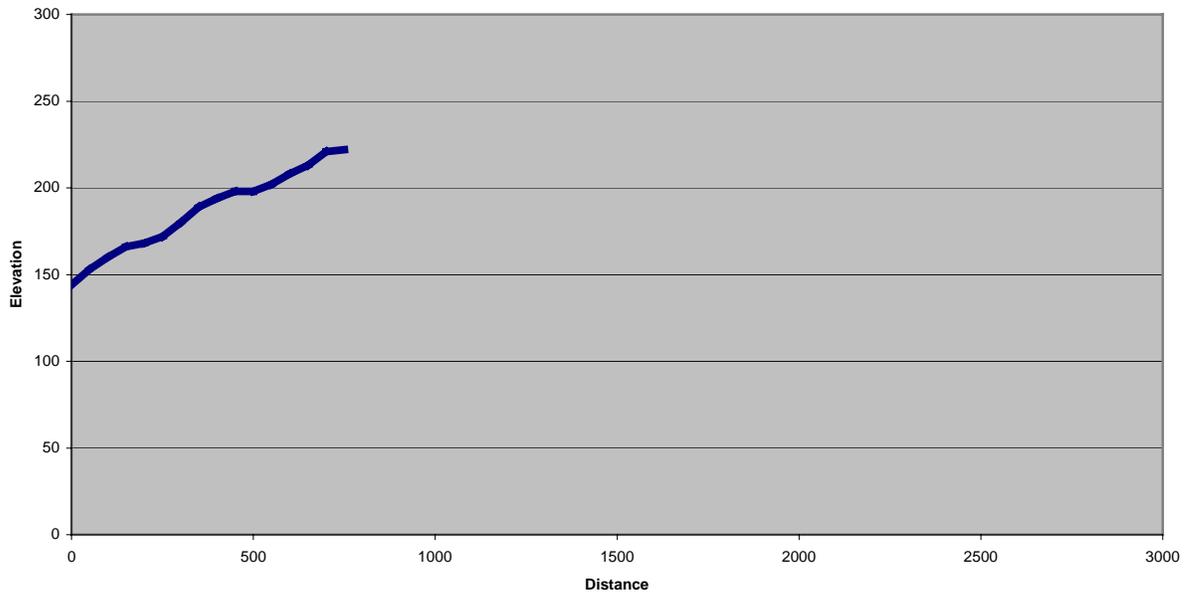


Trail "J"

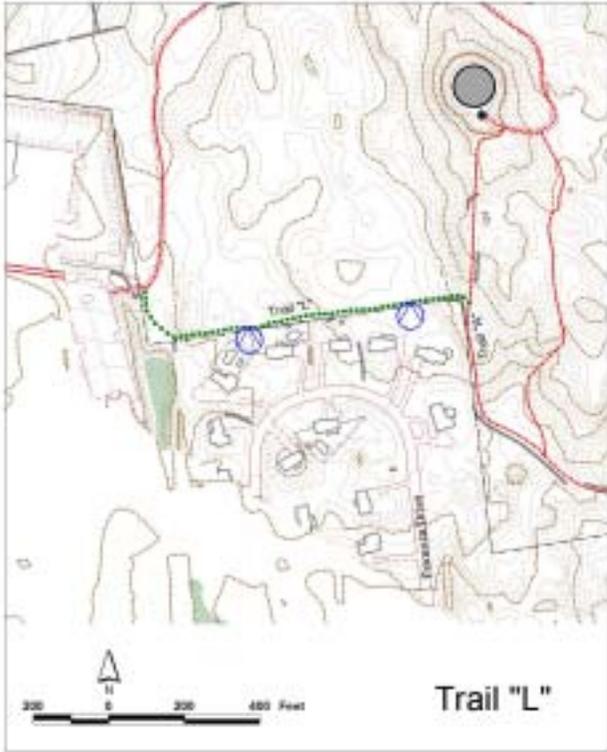


Trail "J" runs along a grown over road used during the gravel extraction operation. It dead-ends, but it does provide the nearest access to several rocky summits that offer views over Fosters Pond. The trail begins at 148 feet and rises steeply to 222 feet for a total rise of 74 feet in its 750-foot length. Slopes run between 10% and 18% for much of this trail's length. This very steep trail is highly susceptible to erosion.

Trail J

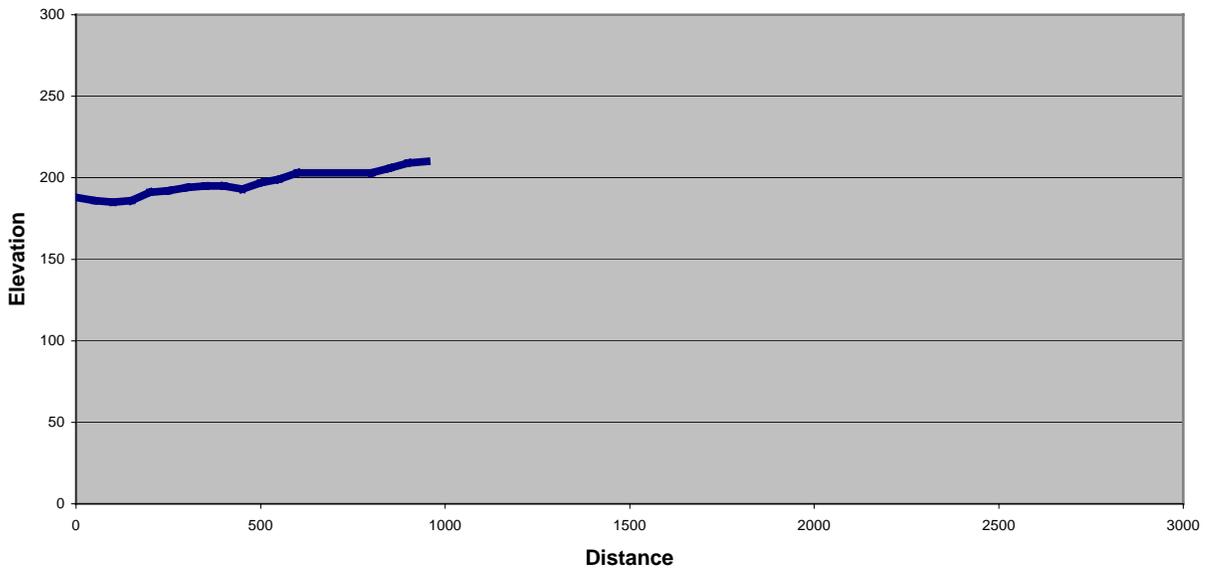


Trial "L"

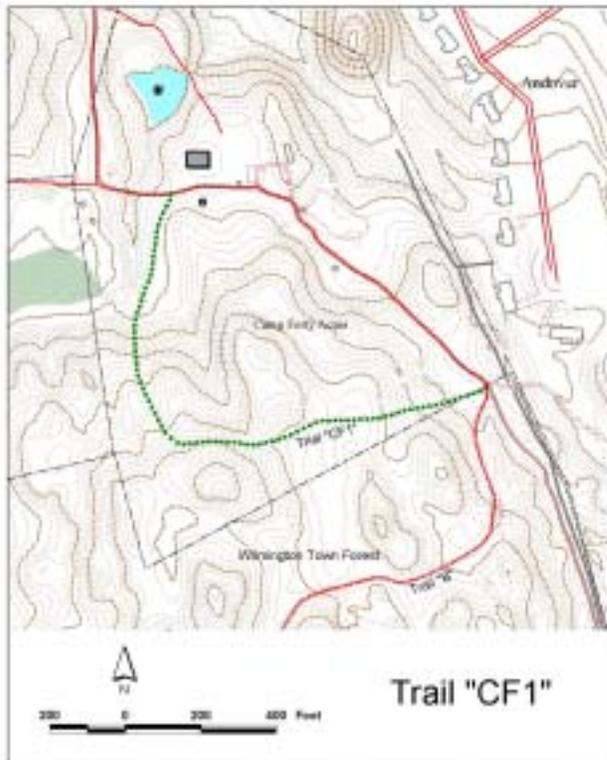


Trail "L" runs 963 feet along the southern boundary of the Town Forest and behind the houses on Fiorenza Drive. The trail rises from 188 feet at the parking area at the end of Research Drive to 210 feet at its intersection with Trail "A". Slopes are gentle with only one length of fifty feet with a slope of 10%. It looks into the backyards of several of the homes along Fiorenza Drive as it passes through young mixed oaks.

Trail L

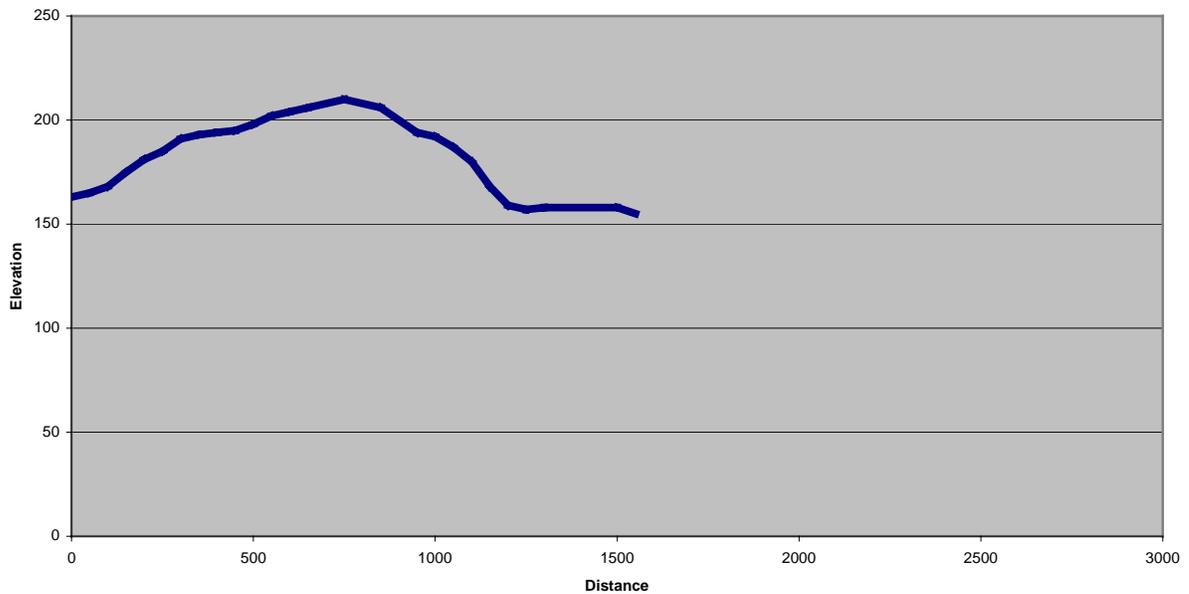


Trail "CF1"



Trail "CF1" is a main trail on the property of Camp Forty Acres. It begins at the intersection of the camp's access road and Trail "B" and ends near the camp's dining shelter for a total distance of 1,552 feet. It rises from 163 feet at the intersection with Trail "B" to a high point of 210 feet before descending to an elevation of 155 feet near the camp buildings. It passes through young mixed oaks with a few white pines and passes the stream that runs from the wetland to the pond.

Trail CF1



Appendix IV – Ecological Management and Forest Management Summary

Stewardship Unit 1	As Needed
Management Goal	Allow area to serve as a buffer between Town Forest and residential development.
Management Concerns	Invasive non-native species, especially bittersweet.
Management Recommendations	Periodic removal of invasive species.
Management Actions/Priority	Habitat Enhancement/Medium Priority. Control of invasive species.
Stewardship Unit 2	By Fall 2010
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Maintain a majority of oaks as a source of food for wildlife.
Management Concerns	Unauthorized cutting. ATV use by abutters. Minor amount of litter/rubbish. Invasive non-native species, especially bittersweet.
Management Recommendations	Litter cleanup. Periodic removal of invasive non-native species. Prevent ATV use. Consider firewood harvest demonstration. Also consider girdling 1 to 6 diseased or deformed hardwood and 1 to 6 diseased or deformed softwood trees/acre to favor better-formed trees and provide additional snags. Consider making rock piles and brush piles.
Management Actions/Priority	Improvement Thinning/Woodlot/High Priority. Prevent unauthorized cutting and ATV use.
Stewardship Unit 3	By Fall 2013
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Preserve snags and maintain a majority of oaks as a source of food for wildlife.
Management Concerns	None
Management Recommendations	Where there are few snags consider girdling 1 to 6 diseased or deformed hardwood and 1 to 6 diseased or deformed softwood trees/acre to favor better-formed trees and to provide snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Low Priority
Stewardship Unit 4	By Fall 2010
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Provides a buffer between Town Forest and adjacent development.
Management Concerns	None
Management Recommendations	Consider girdling 1 to 6 diseased or deformed hardwood trees/acre to favor better-formed trees and to provide snags. Favor white pines. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Improvement Thinning/Low Priority

Stewardship Unit 5	
Management Goal	Mixed stand of red maples and other hardwoods and white pine. Wildlife habitat.
Management Concerns	Invasive non-native species, especially buckthorn.
Management Recommendations	Periodic removal of invasive non-native species. Reassess in 10 years.
Management Actions/Priority	No Management Actions/Medium Priority. Control of invasive species
Stewardship Unit 6	By Fall 2010
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Provides a buffer between Town Forest and adjacent development.
Management Concerns	None
Management Recommendations	Same as SU 4. Consider girdling 1 to 6 diseased or deformed hardwood trees/acre to favor better-formed trees and to provide additional snags. Favor white pines. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Improvement Thinning/Low Priority
Stewardship Unit 7	As Needed
Management Goal	Maintain early to mid-successional habitat for wildlife.
Management Concerns	None
Management Recommendations	Clear, leaving standing dead trees, every 15 years. Consider making rock piles and brush piles.
Management Actions/Priority	Periodic Clear/Habitat Enhancement/Mow/Medium Priority
Stewardship Unit 8	
Management Goal	Allow area to develop naturally. Wetland nature of stand contributes to wildlife value of the property.
Management Concerns	Trail crossing of wetland. Buffer from surrounding activity.
Management Recommendations	Consider boardwalk or bridge. Establish riparian buffer zone. Reassess in 10 years.
Management Actions/Priority	No Forest Management Actions/Trail crossing high priority.

Stewardship Unit 9	By Fall 2013
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Maintain a majority of oaks as a source of food for wildlife. Part of wetland buffer.
Management Concerns	None
Management Recommendations	Potential pre-commercial thinning. Consider girdling 1 to 6 diseased or deformed hardwood and 1 to 6 diseased or deformed softwood trees/acre to favor better-formed trees and to provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Low Priority
Stewardship Unit 10	By Fall 2013
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Maintain a majority of oaks as a source of food for wildlife.
Management Concerns	Invasive non-native species, especially bittersweet.
Management Recommendations	Periodic removal of invasive non-native species. Clear around apples to improve their growing conditions and provide food for wildlife. Consider girdling 1 to 6 diseased or deformed hardwood and 1 to 6 diseased or deformed softwoods trees/acre to favor better-formed trees and to provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Medium Priority
Stewardship Unit 11	
Management Goal	Maintain as potential vernal pool habitat. Wildlife habitat.
Management Concerns	Potential vernal pool. Buffer from any surrounding activity.
Management Recommendations	Allow unit to develop naturally. Monitor as potential vernal pool habitat.
Management Actions/Priority	No Forest Management Actions. Establish buffer zone. Medium Priority
Stewardship Unit 12	
Management Goal	Maintain as potential vernal pool habitat. Wildlife habitat.
Management Concerns	Potential vernal pool. Buffer from any surrounding activity.
Management Recommendations	Allow unit to develop naturally. Monitor as potential vernal pool habitat.
Management Actions/Priority	No Forest Management Actions. Establish buffer zone. Medium Priority.

Stewardship Unit 13	By Fall 2013
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Maintain a majority of oaks as a source of food for wildlife.
Management Concerns	None
Management Recommendations	Consider girdling 1 to 6 diseased or deformed hardwood and 1 to 6 diseased or deformed softwood trees/acre to favor better-formed trees. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Low Priority
Stewardship Unit 14	By Fall 2013
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Maintain a majority of oaks as a source of food for wildlife.
Management Concerns	None
Management Recommendations	Consider girdling 1 to 6+ diseased or deformed hardwood and 1 to 6 diseased or deformed softwoods trees/acre to favor better-formed trees and to provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Low Priority
Stewardship Unit 15	
Management Goal	Allow area to develop naturally. Wetland nature of stand contributes to wildlife value of the property.
Management Concerns	Buffer from any surrounding activity.
Management Recommendations	Establish riparian buffer zone. Reassess in 10 years.
Management Actions/Priority	No Management Actions/Low Priority
Stewardship Unit 16	By Fall 2013
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Maintain a majority of oaks as a source of food for wildlife.
Management Concerns	None
Management Recommendations	Potential improvement thinning. Consider girdling 1 to 6 diseased or deformed hardwood and 1 to 6 diseased or deformed softwoods trees/acre to favor better-formed trees and to provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Low Priority

Stewardship Unit 17	
Management Goal	Allow area to develop naturally. Wetland nature of stand contributes to wildlife value of the property.
Management Concerns	Buffer from any surrounding activity.
Management Recommendations	Establish riparian buffer zone. Reassess in 10 years.
Management Actions/Priority	No Management Actions/Low Priority
Stewardship Unit 18	
Management Goal	Allow area to develop naturally. Wetland nature of stand contributes to wildlife value of the property.
Management Concerns	Buffer from any surrounding activity.
Management Recommendations	Establish riparian buffer zone. Reassess in 10 years.
Management Actions/Priority	No Management Actions/Low Priority
Stewardship Unit 19	
Management Goal	Mixed stand of hardwoods and white pine. Wildlife habitat. Maintain a majority of oaks as a source of food for wildlife.
Management Concerns	None
Management Recommendations	Candidate for “old growth”. Allow unit to develop naturally.
Management Actions/Priority	Old Growth/Low Priority
Stewardship Unit 20	
Management Goal	Mixed stand of white pine and hardwoods. Wildlife habitat. Maintain oaks as a source of food for wildlife.
Management Concerns	None
Management Recommendations	Candidate for “old growth”. Allow unit to develop naturally.
Management Actions/Priority	Old Growth/Low Priority
Stewardship Unit 21	
Management Goal	Mixed stand of red maple and other hardwoods with white pine. Wet nature of stand contributes to wildlife value of the property. Wildlife habitat.
Management Concerns	Invasive non-native species, especially buckthorn.
Management Recommendations	Periodic removal of invasive non-native species. Candidate for “old growth”. Allow unit to develop naturally.
Management Actions/Priority	No Management Actions/Medium Priority. Control of invasive species.

Stewardship Unit 22	
Management Goal	Mixed stand of white pine and mixed hardwoods. Wildlife habitat. Trail destination.
Management Concerns	None
Management Recommendations	Candidate for “old growth”. Allow unit to develop naturally.
Management Actions/Priority	Old Growth/Low Priority
Stewardship Unit 23	By Fall 2004
Management Goal	Mixed stand of oaks and other hardwoods. Wildlife habitat. Views.
Management Concerns	Invasive non-native species, especially bittersweet and buckthorn.
Management Recommendations	Periodic removal of invasive non-native species. Low thinning to improve aesthetic appearance. Consider girdling 1 to 6 diseased or deformed hardwood and 1 to 6 diseased or deformed softwoods trees/acre to favor better-formed trees and provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Medium Priority
Stewardship Unit 24	By Fall 2013
Management Goal	Mixed stand of oaks and other hardwoods. Wildlife habitat. Buffer between Town Forest and adjacent development.
Management Concerns	Invasive non-native species, especially bittersweet.
Management Recommendations	Periodic removal of invasive non-native species. Consider girdling 1 to 6 diseased or deformed hardwood and 1 to 6 diseased or deformed softwoods trees/acre to favor better-formed trees and provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Medium Priority
Stewardship Unit 25	2004
Management Goal	Mixed stand of oaks and other hardwoods. Wildlife habitat. Buffer between adjacent development and Town Forest.
Management Concerns	Invasive non-native species, especially bittersweet, autumn olive, and buckthorn.
Management Recommendations	Periodic removal of invasive non-native species. Allow unit to develop into forest. Preserve cedars for wildlife cover and food.
Management Actions/Priority	Habitat Enhancement/High Priority. Control of invasive species

Stewardship Unit 26	
Management Goal	Mixed stand of oaks and other hardwoods. Wildlife habitat. Buffer between adjacent development and Town Forest.
Management Concerns	Possible invasion by invasive non-native species.
Management Recommendations	Allow unit to develop naturally. Reassess in ten years.
Management Actions/Priority	No Management Actions/Low Priority. Control invasive species.
Stewardship Unit 27	By Fall 2013
Management Goal	Mixed stand of oaks and other hardwoods. Wildlife habitat.
Management Concerns	Invasive non-native species, autumn olive, especially around water tower.
Management Recommendations	Periodic removal of invasive non-native species. In areas with few snags, consider girdling 1 to 6 diseased or deformed hardwood and 1 to 6 diseased or deformed softwoods trees/acre to favor better-formed trees and provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Medium Priority
Stewardship Unit 28	As Needed
Management Goal	Develop into mixed hardwood forest.
Management Concerns	Invasive non-native species, buckthorn.
Management Recommendations	Periodic removal of invasive non-native species. Allow unit to develop into forest.
Management Actions/Priority	Habitat Enhancement/Medium Priority. Control of invasive species.
Stewardship Unit 29	As Needed
Management Goal	Allow area to serve as a buffer between Town Forest and adjacent development.
Management Concerns	Invasive non-native species, buckthorn.
Management Recommendations	Periodic removal of invasive non-native species. Allow unit to develop naturally.
Management Actions/Priority	Habitat Enhancement/Medium Priority. Control of invasive species.

Stewardship Unit 30	As Needed
Management Goal	Allow southern part of area to serve as a buffer between Town Forest and adjacent development. Patches of early to mid-successional habitat for wildlife.
Management Concerns	Invasive non-native species, multiflora rose.
Management Recommendations	Periodic removal of invasive non-native species. Allow southern area to develop naturally. Clear three 2 to 3 acre patches, leaving standing dead trees, every 15 years (one area every 5 years). Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Periodic Clear/Habitat Enhancement/Mow/Medium Priority. Allow southern area to develop as a buffer.
Stewardship Unit 31	As Needed
Management Goal	Maintain and expand early successional habitat for wildlife.
Management Concerns	Invasive non-native species, buckthorn, bittersweet and autumn olive.
Management Recommendations	Periodic removal of invasive non-native species. Expand open area to south. Mow open area every three years after nesting season.
Management Actions/Priority	Periodic Clear/Habitat Enhancement/Mow/Medium Priority. Control invasive species.
Stewardship Unit 32	As Needed
Management Goal	Allow western part of unit to serve as a buffer between Town Forest and adjacent development. Patches of early to mid-successional habitat for wildlife.
Management Concerns	Some rubbish.
Management Recommendations	Remove rubbish. Allow western area to develop naturally. Clear occasional patches, leaving standing dead trees, every 5 to 7 years. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Periodic Clear/Habitat Enhancement/Mow/Medium Priority
Stewardship Unit 33	As Needed
Management Goal	Maintain early to mid-successional habitat for wildlife.
Management Concerns	Old tires and other rubbish.
Management Recommendations	Clear occasional patches, leaving standing dead trees, every 5 to 7 years. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Periodic Clear/Habitat Enhancement/Mow/Medium Priority

Stewardship Unit 34	
Management Goal	Mixed stand of oaks and other hardwoods. Wildlife habitat.
Management Concerns	None
Management Recommendations	Allow unit to develop naturally. Reassess in ten years.
Management Actions/Priority	No Management Actions/Low Priority
Stewardship Unit 35	By Fall 2008
Management Goal	White pine stand with mixture of other species. Wildlife habitat. Potential yarding area for deer.
Management Concerns	None
Management Recommendations	Crop tree pruning to improve views and potential future commercial value of pines. Consider girdling 1 to 6 diseased or deformed trees/acre to favor better-formed trees and provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Pruning/Medium Priority
Stewardship Unit 36	By Fall 2013
Management Goal	Maintain as a buffer between Forest and adjacent development. Wildlife habitat.
Management Concerns	Some rubbish along trail.
Management Recommendations	Remove rubbish. Consider girdling 1 to 6 diseased or deformed hardwood trees/acre to favor better-formed trees and provide additional snags. Also consider girdling 1 to 6 diseased or deformed softwoods. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Low Priority
Stewardship Unit 37	By Fall 2008
Management Goal	White pine stand with mixture of other species. Wildlife habitat. Potential yarding area for deer.
Management Concerns	None
Management Recommendations	Crop tree pruning to improve views and potential future commercial value of pines. Consider girdling 1 to 6 diseased or deformed trees/acre to favor better-formed trees and provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Pruning/Medium Priority

Stewardship Unit 38	By Fall 2008
Management Goal	White pine stand with mixture of other species. Wildlife habitat.
Management Concerns	None
Management Recommendations	Pruning to improve views and potential future commercial value of pines. Consider girdling 1 to 6 diseased or deformed trees/acre to favor better-formed trees and provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Thinning/Medium Priority. Weed and Green.
Stewardship Unit 39	By Fall 2008
Management Goal	White pine stand with mixture of other species. Wildlife habitat. Potential yarding area for deer.
Management Concerns	None
Management Recommendations	Crop tree pruning to improve views and potential future commercial value of pines. Consider girdling 1 to 6 diseased or deformed trees/acre to favor better-formed trees and provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	Pruning/Medium Priority
Stewardship Unit 40	
Management Goal	Maintain as a buffer between Forest and adjacent development. Wildlife habitat.
Management Concerns	None
Management Recommendations	Consider girdling 1 to 6 diseased or deformed trees/acre to favor better-formed trees and provide additional snags. Consider making rock piles and brush piles for wildlife.
Management Actions/Priority	No Management Actions/Low Priority

Appendix V. Recommended Native Wildflowers, Shrubs, and Vines

Listed by Wildlife Value

Species	Latin Name	Soil	Fruit Season	Forest Planting	Wildlife Value*
Shrubs and Vines					
Allegheny Blackberry	<i>Rubus allegheniensis</i>	dry, acid	su, fa		97
Wild Red Raspberry	<i>Rubus idaeus v strigosus</i>	dry, acid	su, fa		97
Black Raspberry	<i>Rubus occidentalis</i>	dry, acid	su, fa		97
Dwarf Raspberry	<i>Rubus pubescens</i>	wet, acid/alk.	su, fa	x	97
Swamp Dewberry	<i>Rubus hispidus</i>	wet, acid	su		97
Scrub Oak	<i>Quercus ilicifolia</i>	dry, acid	fa		96
Dwarf Chinquapin Oak	<i>Quercus prinoides</i>	dry, acid	fa		96
Fire or Pin Cherry	<i>Prunus pensylvanica</i>	dry, acid	su, fa		81
Chokecherry	<i>Prunus virginiana</i>	dry, acid/alk.	su	x	81
Common Elderberry	<i>Sambucus canadensis</i>	wet, acid	su, fa		79
Summer Grape	<i>Vitis aestivalis</i>	dry/wet, acid	fa	x	75
Riverbank Grape	<i>Vitis riparia</i>	wet, acid/alk.	su, fa		75
Fox Grape	<i>Vitis labrusca</i>	dry, acid	su, fa		75
Flowering Dogwood	<i>Cornus florida</i>	dry, acid	su	x	64
White Dogwood	<i>C. racemosa/foemina</i>	dry, acid/alk.	su		64
Pagoda Dogwood	<i>Cornus alternifolia</i>	dry, alkaline	su	x	64
Roundleaf Dogwood	<i>Cornus rugosa</i>	dry, alkaline	su		64
Downy Shadbush	<i>Amelanchier arborea</i>	dry, acid/alk.	su	x	58
Smooth Shadbush	<i>A. arborea v laevis</i>	dry, acid	su	x	58
Running Shadbush	<i>Amelanchier stolonifera</i>	dry, acid	su		58
Thicket Shadbush	<i>Amelanchier canadensis</i>	wet, acid	su	x	58
Highbush Blueberry	<i>Vaccinium corymbosum</i>	wet, acid/alk.	su	x	58
Low Sweet Blueberry	<i>V. angustifolium</i>	dry, acid	su		53
Lowbush Blueberry	<i>Vaccinium pallidum</i>	dry, acid	su	x	53
Cranberry	<i>Vaccinium macrocarpon</i>	wet, acid	fa, wi		53
Winged Sumac	<i>Rhus copallinum</i>	dry, acid	fa		50
Smooth Sumac	<i>Rhus glabra</i>	dry, acid	su, fa		50
Staghorn Sumac	<i>Rhus hirta</i>	dry, acid	fa, wi		50
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	dry, alkaline	su, fa, wi	x	37
Inkberry	<i>Ilex glabra</i>	dry, acid	fa, wi, sp	x	36
American Holly	<i>Ilex opaca</i>	dry, acid	fa, wi	x	36
Smooth Winterberry	<i>Ilex laevigata</i>	wet, acid	fa, wi	I	36
Common Winterberry	<i>Ilex verticillata</i>	wet, acid/alk.	su, fa, wi	x	36
Bayberry	<i>Myrica pensylvanica</i>	dry, acid	fa, wi		36
Sweet Gale	<i>Myrica gale</i>	wet, acid	fa, wi		36
Sawbrier, Wild Sarsaparilla	<i>Smilax glauca v leurophylla</i>	dry/wet, acid	fa, wi	x	33
Catbrier, Bullbrier	<i>Smilax rotundifolia</i>	dry/wet, acid	fa, wi	x	33
Prickly Gooseberry	<i>Ribes cynosbati</i>	dry, acid	su, fa	I	32
Wild Black Currant	<i>Ribes americanum</i>	wet, acid/alk.	su	x	32
Hawthorns	<i>Crataegus spp.</i>	dry, acid/alk.	su, fa	x	29
Hobblebush	<i>Viburnum lantanoides</i>	wet, acid	su, fa	x	25
Sweet Viburnum	<i>Viburnum lentago</i>	wet, acid/alk.	su	x	25

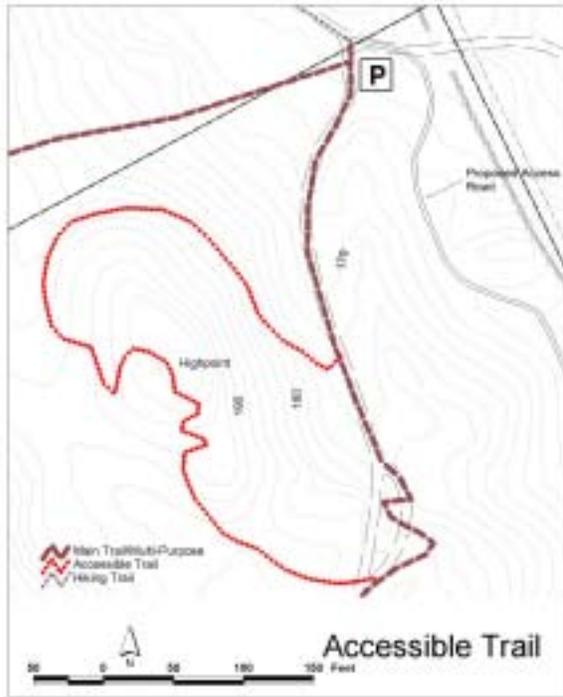
Species	Latin Name	Soil	Fruit Season	Forest Planting	Wildlife Value
Wild Raisin	<i>Viburnum nudum</i>	dry, acid	fa, wi	x	25
Smooth Arrowwood	<i>Viburnum dentatum</i>	wet, acid/alk.	su, fa	x	25
Pasture Rose	<i>Rosa carolina</i>	dry, acid	su, fa, wi		24
Virginia Rose	<i>Rosa virginiana</i>	dry/wet, acid	su, fa		24
Swamp Rose	<i>Rosa palustris</i>	wet, acid/alk.	su, fa		24
American Hazelnut	<i>Corylus americana</i>	dry, acid	su, fa	x	23
Beaked Hazelnut	<i>Corylus cornuta</i>	dry, acid/alk.	su, fa	x	23
Canada Yew	<i>Taxus canadensis</i>	dry/wet, acid	su, fa	I	17
Speckled Alder	<i>Alnus incana</i>	wet, acid	su, fa		16
Common Alder	<i>Alnus serrulata</i>	wet, acid	su, fa		16
Black Huckleberry	<i>Gaylussacia baccata</i>	dry, acid	su, fa	x	14
Dangleberry	<i>Gaylussacia frondosa</i>	dry/wet, acid	su, fa	x	14
Mt. Fly-honeysuckle	<i>Lonicera villosa</i>	wet, acid/alk.	su		14
Limber Honeysuckle	<i>Lonicera dioica</i>	dry, acid/alk.	su	x	14
Spicebush	<i>Lindera benzoin</i>	wet, acid/alk.	su, fa	I	12
Black Chokecherry	<i>Aronia melanocarpa</i>	dry/wet, acid	su, fa	x	11
Red Choke-cherry	<i>Aronia arbutifolia</i>	dry/wet, acid	su, fa	x	11
Bearberry	<i>Arctostaphylos uva-ursi</i>	dry, acid	fa, wi		8
Wildflowers and Grasses					
Common Smartweed	<i>Polygonum hydropiper</i>	wet, acid	su, fa		66
Spreading Dogbane	<i>Apocynum androsaemifolium</i>	dry/wet, acid	su, fa	x	43
Common Milkweed	<i>Asclepias syrica</i>	dry, acid	su, fa		42
Sweet Goldenrod	<i>Solidago odora</i>	dry, acid	fa, wi	x	20
Gray Goldenrod	<i>Solidago nemoralis</i>	dry, acid	fa, wi	x	20
Swamp Milkweed	<i>Asclepias incarnata</i>	wet, acid	su, fa		20
Butterfly Weed	<i>Asclepias tuberosa</i>	dry, acid	su, fa		20
Blue Heartleaf Aster	<i>Aster cordifolius</i>	dry, acid	fa, wi	x	19
New England Aster	<i>Aster novae-angliae</i>	dry/wet, acid	fa, wi	x	19
Wild Lupine	<i>Lupinus perennis</i>	dry, acid	su, fa	x	13
Tickseed Sunflower	<i>Bidens coronata</i>	wet, acid	fa		10
Common Cinquefoil	<i>Potentilla simplex</i>	dry, acid	su, fa, wi		10
Wild Geranium	<i>Geranium maculatum</i>	dry/wet, acid	su, fa	x	9
Joe-pye Weed	<i>Eupatorium maculatum</i>	wet, acid	fa		9
Sedges	<i>Carex spp.</i>	wet, acid	fa	x	8
Lance-leaf Violet	<i>Viola lanceolata</i>	dry/wet, acid	su		7
Orange Jewelweed	<i>Impatiens capensis</i>	wet, acid	su, fa		7
Fireweed	<i>Epilobium angustifolium</i>	dry, acid	fa		5
Evening Primrose	<i>Oenothera biennis</i>	dry, acid	su		5
Blue-eyed Grass	<i>Sisyrinchium atlanticum</i>	dry, acid	su	x	5
Wild Bergamot	<i>Monarda fistulosa</i>	dry, acid	su, fa		2
Indian Paintbrush	<i>Castilleja coccinea</i>	wet, acid	sp, su, fa		
Little bluestem	<i>Scizachyrium scoparium</i>	dry, acid			
New England Blazing Star	<i>Liatris scariosa</i>	dry, acid	su, fa	x	
Wood Lily	<i>Lilium philadelphicum</i>	wet, acid	su, fa		
New York Ironweed	<i>Vernonia noveboracensis</i>	wet, acid	su, fa		
Columbine	<i>Aquilegia canadensis</i>	dry, acid	sp, su, fa	x	
Trout Lily	<i>Erythronium americanum</i>	wet, acid	sp	x	
Slender Blue Flag	<i>Iris prismatica</i>	dry/wet, acid	sp, su	x	
Wild Indigo	<i>Baptisia tinctoria</i>	dry, acid	su		

* Number of animal species known to use plant, as reported in American Wildlife & Plants A Guide to Food Habits, Alexander C. Martin, et al, 1951 and Landscaping for Wildlife, Carrol L. Henderson, 1987.

Forest Planting Guide

- x. Edge or Light to Moderate Shade
 - I. Interior or Full Shade

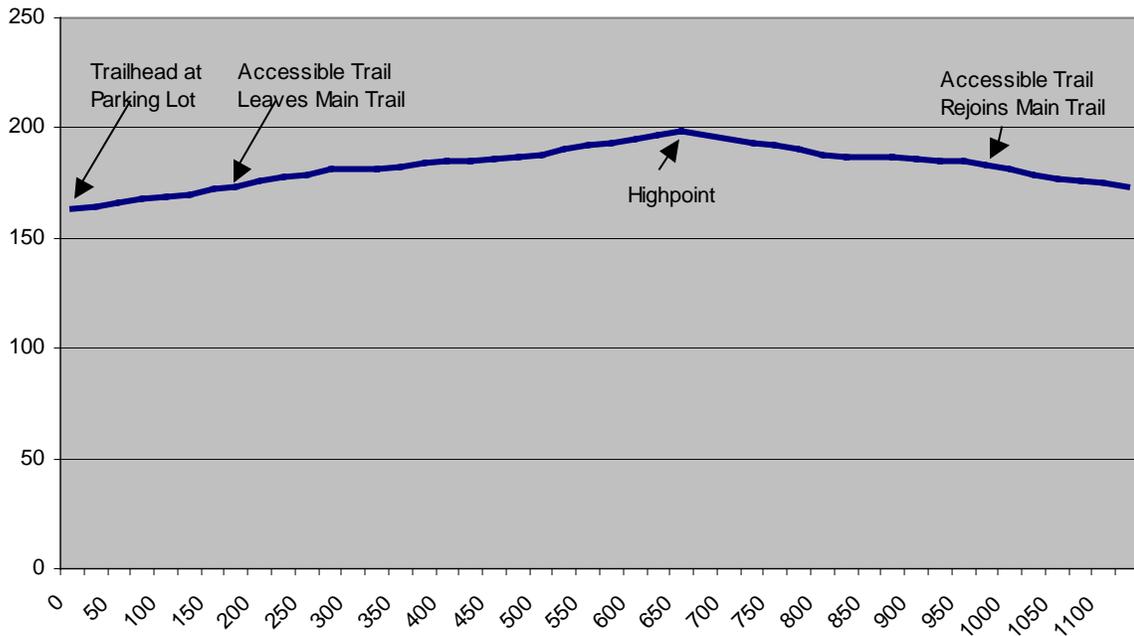
Appendix VI. New Trails



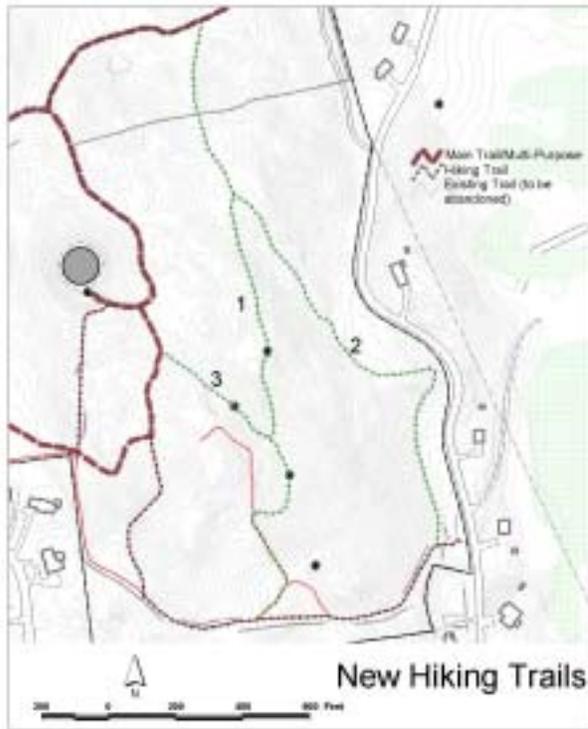
Accessible Trail

This trail would be carefully graded and built to accommodate users with walkers, baby strollers, and wheelchairs. It begins at the trailhead and parking lot and runs along the main Multi-purpose Trail until it branches off to the right to make a loop that gently climbs a hill that offers views of this attractive portion of the forest. It would have three pull-offs with rustic benches—one at the highpoint and one on the way up and one on the way down. The total length of the trail from the trailhead and back would be 1,325 feet. It would have no grades higher than 12% and most grades would be less than 10% with several nearly level areas for resting.

Accessible Trail

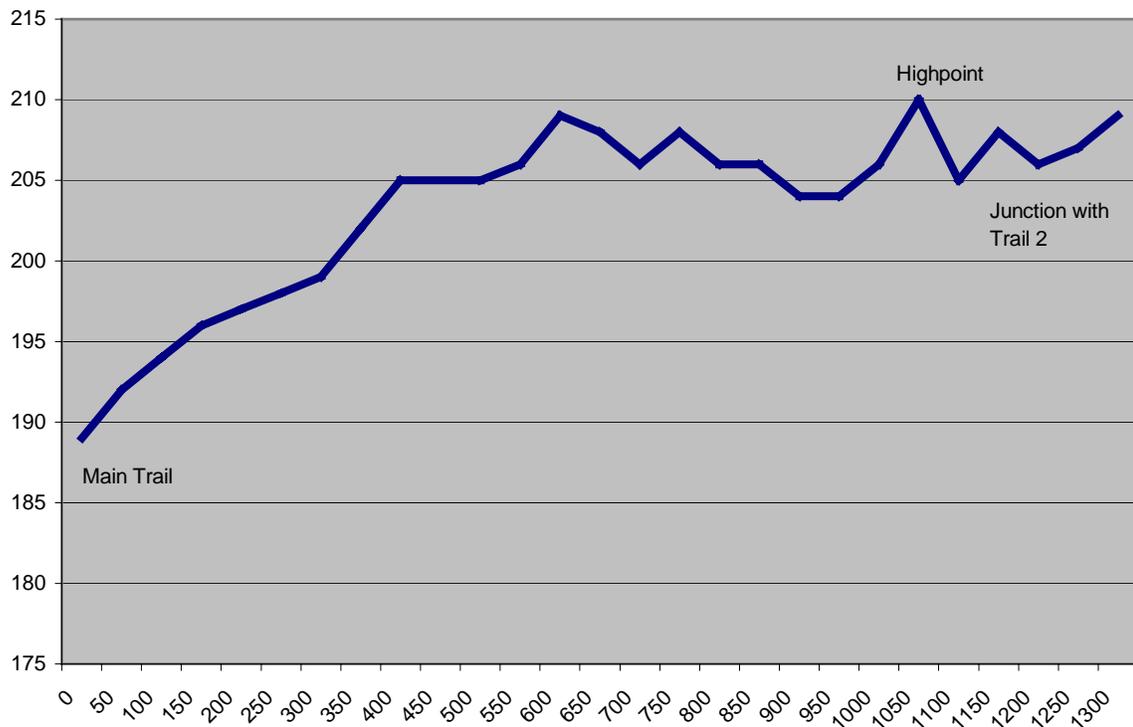


New Hiking Trails

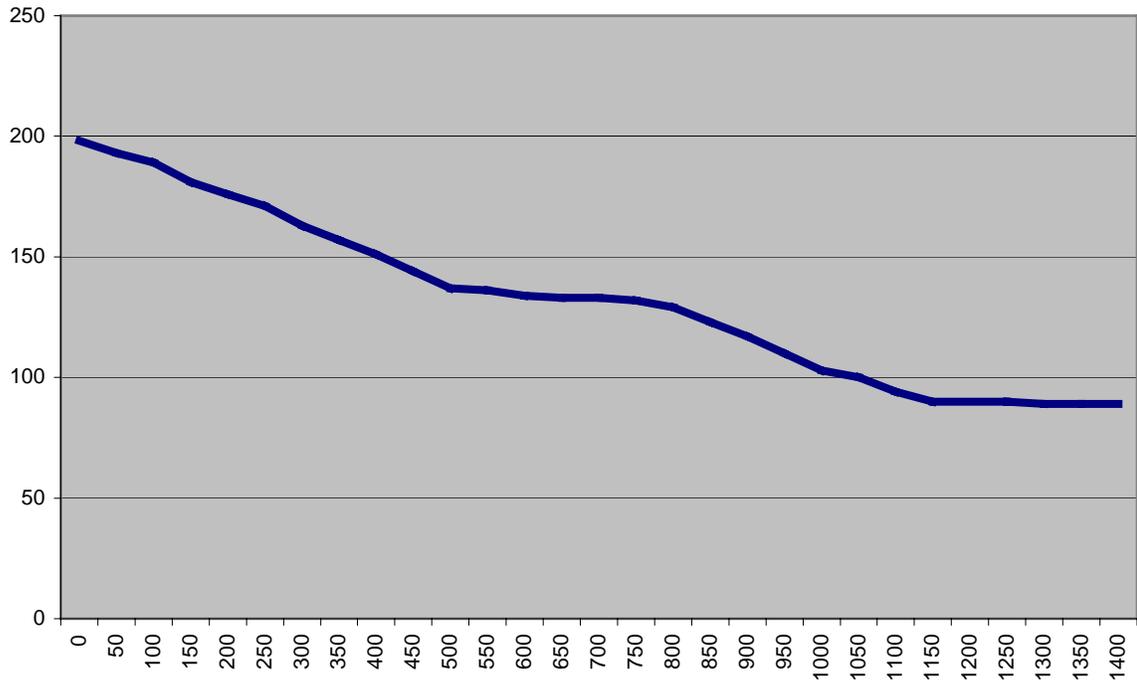


The southeast portion of the site offers several opportunities for more rugged hiking trails. These 3 to 4 foot wide trails would wind around trees and rocks and require minimal, hand-tool construction. They could be built with minimal brush removal and leveled with a grub-hoe and shovel. Steep grades should be designed to prevent erosion by channeling water away from the trail with “rolling dips” or “water bars”. See the **Complete Guide to Trail Building and Maintenance** by the Appalachian Mountain Club. Trail 1 begins at the main Multi-purpose Trail and runs 1,300 feet to a junction with Trail 3. Trail 2 runs 1,400 feet to a junction with an existing trail along the forest’s southern boundary. Trail 3 runs 1,100 feet and connect to a Multi-purpose Trail leading to the water tower.

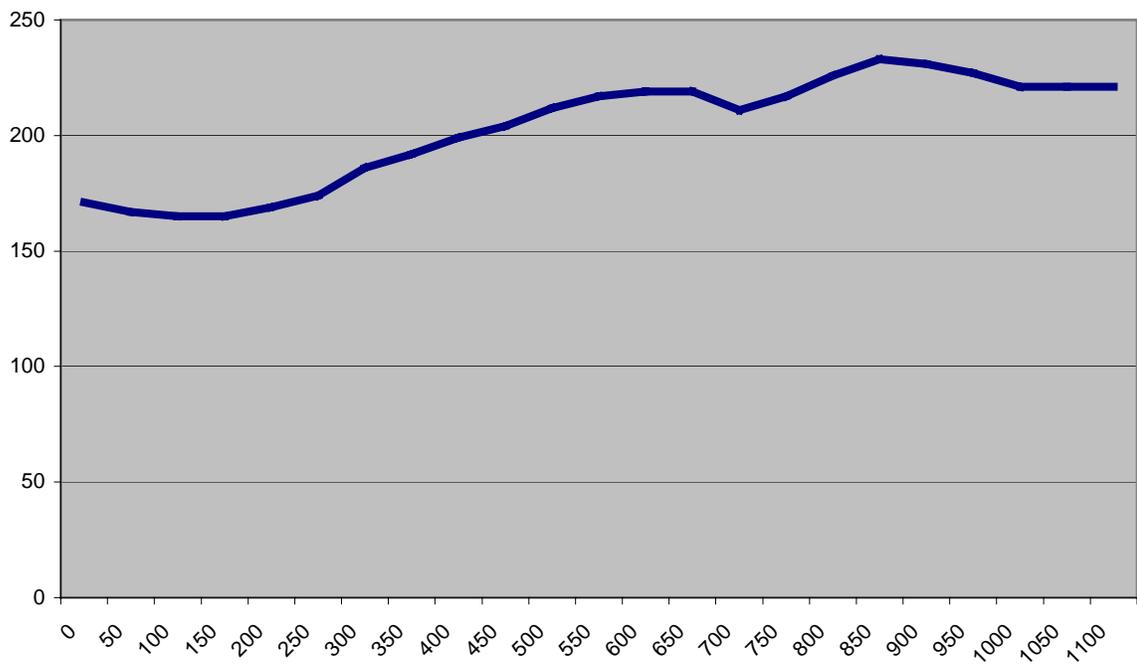
hiking 1



Hiking 2

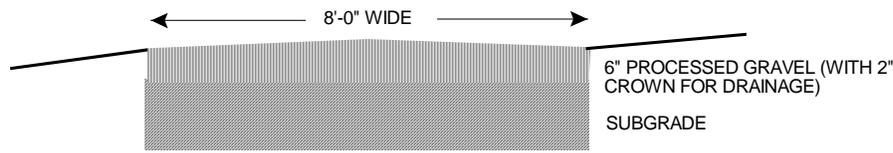


Hiking 3

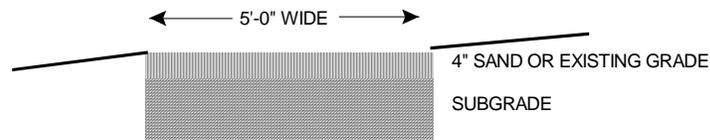


Appendix VII. Design Details

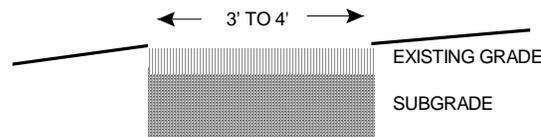
Trails



ALL PURPOSE TRAIL



ALL PURPOSE TRAIL

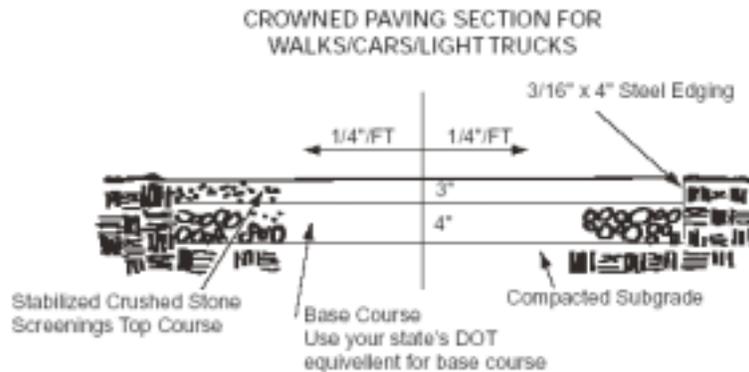


HIKING TRAIL

Trail Notes:

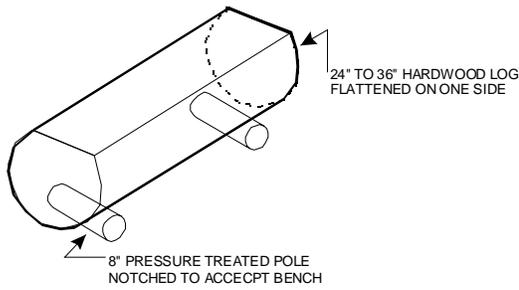
1. Clear overhanging vegetation up 8 feet.
2. These trail surfaces are generally poorly suited for wheelchair access. A layer of compacted crushed stone with a "soil stabilizer" (a special mix with a psyllium binding additive) can be used to provide a universally accessible trail. See below.

Accessible Trail



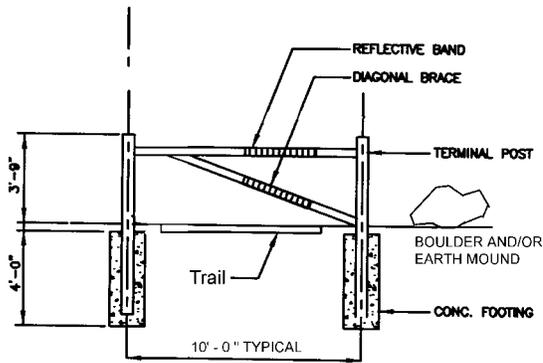
Note: Soil stabilizer is an additive made from psyllium husk powder. It binds and "stabilizes" the crushed stone layer making it suitable for wheelchairs, etc., but still maintains the appearance of a gravel trail.

Log Benches

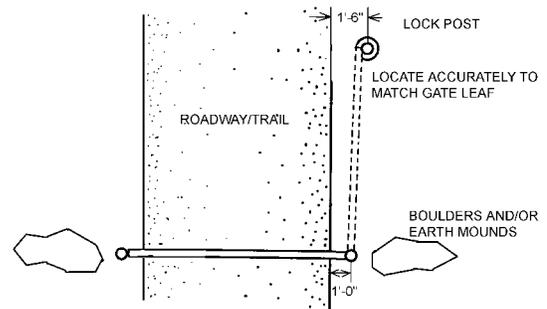


Example of Log Bench

Gate Design



SINGLE LEAF GATE ELEVATION



SINGLE LEAF GATE PLAN

Notes:

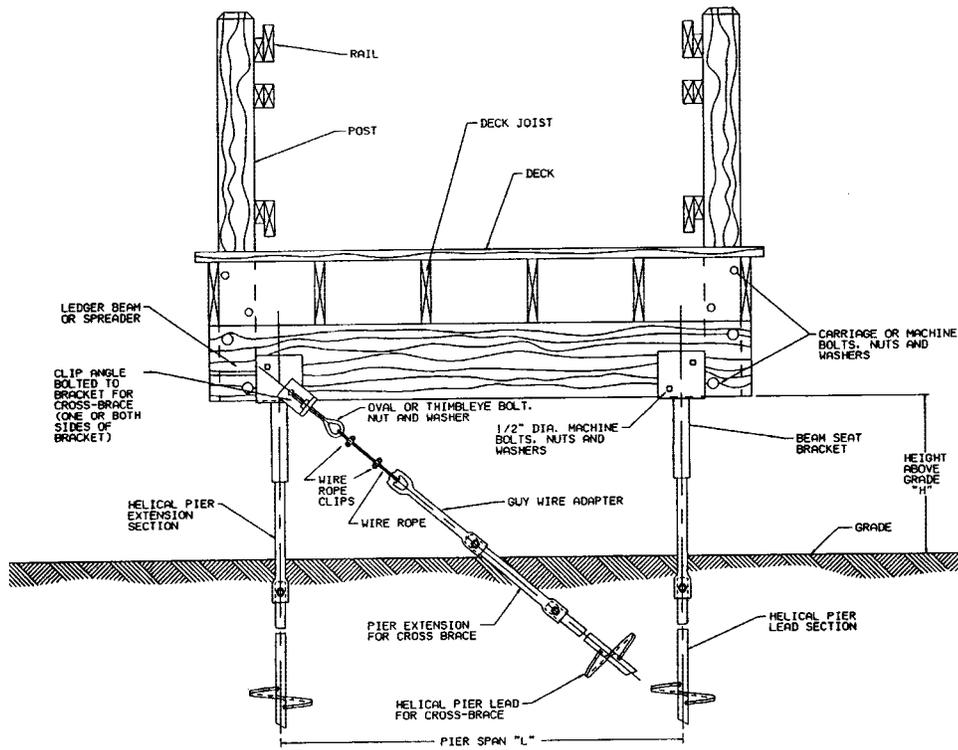
1. All welded pipe construction.
2. Line of gate top and bottom shall be installed straight and true. All posts shall be installed parallel and plumb. All leaves shall be installed parallel and true.
3. All gate hardware shall be double dip hot galvanized.

Dog Waste Disposal



Example of a Dog Waste notice and plastic bag dispensers.

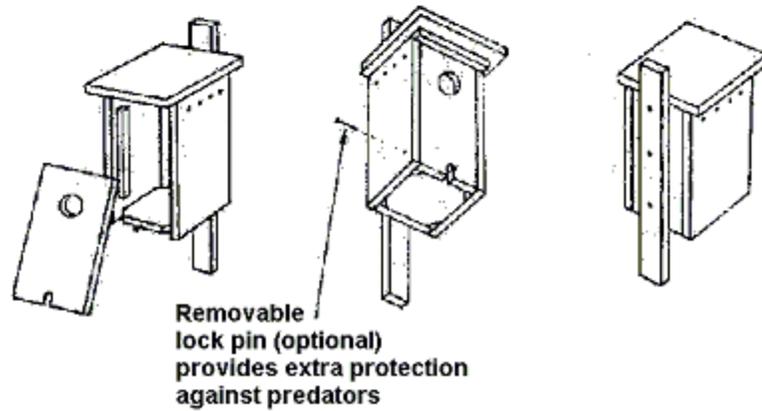
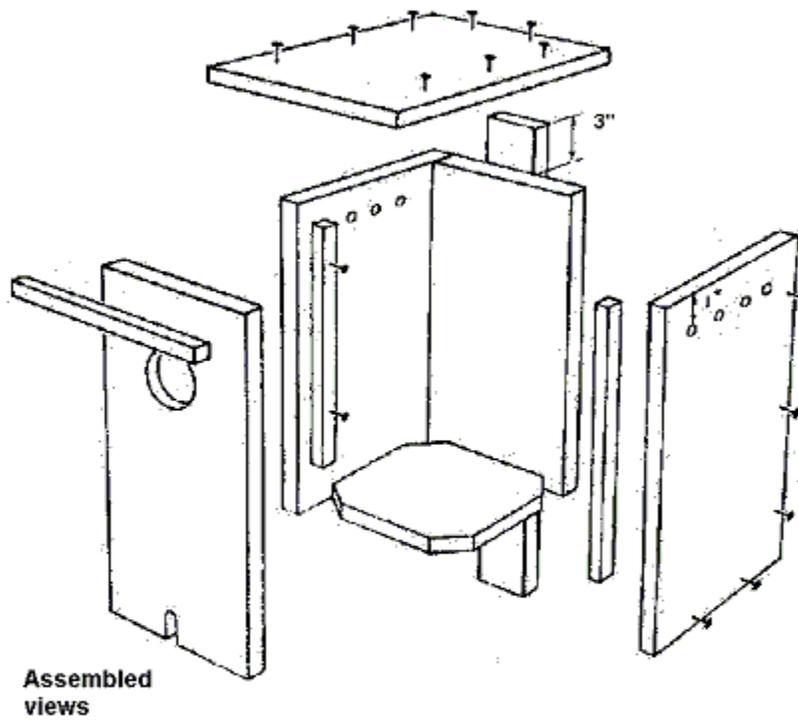
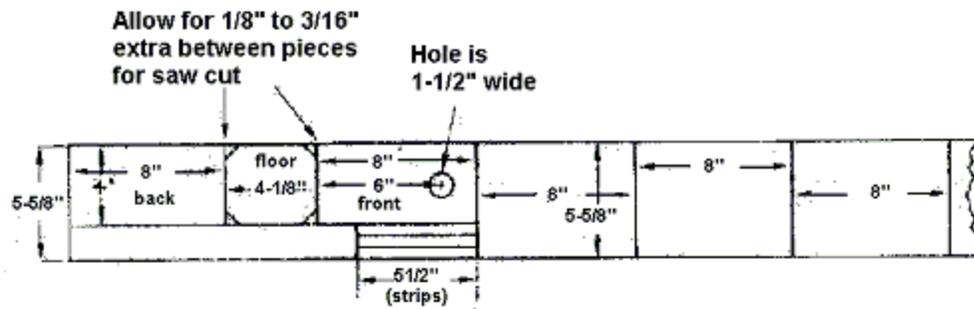
Boardwalk Support System



Helical Pier Support System

- Minimal disturbance
- Transfers loads to bearing capable strata
- Isolates structure from seasonal surface changes
- Modular helical foundation and extension sections,
- Portable hand-held installing equipment.

Appendix VIII – Birdhouses



Birdhouses (cont.)

The availability of suitable nesting sites is a vital requirement of all birds. By placing birdhouses in backyards, people can help provide these nesting sites and attract a greater variety of birds to our yards. Putting up nesting structures is easy, and many common birds that visit backyards will utilize artificial boxes and shelves. However, some knowledge of the nesting requirements of birds is necessary in order to maximize your (and the birds) success with birdhouses.

NESTING REQUIREMENTS

It is helpful to first outline some of the different types of nesting birds and their needs. Two of the principal groups of nesting birds are cavity nesters and open nesters.

“Cavity nesters” require cavities, usually in wood, in which to build nests and lay eggs. Bluebirds, chickadees, and woodpeckers fall into this category. In contrast, “open nesters” place their nests among the branches of trees or shrubs, utilizing a sturdy crotch or small branches to support the nest. Robins, jays, and cardinals are among those that build open nests. Almost all birds build nests strictly for the purpose of raising young. Once the young have fledged, the nest is no longer used by the young or adults. It is thought that birds avoid re-using old nests in order to escape nest parasites, such as feather mites.

THE CAVITY SHORTAGE

Woodpeckers regularly excavate their own cavities for nesting. Most woodpeckers seek out dead or dying wood for excavation, although a few of the larger species, such as sapsuckers and the Hairy Woodpecker, can drill into live wood. Many other cavity nesters, including bluebirds, wrens, and nuthatches, usually have to use abandoned woodpecker holes because they do not have the strong bills necessary for drilling.

Cavities are a limited resource and there is strong competition for those that exist. This is one reason why some cavity nesters respond so readily to artificial nest boxes. Cavities are also used by birds for night roosting, and they can provide valuable shelter during extremely cold winter nights. Downy Woodpeckers, for example, spend several weeks every fall preparing multiple cavities for use as roosting sites. This is also the time of year when woodpecker damage to houses is most likely to occur. For advice on how to deal with this unusual problem, ask for Massachusetts Audubon’s “Living With Woodpeckers” information sheet.

TERRITORIES

Most backyard birds defend an area around their nests that usually includes feeding habitat. Territory size dictates how many pairs of a particular species will nest on your property. For some birds, territories are quite small. A robin, for example, may defend a territory of less than an acre, so a small property may support several pairs. In contrast, chickadees may defend breeding territories of up to 10 acres. This will certainly limit how many chickadees will nest in a typical backyard. Notice that territory size does not necessarily depend on the size of the bird. Rather, territory size depends on a number of environmental factors, including the type of food source utilized by the bird.

The concept of territory is the main reason why birdhouses should be constructed for a single pair only; multiple units are useless to most birds. The only exception to this rule is the Purple Martin, a type of swallow that nests exclusively in colonies that often contain dozens of pairs. Houses for martins usually consist of multiple apartments for many pairs.

Unfortunately, Purple Martins occur at only a few disjunct breeding sites in Massachusetts and are notoriously difficult to attract to new areas. Do not attempt to build and erect a martin house unless you are sure there are martins in the area. Otherwise, it will most likely become filled with House Sparrows.

In general, most backyards will support several pairs of different species. Each species will keep others of its own kind out of its territory, but will not usually be bothered by different species.

GENERAL GUIDELINES

The first decision to make is whether you are going to buy or build a birdhouse. If you decide to buy, ready-made houses are widely available, but they are not all equal in quality. Before buying, it is helpful to know which species you wish to attract and what the nesting requirements are.

First of all, birdhouses should be made of wood. Wood is both durable and porous enough to allow moisture and heat to escape during the summer, which keeps the young birds from getting too hot inside. Metal or plastic houses can be death traps in such heat. The dimensions of a birdhouse are also important, especially the size of the entrance hole. The entrance hole should be just big enough for the intended bird and no bigger. Chickadees will not use a house with a 3-inch entrance hole, for example. In addition, a birdhouse should always have a removable panel, whether this is the front, side, or top, so that old nests can be removed and the inside cleaned.

Also, birdhouses should not be painted but left untreated or stained on the outside only with a natural wood preservative such as linseed oil. Bright, unnatural colors will not be accepted by the birds because they make the house more conspicuous to predators. Finally, birdhouses should not have perches on the outside. Most birds do not need them, and they only make it easier for predators and House Sparrows or starlings to get into the house.

BUILDING A BIRDHOUSE

If you decide to build your birdhouses, obtain $\frac{3}{4}$ inch untreated pine, white cedar, or poplar. Do not use creosote-treated lumber because the residues are toxic to birds. The outside surfaces of birdhouses can be treated with linseed oil. The house will last longer if it is assembled with brass hardware rather than steel, which rusts. Screws, although more expensive and requiring predrilling, are better than nails since they are less likely to pull out with time. Some experts recommend using rough-sawn wood, which is easier for birds to grip with their feet. This is important for birds such as Tree Swallows, which can have difficulty getting out of houses if the inside surface is too smooth. As an added measure for these birds, it is advisable to cut grooves on the inside front panel of the house or to add a small strip of hardware cloth on the inside under the entrance so that the birds have an escape ladder to help them get out. All houses should have drainage holes in the bottom and holes in the side panels near the top for ventilation. See accompanying diagrams for construction details.

To be most successful, birdhouses should be constructed for particular species since many species have specific requirements for hole-size and inside area. However, if you do not have particular birds in mind but just want to attract something, you can construct multi-species houses that will suit a number of similar-sized birds. For example, a house with 4-inch square inside area and a $1\frac{1}{4}$ inch entrance hole will suit wrens, chickadees, titmice, and

nuthatches. Place several of these houses in different habitats in the yard and see what shows up! The accompanying chart has dimensions for four different multi-species houses.

BIRDHOUSE PLACEMENT

Birdhouses should be erected preferably in the fall or early winter so that birds will have plenty of time to locate them before the breeding season. The houses will also be well weathered by then. It is also a good idea to leave the houses up year-round so that they can serve as roosting sites in the winter. When deciding on the placement of the houses in the yard, keep in mind the habitat requirements of the species you wish to attract. For example, bluebirds will use houses in open fields but not deep woods, and chickadees the opposite.

Consult the accompanying chart for habitat requirements before placing the houses. A general rule is to place no more than 2 houses per species per acre of property. Remember, however, that an acre of property may support several pairs of different species.

PREDATOR GUARDS

Birdhouses are safest from predators when they are mounted on poles equipped with predator guards. A predator guard is a device placed on the pole that keeps raccoons, cats, and even snakes from climbing the pole. Predator guards are commercially available and can also be fashioned at home (see Shalaway [1995] for plans). Pole-mounted houses will need an extra flange made of wood or metal attached to the bottom that will accept the pole. You may wish to purchase the pole first and then design or buy the appropriately sized flange and predator guard. A predator guard consisting of an extra thick piece of wood can be placed over the entrance to give some protection from the reaching arms of mammals such as raccoons.

All houses, whether attached to a pole or tree, should be securely fastened so that they do not swing since birds do not like moving houses.

Some birds such as nuthatches and woodpeckers prefer houses mounted on trees. The house design in the accompanying diagram includes a backboard that can be used for attachment to a tree. Houses should be mounted with the entrance hole facing slightly downward and away from prevailing winds to keep rain from entering the house.

NESTING SHELVES

Nesting shelves for robins and phoebes should be located on buildings, preferably under existing overhangs such as on a porch. Mount the shelves where they will be away from too much activity. Barn Swallows are most likely to use shelves placed in a barn or other large, open structure where there is plenty of flying room. This species often nests in small colonies consisting of several pairs. A nearby supply of mud for nest construction is also necessary to attract this species.

MAINTENANCE

Houses should be cleaned out once a year at minimum. The best time to do this is after the birds have finished breeding, usually by mid-August. Remove old nesting material and scrub the house with a solution of one part bleach to nine parts water. Rinse the inside well and allow it to air dry completely before closing it up again. This is also a good time to look over the house and make sure the hardware is still firmly in place and the panels are not pulling apart.

Some birds, such as wrens and bluebirds, are multiple brooded. This means that each pair typically raises more than one (usually 2 to 3) family per summer. For these species, cleaning out the nesting material between broods is recommended to reduce nest parasites. This means that you have to keep a close eye on the birds so that you know when the young fledge (leave the nest). Although a few studies have shown that bluebirds prefer houses with old nests, it seems preferable to remove nests that may be heavily infested with parasites that can weaken or kill baby birds.

PROBLEMS

Things do not always go as planned when we put out birdhouses. Most problems arise from competition between different species for a house. Both House Sparrows and European Starlings are fierce nest competitors that are capable of driving away many native bird species. Starlings can be eliminated from houses with an entrance hole of 1 ½ inch or less. If starlings get into houses with larger entrances, continual removal of the nesting material may dissuade them. Unfortunately, starlings are tenacious, so repeated efforts may be required. If starlings succeed in taking over a house, try erecting another house nearby so that a different species has a chance to use it.

House Sparrows generally present more of a problem than starlings because they can squeeze into smaller holes. Only a 1-inch entrance hole excludes them; however, it also excludes all other species except for House Wrens. Continual removal of the nesting material sometimes convinces them to move. House Sparrows also will not use houses mounted in woods. When sparrows move into bluebird houses, it helps to lower the boxes to a height of less than 5 feet. Sparrows do not like to nest this close to the ground, but bluebirds do not seem to mind. Competition from House Sparrows will likely be a problem whenever houses are placed in open areas.

Bluebirds also face competition from Tree Swallows since the two species inhabit similar areas and use the same size nesting cavities. Because the swallows are more aggressive than bluebirds, the bluebirds are usually driven away from nesting sites. To alleviate this problem, mount bluebird houses in pairs placed 10 to 12 feet apart. If a pair of swallows moves into one, they will keep away any other pairs of swallows that try to nest but will ignore a pair of bluebirds nesting nearby.

Sometimes birds nest in places that seem perilous to us. Robins and phoebes often build nests over frequently used doorways. Wrens have been known to build nests in clothing hanging on a line and in cars parked in one place for a long time. House Finches are likely to nest in hanging planters on porches. While these places seem dangerous and inconvenient to us, it should be remembered that the nesting instinct in birds is quite strong and that, more often than not, pairs with unlikely placed nests are successful in fledging young. The best thing to do in these situations is give the birds a little space and time. Use a different doorway if there's a nest overhead, and water hanging plants containing nests at the edges (but do keep watering them: the plants must be alive to provide shelter for the nests inside!) The birds usually finish their nesting cycle in about four to six weeks so human cooperation is only required for a relatively short period of time.

/Diane M. Lahaise/

Commercially made birdhouses available at:
Massachusetts Audubon Gift Shop

Drumlin Farm Wildlife Sanctuary
 Route 117, Lincoln, MA
 781-259-9661
 Hours: Tuesday-Sunday, 10 a.m.-5 p.m.

Species	Floor Size*	Height (front) *	Hole Diam. *	Height to Hole*	Mounting Height (ft)	Habitat	Comments
Cavity Nesters:							
House Wren	4 x 4	7	1	5	4-10	Old fields and thickets	
Carolina Wren	4 x 4	7	1 3/8	5	5-10	Old fields and thickets	
Black-capped Chickadee	4 x 4	9	1 1/8	7	5-15	Open woods and edges	Add 3" of wood chips
Tufted Titmouse	4 x 4	9	1 1/4	7	5-15	Woods and edges	Add 3" of wood chips
White-breasted Nuthatch	4 x 4	9	1 3/8	7	5-15	Woods and edges	Add 3" of wood chips
House Finch	5 x 5	8	1 1/2	6	5-10	Backyards and porches	Also nests in hanging plants
Eastern Bluebird	4 x 4	10	1 1/2	8	4-6	Open land with scattered trees	
Tree Swallow	5 x 5	7	1 1/2	5	5-15	Open land near water	Escape ladder inside front**
Downy Woodpecker	4 x 4	9	1 3/8	7	5-20	Forest openings and edges	Fill box with wood chips
Hairy/Red-headed Woodpecker	6 x 6	12	2	10	8-20	Forest openings and edges	Fill box with wood chips

Species	Floor Size*	Height (front)*	Hole Diam.*	Height to Hole*	Mounting Height (ft)	Habitat	Comments
Northern Flicker	7 x 7	17	2 ½	15	10-15	Forest openings and edges	Fill box with wood chips
American Kestrel	8 x 8	16	3	13	10-30	Open land with scattered trees	Add 3" wood chips
Eastern Screech-Owl	8 x 8	16	3	13	10-30	Farmland, orchards, woods	Add 3" wood chips
Barred Owl	14 x 14	26	8	23	15-30	Mature bottomland forest	Add 3" wood chips
Wood Duck	12 x 12	22	4	17	5 (over water) 15 (over land)	Wooded swamps, bottomland	Add 3" wood chips and escape ladder inside front**
Open Nesters:							
American Robin	6 x 8	8	---	---	6-15	Backyards and porches	Place on side of building
Eastern Phoebe	6 x 6	6	---	---	8-12	Backyards and porches	Place on side of building
Barn Swallow	6 x 6	6	---	---	8-12	Open areas and farmland	Place on side of building
Multi-species Birdhouses:							
Chickadee, titmouse, nuthatch, wrens, and Downy Woodpecker	4 x 4	8	1 ¼	6	4-20	see above	Add wood chips
Bluebird/Tree Swallow	5 x 5	8	1 ½	6	5	see above	

Species	Floor Size*	Height (front)*	Hole Diam.*	Height to Hole*	Mounting Height (ft)	Habitat	Comments
Hairy and Red-headed Woodpeckers, Saw-whet Owl	6 x 6	11	2 ½	9	15-20	see above	Add wood chips
Flicker/screech-owl/kestrel	8 x 8	16	3	13	12-20	see above	Add wood chips

- Measurements in inches; floor size and height are INSIDE dimensions

** Escape ladder consists of grooves carved into inside of front panel, or hardware cloth stapled under hole inside box

Sources: Shalaway (1995); Terres (1994); Pistorius (1981).

©2003-2004 Massachusetts Audubon Society. All rights reserved.

Appendix IX – Cost Estimates

Item	Source	Units	Cost/unit	Total
Log Bench	Local Contractor Or Highway Department	3	\$1,500.00 installed	\$4,500
Steel Gate	Local Contractor Or Highway Department	1	\$1,000	\$1,000
Dog Waste Disposal System	Several Manufactures	2	\$300.00 installed	\$600
Boardwalk/Bridge	Local Contractor	130 feet	\$8/sf	\$18,000
All Purpose Trail Erosion Control	Local Contractor	800 Sq. feet	\$8/sf	\$6,400
Vegetation Restoration	Local Contractor	800 Sq. feet	\$8/sf	\$6,400
Handicapped Trail	Local Contractor	1,000 feet		\$13,500
New Sections of All Purpose Trail	Local Contractor Or Highway Department	1,130 feet		\$6,000
New Hiking Trails	Volunteers	7,350 feet		
Access Road & Parking Lot	Local Contractor Or Highway Department	1,025 feet 17 spaces		\$40,000
Boulder or Mound Placement	Local Contractor Or Highway Department	6	\$500	\$3000

Appendix X – Annual Maintenance/Monitoring Schedule

Task/Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	No v	Dec
Spring Cleanup				X								
Invasive Plant Control				X					X			
Field Mowing										X		
Periodic Clean Up*					X	X	X	X	X	X		

** or as needed.*

Spring Cleanup would include general litter removal; trail maintenance and trimming of overhanging vegetation. It could also include control of non-native invasive plant species. It is generally adequate to do field mowing every other year.