

Spring 5-2010

## Western Woburn Greenway Study

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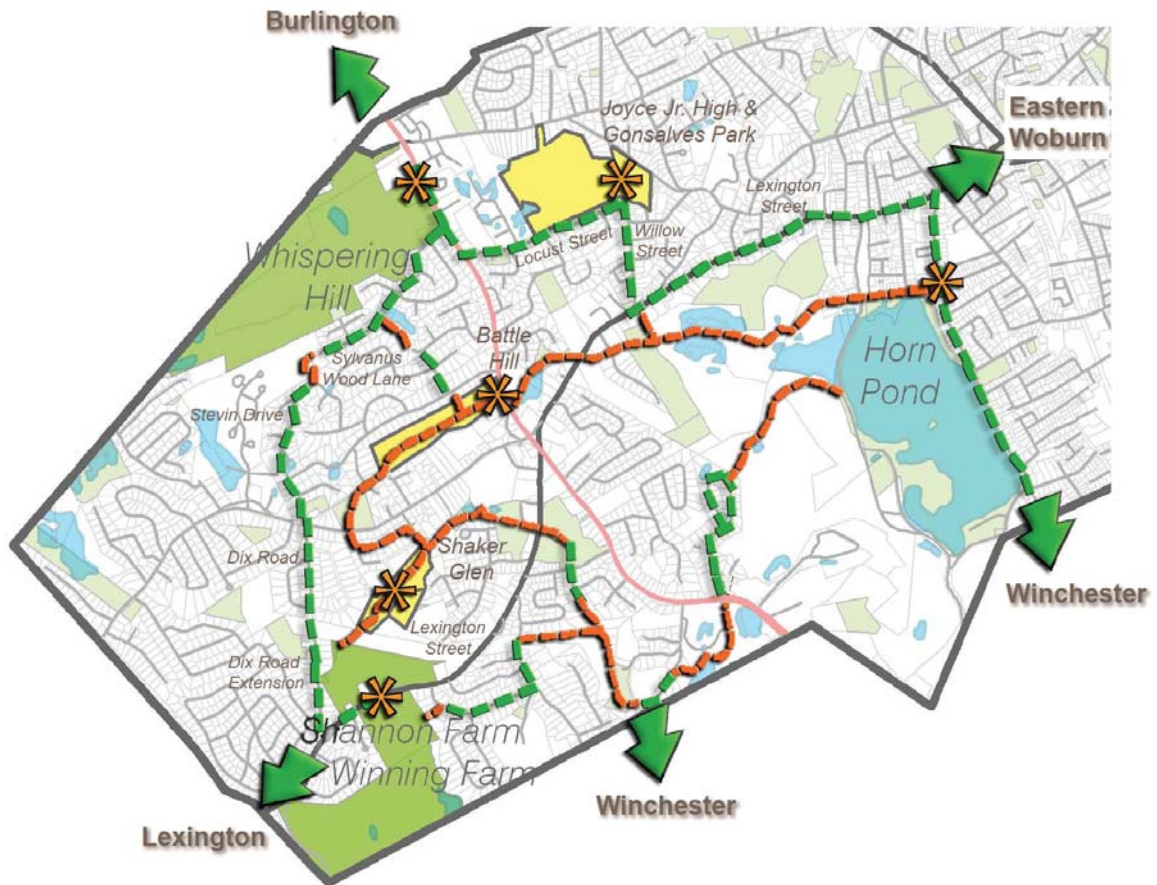
Masters, Jennifer H.; Aldeghi, Bryan C.; Kells, Eric C.; Pollock, Maureen C.; Decourcey, Rebekah Lynne; Waag, Carol; Kwon, Youjin; Ostermier, Kathryn E.; McGeough, Patrick T.; and Ball, Ryan Patrick, "Western Woburn Greenway Study" (2010). *Landscape Architecture & Regional Planning Studio and Student Research and Creative Activity*. 6.  
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# Western Woburn Greenway Study

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May 2010

## **ACKNOWLEDGMENTS**

Professor Jack Ahern and students are grateful for the opportunity to work with the talented and dedicated leadership of the City of Woburn.

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# WESTERN WOBURN GREENWAY STUDY

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## **EXECUTIVE SUMMARY**

### **A. Goal of Study**

In spring 2010, the Department of Landscape Architecture and Regional Planning at the University of Massachusetts Amherst was asked to complete a landscape planning study, the “Western Woburn Greenway Study” for the City of Woburn, MA. The study was undertaken by a team of graduate students, supervised by Professor Jack Ahern. The goals of that study are as follows.

The City of Woburn currently has two large parcel groups of undeveloped land, Whispering Hill (the north focus area) and Winning/Shannon Farms (the south focus area) that are, or may become, available for acquisition (see “Scope of Project” below). The first goal of the study was to analyze these focus areas and conduct suitability assessments for potential land uses that meet the needs of the residents of Woburn, as well as meet the goals specified by the town’s 2004 Open Space and Recreation Plan. The analysis and land use recommendations could be used by the city in current and future land acquisition decisions.

The second goal of the study was to evaluate strategies and actions for connecting these focus areas with linkages to each other, to other existing open spaces in Woburn, and to other green spaces in neighboring towns. These linkages could be obtained with Green Streets and Greenways serving as connectors.

### **B. Scope of Project**

The West Woburn Greenway Study focuses on two distinct focus areas in western Woburn, the potential greenway connections between these two areas, and other greenway connections between these parcels and Horn Pond. The northern focus area centers on the 75 acres of the Whispering Hill Woods property, currently owned by Northeastern University. It is located west of Cambridge Road near the city’s border with Burlington, and is surrounded on three sides by Mary Cummings Park, which contains nearly 200 acres. The Whispering Hill property contains characteristics that extend beyond its boundaries into Mary Cummings Park in Burlington, such as site access, wildlife habitat and trails. The recommendations of this report are intended to help the city decide if it should purchase the property – and to offer a suggested master plan for the property should it come under public ownership.

The southern focus area consists of Winning Farm and Shannon Farm. Winning Farm is a 60-acre parcel on the southern border of Woburn, south of Lexington Street. Half of the parcel has recently been deeded to the city for conservation use as part of a negotiation with developers, who have been granted approval to build a new townhouse development on the other half of the parcel. Shannon Farm, which consists of land on either side of Lexington Street, is currently privately owned Chapter 61A agricultural land, a portion of which is currently farmed. As with the Whispering Hill parcel, the city is interested to explore possible uses of the site, in the event that the site is offered for sale in the future.

This study will also consider potential greenways along city streets and through publicly owned open space to connect the north and south focus areas. One of these greenways passes through Shaker Glen and the Battle Road Woodland Area. Another greenway destination is Horn Pond, a 500 acre conservation area surrounding a 133 acre pond situated 3 miles northeast of Winning Farm and 2.5 miles southeast of Whispering Hill. Due to its size and close proximity to the other study areas, it is a logical destination for a green corridor linking all three open spaces. Together, Whispering Hill/Mary Cummings Park, the Winning Farm and Shannon Farm, and the Horn Pond Conservation Area, occupy the corner points of a green triangle with a perimeter of roughly 9 miles.

This study is exploratory and informational in scope and was designed to explore how these parcels might be used and how they can be linked into a greenway system. The results are expected to inform the city government of issues and opportunities related to these properties.

### **C. Studio Process**

As stated, the goal of this studio project is to provide the city of Woburn with information that could inform important future land use and acquisition decisions. To achieve the goal, students engaged in a number of activities, including community meetings, site visits, GIS analysis, land use suitability assessment, conceptual planning, and the presentation of our findings and recommendations. These steps are described in order below.

The project was introduced to residents of Woburn at a city council meeting on March 10, 2010. Mayor Scott Galvin and city planner Edmund Tarallo facilitated the meeting, during which Professor Jack Ahern explained the project and solicited initial input from the community. Students took notes on the suggestions made by the meeting participants, which included specific land use requests and helpful information about the sites and other parcels of interest (conservation land, rights of way, vacant properties, and recreational fields and facilities) throughout the city. We appreciated input from members of the Woburn Residents Environmental Network (WREN,) and the Friends of Mary Cummings Park, as well as members of the city council and the planning board. The community's interest in the city's land use policy and decisions is admirable.

With this information, we began our analysis of the focus areas, as well as the overall city of Woburn (see Figure ES-1 for a process flow chart.) We analyzed GIS data from the Commonwealth of Massachusetts, as well as more detailed GIS data obtained from the city of Woburn. We visited the sites and recorded information about vegetation, topography, and other geologic features. The hydrology of the focus areas and our commitment to maintaining or improving the quality of water for the city was of primary importance in our analysis.

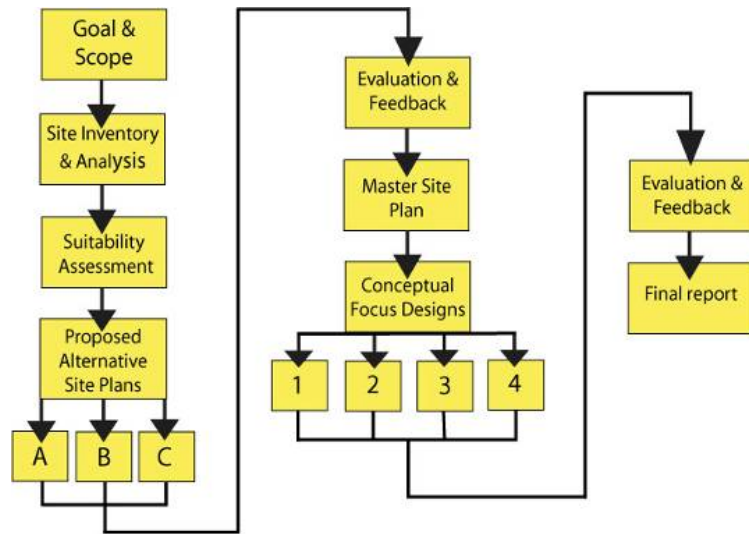


Figure ES-1: Studio process

Next, we conducted suitability assessments for specific land uses (those suggested by the community, as well as others found in the city’s Open Space Plan) for each focus area, based on factors such as soil, slope, drainage, vegetation, access, and others. We respected the city of Woburn’s 150’ wetland buffer in our assessments. Our results indicate areas within the focus areas that are suitable for specific land uses such as recreational fields, cemeteries, and agriculture. They are included in this report.

Based on the initial community input and our land use suitability findings, we developed several alternatives plans for each focus area which were evaluated by Professor Ahern. The plans were presented to the community at a second meeting on April 14, 2010. We also presented the concept of a greenway to connect the focus areas to each other and to Horn Pond. The community was engaged in the meeting and took advantage of the opportunity to view and comment on the plans, which were displayed on boards.

With this second round of community feedback, we developed conceptual master plans for each focus area and a refined greenway plan. Each student also developed a more detailed design for a specific component of the plan and produced illustrative plan and section drawings. These plans were evaluated by Professor Ahern and two practicing landscape architects.

The conceptual master plans and greenway plan were presented at a final community meeting in Woburn on May 4, 2010, and comments from the community have been incorporated in this final report.

## D. Proposed Plans for the Properties

### 1. Whispering Hill

The conceptual master plan for Whispering Hill is based on the principle that the property should be preserved and protected. The existing trail system winds its way through the mixed deciduous forest, and extensions on these trails are proposed. The first is a trail that loops around the wetland on a wooden boardwalk. It is compliant with the Americans with Disabilities Act (ADA) and designed for universal access including children, disabled persons, and the elderly. The second extension is a proposed fitness and exercise trail with a steeper slope. It creates a loop between the accessible trail and the main parking area on Route 3.

A large steep escarpment runs through the site. The eastern side faces Route 3 and contains a proposed central parking area and a soccer field. The parking area was designed to be 'green' and sustainable. The soccer field could provide an important community social space.

An optional component of the conceptual plan is a natural area that could be used to bury cremated remains only. This cemetery would have little impact on the preserved environment, and by generating revenue and visitation, would help to ensure that the area is preserved in perpetuity. A series of branching paths would link the plots and cover approximately ten acres of the site. This option is for consideration and could be changed into a passive natural area with no effect on the master plan.

## **2. Winning and Shannon Farms**

Our recommended potential uses for Winning Farm and the possible acquisition of Shannon Farm are based on community input from city officials, from two public meetings, and from the stated goals in Woburn's 2004 Open Space and Recreation Plan. These potential uses include: recreational fields, community agriculture, cemeteries, trail systems, and passive recreation. In order to determine where to site these activities, we analyzed physical and ecological factors needed for each proposed land use. These factors included: site requirements such as soil, drainage, and topography, as well as accessibility to the proposed land use, and compatibility with other land uses on the site and with adjacent properties.

Woburn has expressed a desire to provide more recreational fields and cemetery space in the city, as well as to preserve the remaining agricultural lands. Since the size requirement for cemeteries, recreational fields, and agriculture together equal more than the available land on a combined Winning and Shannon Farm - we propose two alternative master plans for the city to consider. The first master plan proposed has a strong emphasis on agriculture and recreation and the second emphasizes cemeteries and conservation.

In both master plans, we propose the "undeveloped" portion of Winning Farm to be dedicated to conservation uses. Winning Farm is prone to flooding and is considered environmentally sensitive. Portions of the site have steep slopes. There are two wetlands within the property, one at the east edge of the property line and another within the property where there is also a certified vernal pool. Winning Farm has a mature forest with mixed upland deciduous canopy and understory trees. Obligate and facultative wetland plants can be found in the two wetlands. Due to the fact that this property is considered environmentally sensitive and is predominantly a mature forest, we recommend minimal intervention but encourage visitors to enjoy it for hiking, running trails, and environmental education.

## **E. Greenway Connections**

### **Definition of a Greenway**

A greenway is a system of connected lands that provides a different way of thinking about how people move around within a city. It's the idea that a journey is more than, and different from, the destination: moving between two points can be enjoyable and relaxing. In addition to enhancing the experience of movement throughout the city, greenways often connect recreational and conservation areas, acting as a safe corridor for wildlife as well as for citizens and schoolchildren, and for responsible management of water resources.

Paths and corridors in a greenway can vary according to the transportation opportunities and needs of the surrounding areas. One of the benefits to green streets is their adaptable nature: with careful design, they can be appropriate for many different contexts within a city. Green streets can include bioswales, sometimes called rain gardens. In addition to being beautiful to look at, bioswales benefit public health by infiltrating and cleaning stormwater. They can also benefit city finances by replacing stormdrain systems with living systems – with reduced construction and maintenance costs. The job of a bioswale is to slow down and retain water, begin to clean it, and allow it to infiltrate and recharge groundwater aquifers.

### **Potential Greenways for Woburn**

An evaluation of Western Woburn revealed three major existing and potential nodes of recreation / conservation space: the two focus areas of this study (Whispering Hill & Mary Cummings Park, Shannon and Winning Farms,) and Horn Pond. (*Figure ES-2*) If the greenway were established in western Woburn as proposed, Horn Pond would provide an important node to link with the eastern part of the city. In addition to these larger areas of open space, we have also recommended connecting smaller patches of conservation land in the greenway, including Shaker Glen and Battle Road.

The greenway system would be comprised of a network of green streets and pedestrian paths. We have considered different types of streets in Woburn and proposed green street designs appropriate to their uses: main arterial roads such as Route 3 and Lexington Street, collector roads such as Dix Road and Stevin Drive, and residential streets such as Sylvanus Wood Lane and Fairway Drive.

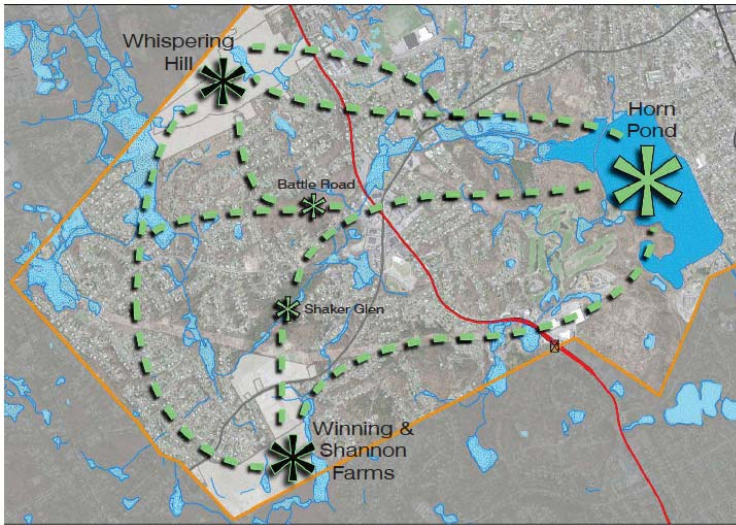


Figure ES-2: Green connections in Western Woburn

## F. Synthesis and Conclusion

With Woburn's acquisition of Winning Farm, the potential purchase of Whispering Hill, and right of first refusal on Shannon Farm should it become available, there is great opportunity for the city to create a greenway system connecting open space. These parcels and their potential connections are not isolated patches within the city, but an opportunity to create a larger green, living system.

This greenway system would include green streets: a result of strategic redesign of identified arterial roads, collector roads, and residential streets that together with pedestrian paths would create green connections for the city. In addition to green streets, there is the opportunity for green parking lots at all three sites: these would be visible places to demonstrate innovative green construction materials and techniques.

During several public meetings, Woburn city officials and community members expressed a need for recreational space, conservation space, and increased cemetery space as the city is nearing cemetery capacity. In evaluating the three parcels, we have made locational recommendations based on our analysis of land, identifying those areas with the characteristics most suited to the proposed uses. This analysis is reflected in our proposed land use for Whispering Hill, Winning Farm, and Shannon Farm.

The land within Whispering Hill lends itself primarily to conservation uses. We recommend the city develop the site for passive uses including a network of trails, including an Americans with Disabilities Act (ADA)-compliant universal access trail as well as a fitness trail for visitors who desire more rigorous activity. In addition, there is appropriate land to site a soccer field, providing social open space for the community.



Winning Farm is a largely intact mixed upland deciduous forest that contains two protected wetlands. For those reasons, we recommend that undeveloped areas of Winning Farm be dedicated to conservation use, including ADA compliant hiking trails, a fitness trail, and environmental education.

A potential land acquisition in the future, Shannon Farm lends itself to a Community Supported Agriculture farm providing fresh fruits and vegetables to Woburn residents, or for recreational fields that could also be constructed on the parcel.

This is unique a moment in time for Woburn: it is the City's chance to look to the future and demonstrate its leadership in the region by taking advantage of these land acquisition opportunities. The connection of existing and potential open space with a greenway system would be a show of long-term innovative vision in planning for the health and vibrancy of the City of Woburn for years to come.

## **CHAPTER 1: INTRODUCTION TO WOBURN**

### **A. Introduction**

The City of Woburn is a developed suburb located approximately 10 miles northwest of Boston at the intersection of Interstate 95 and Interstate 93. Due to its long history and the significant urban development of the 20<sup>th</sup> century, open space in Woburn has dramatically decreased over the years and is now considered a unique asset that is important to protect. In this study, we looked at several of the last remaining parcels of significant open space in the city. These valuable pieces of land provide the opportunity for Woburn to create a network of open space that could benefit all the members of the community.

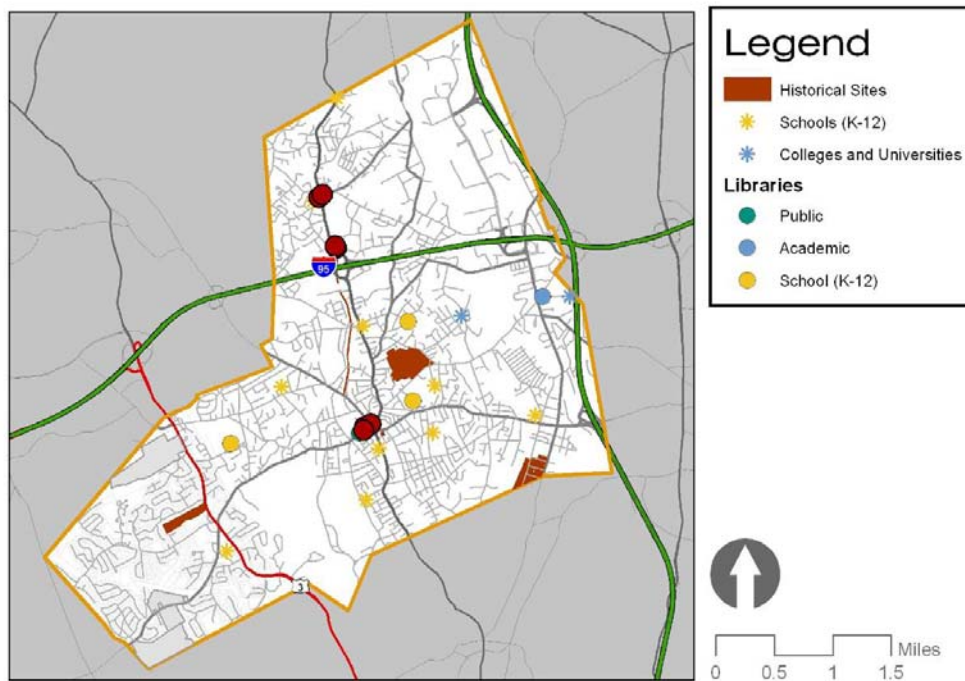
Before analyzing the specific opportunities related to these last pieces of open land, however, it was important to research and fully understand the background of the city itself. We looked at the history of the city, demographics, natural assets, environmental cycles, and current ideas and trends shaping the city. Understanding where the city is and where it came from informed the ideas and recommendations of this study.

### **B. Woburn's Educational and Cultural Resources**

#### **A Cultural History of Woburn**

Creating a vision for the Woburn greenway plan begins with a look at its history, starting with the settlement of Charlestown in 1629. Citizens of early Charlestown petitioned in the early 1630's for more land. A large piece of territory that includes present day Woburn, Winchester, Burlington, and parts of Stoneham and Wilmington was granted to Charlestown. Woburn Center was chosen as the new site for the village in 1640. Officially settled in 1640, Woburn is one of the oldest and most historic communities in New England. Woburn officially became a city in 1889.

Woburn's economy was primarily agriculturally-based well into the early 19<sup>th</sup> century. The tanning and leather business boomed after the opening of the Middlesex Canal in 1803. Railroad expansion in 1835 and 1844 rapidly expanded this industry. The early rubber industry was established in 1836 in Woburn by Charles Goodyear who discovered the "vulcanization" process in 1839. With such a diverse history, Woburn holds within its border a number of historical and cultural resources. The cultural resources are listed below and correspond to the accompanying map (Figure 1-1. *Cultural and Historical Resources*)



## Cultural and Educational Resources

Figure 1-1. *Cultural and Historical Resources (City of Woburn, 2005)*

- The First Burial Ground - The First Burial Ground is located on Park Street. It was used as the town burial yard from 1642 until 1794. The earliest stone is dated 1690.
- The Second Burial Ground - The Second Burial ground, located on Montvale Avenue, dates from 1704 to 1845. Fifty-one Revolutionary War veterans are buried here. Many important early Woburn citizens including Samuel Thompson, Sylvanus Plympton and others, are buried here.
- Baldwin Mansion - The Baldwin Mansion, located at 2 Alfred Street, is on the National Register of Historic Places. It was built in 1661 by Deacon Henry Baldwin and altered to its present appearance by his great grandson, Colonel Loammi Baldwin, in 1803. Colonel Baldwin was the builder of the Middlesex Canal, the father of the noted Baldwin apple, and a Revolutionary War patriot and soldier. (See Figure 1-2.)
- The Rumford House - The Rumford House at 90 Elm Street, is on the National Register of Historic Places and is a National Historic Landmark. Sir Benjamin Thomson, Count Rumford, became a world-renowned soldier, statesman, inventor and scientist. The Rumford Historical Association has maintained Rumford's birthplace at 90 Elm Street as an historic site.
- Battle Road Conservation Area - Woburn sent 180 men, better than half of the available male population of 311, to join the Lexington-Concord battle of April 19, 1775. Most of them reached the battle scene over Battle Road, a wide path still existing in West Woburn. Over this road went Sylvannus Wood who captured the first Redcoat. Asahel Porter and Daniel Thompson, the two Woburn men who were killed by the British that

- The 1790 House - This property is also on the National Register of Historic Places. This magnificent home located at 827 Main Street in North Woburn was originally built in 1790 for Woburn lawyer Joseph Bartlett. (See Figure 1-3.)
- Middlesex Canal - In 1793, an organization was formed to construct the first and longest towpath canal in U.S. History. Digging began in 1794, and the canal was completed and opened from Lowell through Woburn to Boston in 1803. By 1853 through traffic on the canal had stopped and in 1859 the corporation was dissolved. Starting at Kilby Street it proceeds north to Merrimack Street. One of the last water bearing remnants of the old canal is also found in Woburn. A portion of the canal at the corner of Alfred and Main Streets is on the National Register.
- Horn Pond Area - The natives referred to Horn Pond as Lake Innitou. From earliest times it was a center of recreation and economic activities. Fishing and ice harvesting were major attractions. With the building of the Middlesex Canal, the area commanded the canal's commercial and social life. It was a favorite vacation site for residents of Boston and became one of the first major resort areas in the nation. The Horn Pond House, built in 1810, was a thriving hotel and tavern with bowling alleys, restaurant and a ballroom housed in a magnificent pavilion. The pump station at the south end of the pond houses a 1903 Pratt iron pump, the only one of its kind made.
- Goodyear Green - Goodyear Green is located at the corner of Montvale, Center and Orange Streets in East Woburn. In 1839, Charles Goodyear accidentally discovered the process for the vulcanization of rubber when he dropped a specimen of rubber and sulfur on a hot stove. His home was near this location. Goodyear's discovery made fortunes for other people, but nothing for him, as he was jailed for debt and later died in poverty. A bronze marker on the Green commemorates Goodyear's discovery.
- First Congregational Church - This church, located at 322 Main Street, is also on the National Register of Historic Places. The first Church in Woburn was established on August 24, 1642 by a commission of seven from the Charlestown Church. Headed by Captain Edward Johnson, the Commission was a part of a committee of thirteen charged by Charlestown to locate a village on its northern border in 1640. The village known as Charlestown Village was incorporated as Wooborne Town on October 7, 1642. The present church is the sixth meeting house, built in 1860 by John Stevens, a local architect. The building is the tallest wood structure of its kind in the world. The main sanctuary is the largest built by wood without internal supports in the Americas.
- The Library - This library, located on Pleasant Street, is on the National Register of Historic Places and is designated a National Historic Landmark. There was a Preservation Restriction that expired in 1996. The noted architect Henry Hobson Richardson, who also designed Boston's Trinity Church in Copley Square, created the distinctive design of the Public Library in downtown Woburn. Opened May 1, 1879, the Woburn Public Library was one of the first town libraries in the country to be built on such a grand scale. (See Figure 1-4.)
- U.S. Post Office - The Woburn Center Station at 2 Abbot Street, in Woburn Square, is on the National Register of Historic Places.



*Figure 1-2: Baldwin House on Middlesex Canal  
(<http://en.wikipedia.org/wiki/Woburn,Massachusetts>)*



*Figure 1-3: The 1790 House (<http://en.wikipedia.org/wiki/Woburn,Massachusetts>)*



*Figure 1-4: Woburn Public Library, designed by Henry Hobson Richardson  
(<http://en.wikipedia.org/wiki/Woburn,Massachusetts>)*

The majority of historical and cultural resources are found near the Woburn town center. The scope of this project, however, is the western portion of Woburn. The Battle Road Conservation Area is the only historical resource within our project scope, and it will be an important node within our study.

### **Educational Resources**

The Woburn Public School system serves more than 4,500 students from preschool to grade 12. This is comprised of eight elementary schools, two middle schools, and one high school.

Of these schools, Clapp-Goodyear, Joyce Middle School, and Clyde Reeves Elementary are located within our project scope. The Reeves School is northeast of the Winning Farm property. Joyce Middle School is located east of Whispering Hill. Clapp-Goodyear is directly adjacent to the Horn Pond Recreational Area and just south of the Woburn town center.

Providing connections to schools is an important part of a greenway system. The Safe Routes to School Initiative is a program funded by the U.S. Department of Transportation Federal Highway Administration to create safe, healthy trip options for parents and children to get to and from school. (See Appendix H.) Currently, the Clapp-Goodyear School is the only school in Woburn that is participating in the program. The Greenway system discussed later in this report incorporates Reeves Elementary and the Joyce Middle School, giving students a new, safe option to get to school.

### **C. Demographics**

An analysis of the demographics of Woburn was conducted to gain a better understanding of the people of Woburn and to inform our planning and design work.

The median age of the population can inform the planner on what uses are suitable for a given parcel of land. For example, for recreational land uses, a teenager typically is interested in different types of recreational activities than an elderly person. At the 2000 Census, the median age of Woburn was about 39, slightly older than median ages in Massachusetts (37) and in the entire United States (36). In the study area's Census Blocks the median ages were in the 39 to 45 year age categories. This places western Woburn in the older two of the five age categories identified in Figure 1-8 below. Figure 1-9 shows the ages in Woburn distributed in 5 year cohorts, by gender. This figure, called an age pyramid, shows a small younger population, which is typically the largest category. Figures 1-10 and 1-11 reinforce this fact by showing the percentage of the population under the age of 5 and over 65. It is clear that planning decisions related to the western focus area must keep the needs of the older populations in mind, as they are the most dominant group.

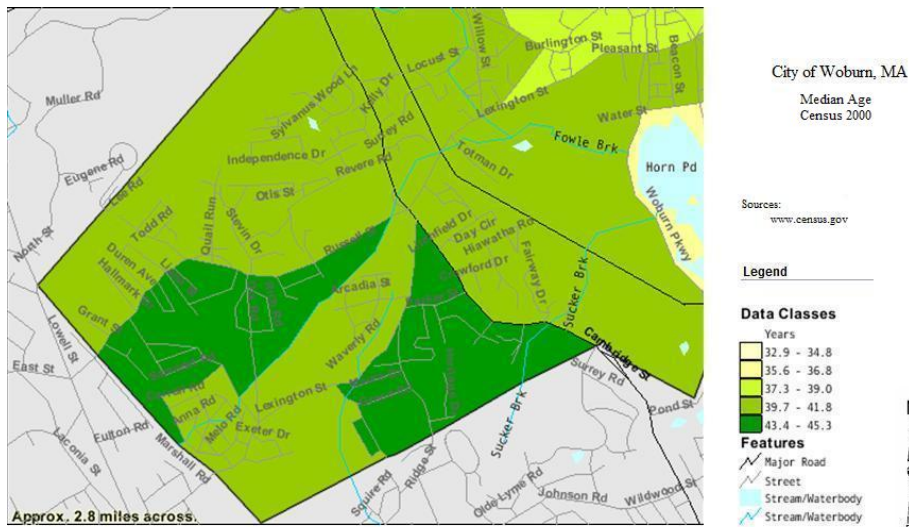


Figure 1-5: Woburn's median age breakdown for the western portion (US Census 2000)

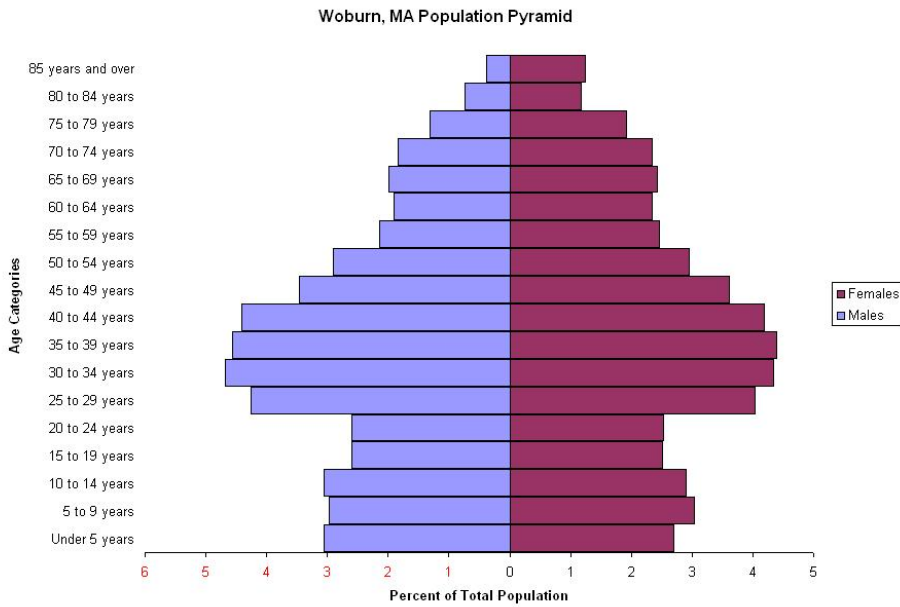


Figure 1-6: An age pyramid showing the distribution of Woburn's ages by sex (US Census 2000)

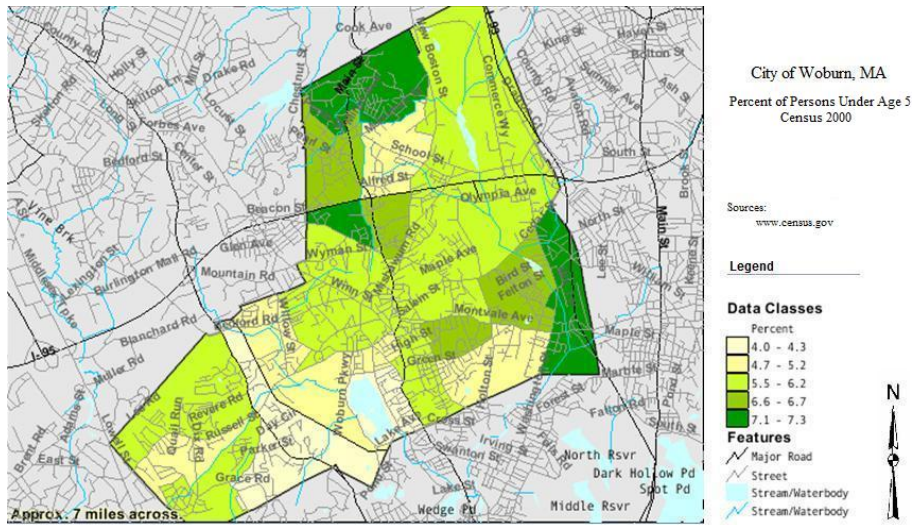


Figure 1-7: The percentage of persons under the age of 5 in Woburn (US Census 2000)

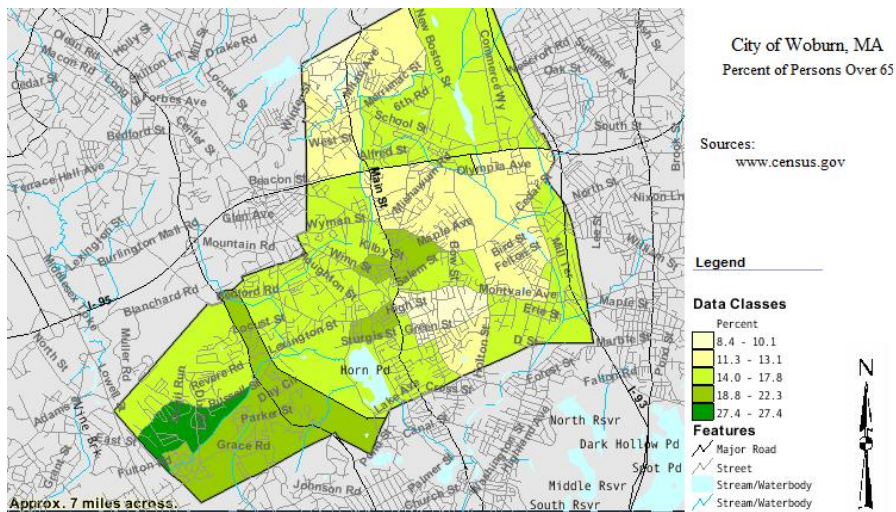


Figure 1-8: The percentage of persons over the age of 65(US Census 2000)

The next important piece of information that we can gather from the census data is the number of households in the Census Blocks that encompass the study areas, which determines housing density. The strip along the Route 3 corridor, shown below in Figure 1-12 in dark green, is the most densely-developed section of the western focus area. It is categorized in the highest of the five designated categories, which holds between 1,100 and 1,200 households. The other two Census Blocks in the focus area are in the lower housing density categories. Knowing that there is moderate housing density overall in the section of Woburn containing the study areas helps to guide what plans or designs are proposed by informing the planner on how many households will



be directly affected by the implementation of any plans and also to help gauge the number of potential users of the proposed land uses.

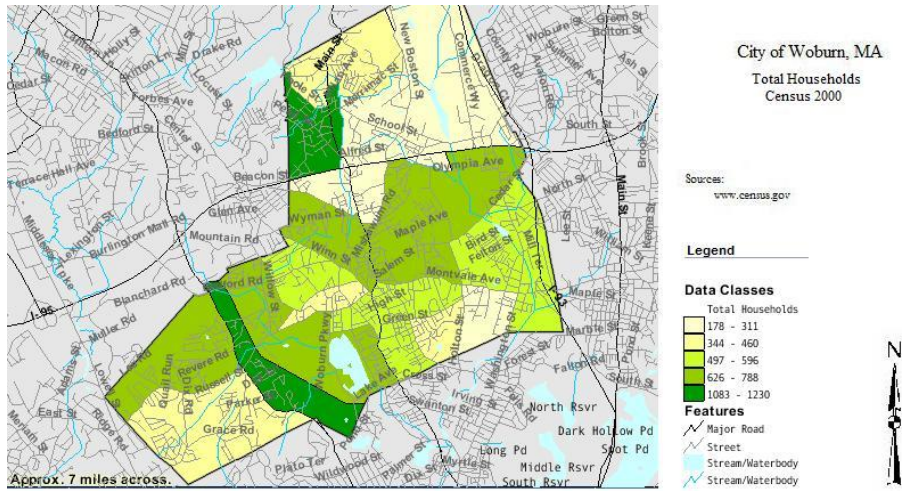


Figure 1-9: Woburn’s housing density (US Census 2000)

Understanding the median incomes in the study area is also important. The City of Woburn, in its entirety, has a median annual income of \$54,897 (Census 2000). This is higher than both Massachusetts (\$50,502) and the United States (\$41,994). Looking specifically at the western focus area (see Figure 1-13), the median income is around \$70,000. This is dramatically higher than the average for the City of Woburn, as well as MA and the US. As previously stated, the population in the western focus area has a high number of older residents, which could be a contributing factor to the high median income here as well.

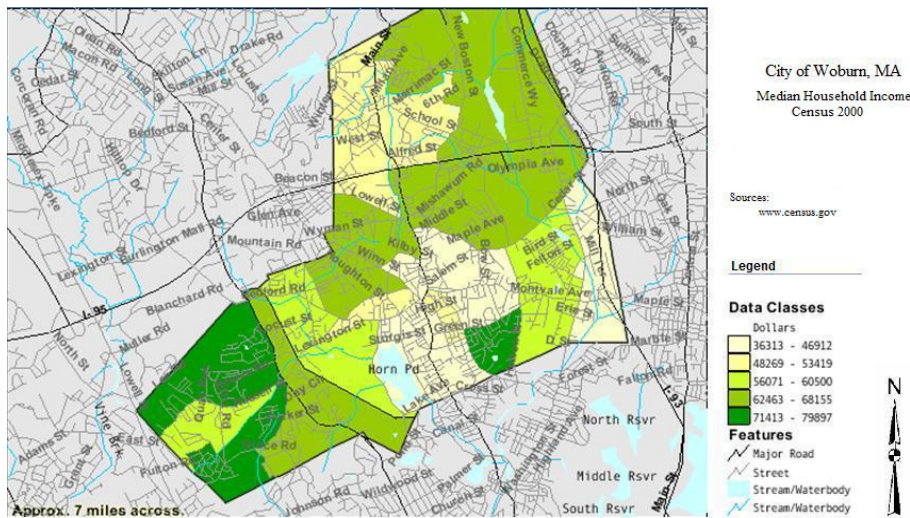
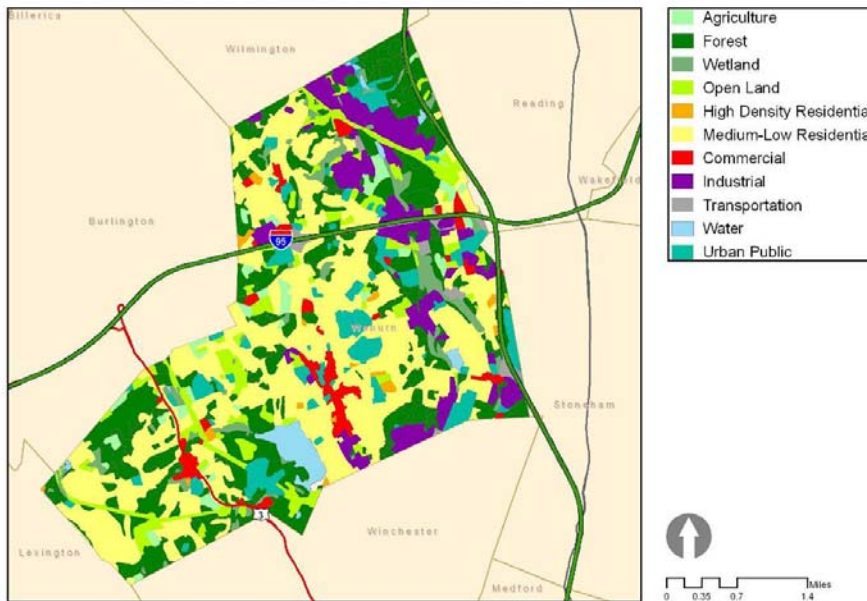


Figure 1-10: Median household incomes in Woburn (US Census 2000)

Demographic data and trends have informed our planning. We know that the population in the western focus areas is, in general, older in age with a higher income than average for the entire city. It is important to remember that the census data used is from the year 2000, so there is a ten-year difference between this information and the current demographics of Woburn. The information used from the 2000 Census is, however, a very useful gauge of trends. We can use this valuable demographic information in the best way possible when planning for the future uses of the study sites in Woburn.

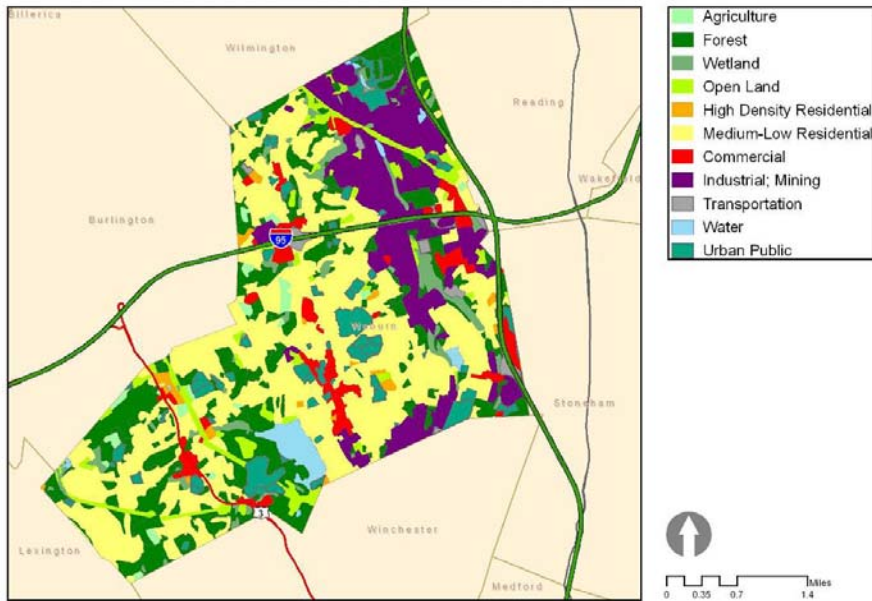
#### D. Land Use Trends

In order to evaluate the land use of Woburn, data for four specific years were available from Massachusetts GIS, a Massachusetts agency dedicated to providing spatial data for the Commonwealth. These years are 1971, 1985, 1999, and 2005 (See Figures 1-14 through 1-17 below).



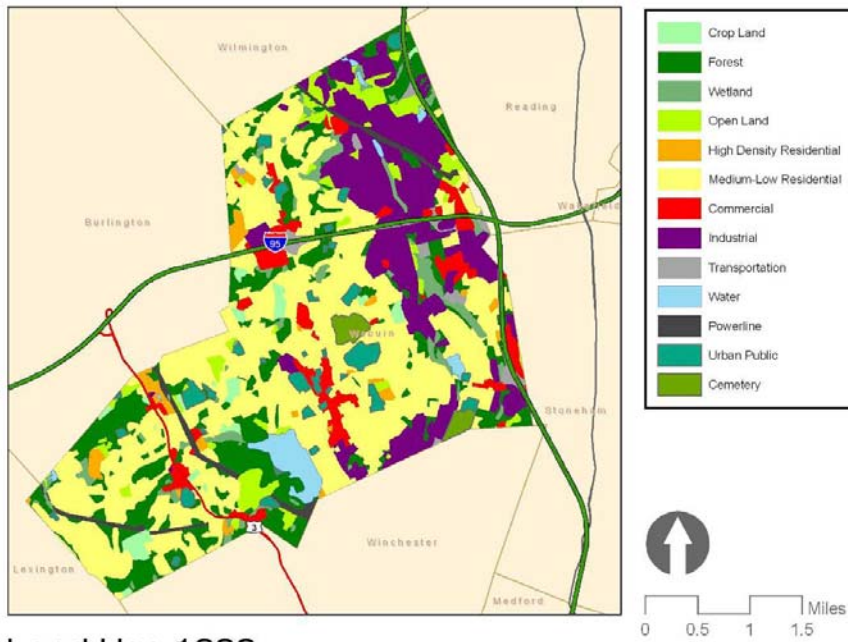
Woburn Landuse 1971

Figure 1-11: Woburn Land Use 1971 (MassGIS)



Woburn Landuse 1971

Figure 1-12: Woburn Land Use 1985 (MassGIS) *(REPLACE WITH 1985 MAP)*



Land Use 1999

Figure 1-13: Woburn Land Use 1999(MassGIS)

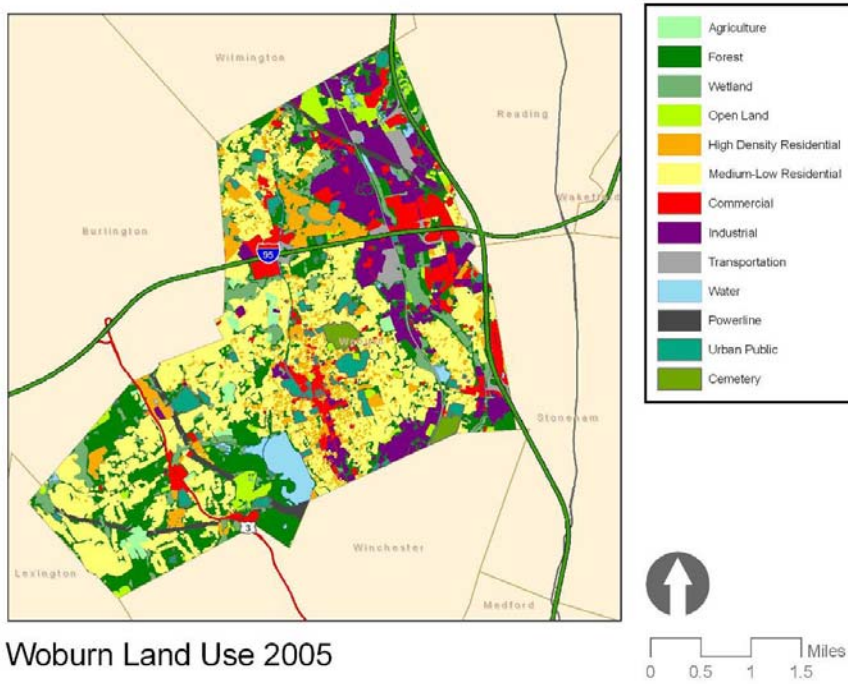


Figure 1-14: Woburn Land Use 2005. (MassGIS)

Currently, the City of Woburn occupies 8,256 acres (12.9 square miles). Figure 1-18 below illustrates the major land use trends from 1971 to 2005, as expressed in a percentage of the total acreage of the city.

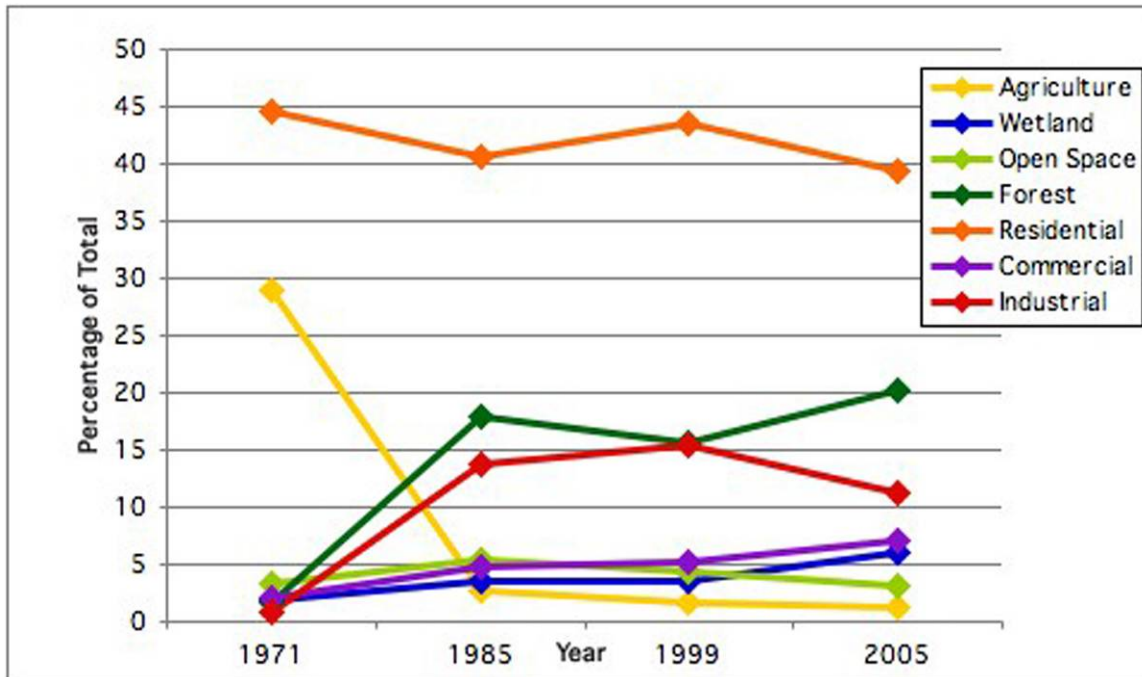


Figure 1-15: Woburn Land Use Trends, 1971-2005. (MassGIS)

## **Residential**

As with many urban or peri-urban areas, the primary land use in Woburn is residential. Between 1971 and 2005, the area given over to residences has decreased slightly from 45% to 39% of the total area. That translates to 441 fewer acres for residences. With the exception of the downtown area, most of that land is considered low-medium density housing.

## **Agriculture**

During that same time, the amount of land devoted to agriculture has decreased dramatically. From available MassGIS data, the largest change seems to have occurred between the period of 1971 (29%) and 1985 (3%). This was a period of time when the number of small farms across the country was reduced. Woburn currently has only 112 acres of agricultural land within its boundaries (Figure 1-17 above). This indicates that the majority of Woburn's food supply comes from outside the city. A local food supply is an important community resource to protect. Locally-produced food creates a local economy that supports local employment. It also helps ensure that healthy food is available for all residents.

## **Commercial**

Manufacturing in Woburn capitalized on the land surrounding the major highways that run through the city (I-95 and I-93). Most of the land devoted to industry has remained in this north-west area of the city. As with any growing city, Woburn has increased its industrial and commercial sectors over the past 40 years. Most of the commercial interests reside in the downtown area where restaurants and shops are concentrated.

## **Wetlands**

Woburn has taken measures to ensure the preservation of important wetlands and open spaces over the past four decades. The preservation of these spaces is very important to social and environmental well-being. Wetlands provide important functions including flood control, water quality improvement, groundwater recharge, wildlife habitat and recreational and educational values. It has been shown time and again that access to nature increases people's happiness, healthiness and interest in the world (Kuo, 1998). Wetlands are a special category of a natural area and have specific benefits, including flood moderation and ground water infiltration.

Over the past four decades, Woburn has seen an increase of acreage of forested land. The amount of forested area grew from 137 acres to 1672 acres, which accounts for 20% of the current total. Much of the increase seems to have come from former agricultural land allowed to return to nature. While it is unfortunate that agricultural land decreased so much, the transition of land back to its forested state, is a positive trend that few cities experience. Forested habitats house many forms of wildlife including mammals, amphibians, reptiles, and birds. The large abundance of trees pulls toxins and pollutants out of the air, and provides clean oxygen in return. Forests moderate the climate, especially in summer. Forests also provide beautiful view-sheds and areas for recreation within them.

Several recommendations directly related to our study can be made based on this analysis:

- Encourage the current trend of increasing forested areas. The more acres devoted to forests, the healthier the citizens and wildlife will be.

- Continue to preserve open spaces. They provide important areas that allow people to interact with the natural world.
- Continue to preserve and manage wetlands for the functions and ecosystem services they provide.
- Preserve and protect agricultural lands. Consider incentives to encourage people to develop land as agriculture.

## E. Hydrology

### Introduction

Water is essential to all life: human, animal, and plant. Clean water, free from nitrates and other forms of pollution, is an essential resource for maintaining public health in all communities. Woburn’s water supply depends in a large part on Horn Pond (60%), not only a reservoir for the public water supply, but also as a designated priority habitat for wildlife. By protecting Horn Pond and the streams and rivers that lead to it, Woburn can improve the water meant for human consumption while also benefitting the wildlife, and providing water for recreational activities and for the quality of life of the community.

### Goals

It is important to understand water as part of a hydrologic system moving through watersheds, from small streams to rivers to ponds, and into the groundwater that enters drinking water supply aquifers. Water flows downhill through streams, rivers and lakes to form a *watershed*. Watersheds are named for the rivers into which their water flows – thus the rivers and streams in the Mystic Watershed (covering most of Woburn) flow into the Mystic River. (Figure 1-19) A sub-watershed is a smaller system within a larger watershed – the main sub-watershed in Woburn is the Aberjona, which drains into the Aberjona River. These hydrologic connections challenge cities to manage water: each change made to a small stream can positively or negatively impact the quality of rivers, ponds, and reservoirs further down the river system.

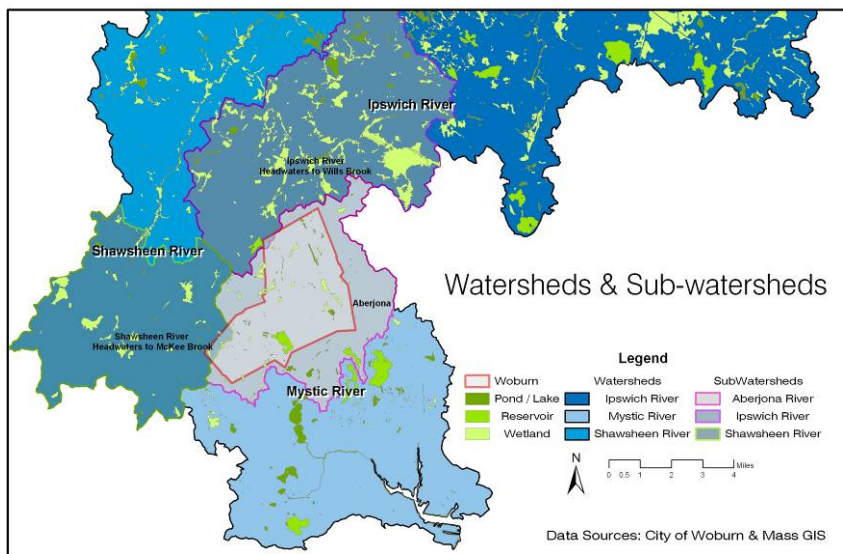


Figure 1-16: Woburn is primarily located within the Mystic River watershed and the Aberjona Sub-watershed. Source: Mass GIS Hydrography 1:25,000 (Mass GIS Surface Supply Watersheds)

There is an unfortunate history of polluted drinking water in Woburn - an area of particular concern for the community. Woburn lost 30% of its water supply in 1979 when wells G & H were closed after becoming polluted with carcinogens and increasing human health risks (U.S. Environmental Protection Agency). Today, more than half (60%) of Woburn’s water comes from wells A-F, located around Horn Pond (City of Woburn, Department of Public Works). There are protections in place for the water around Horn Pond: the City of Woburn Zoning Ordinances sections 15-3 through 15-5, prohibit certain activities in a Groundwater Protection District, including but not limited to storage of petroleum, heavy industrial use, landfills and open dumps, and the storage of sludge or septage. (Figure 1-20)

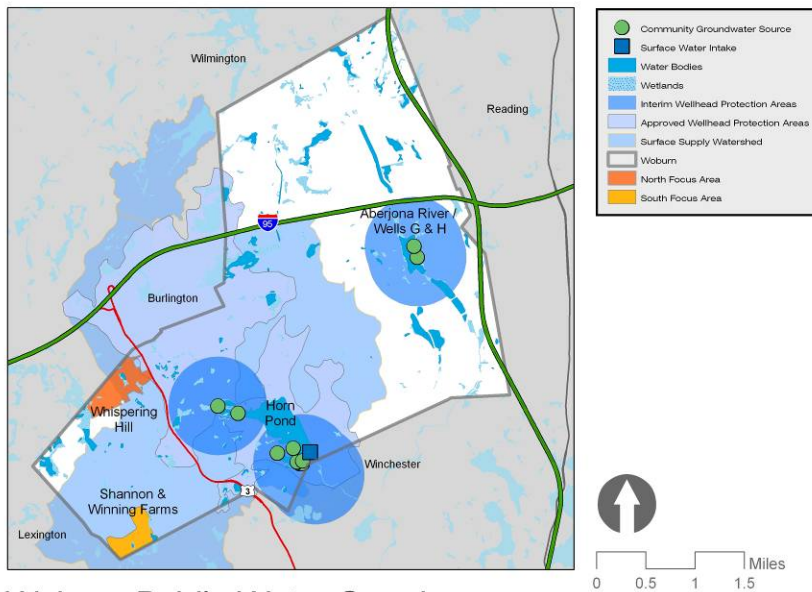


Figure 1-17: Woburn’s public water is primarily drawn from the community groundwater sources and water intakes surrounding Horn Pond. Wells G & H have been permanently closed due to pollution and public health hazards. (Mass GIS Public Water Supplies, Mass GIS Surface Water Protection Zones A, B, C, and DEP Wellhead Protection Areas)

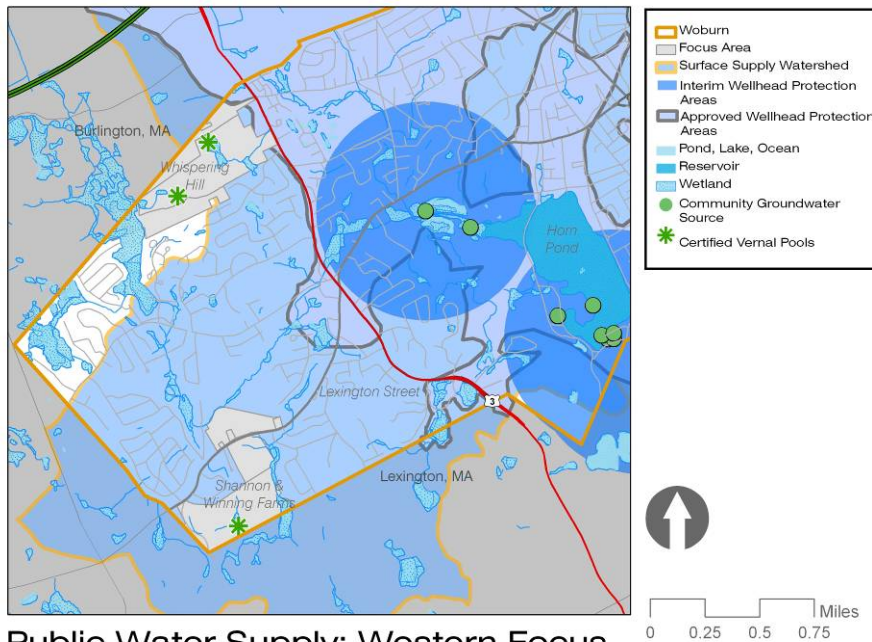
In addition to the 60% of drinking water that comes from Horn Pond wells, 40% of Woburn’s water comes from the Quabbin Reservoir, and is provided to Woburn by the Massachusetts Water Resource Authority (City of Woburn, Department of Public Works). By conserving and protecting Horn Pond and the streams and rivers that lead to it, Woburn can maintain and improve the quality of its water supply, and avoid increased dependence on water brought in from other sources like the Quabbin Reservoir.

Other designated and potential areas for hydrologic preservation and conservation are both the 100 year and 500 year floodplains in Woburn. Protecting these floodplains prevents loss of property and life in the event of a flood, and provides numerous collateral benefits including:

recreation, climate stabilization, wildlife habitat and helping to define community character. In order to maintain these community and wildlife benefits, it is important to protect and buffer these sensitive areas.

Within the two focus areas described below, it is important to understand not only the specific parcels that are already protected, but also the opportunities to expand protection and provide further benefit with respect to Woburn’s water resources.

**Focus: Western Woburn**

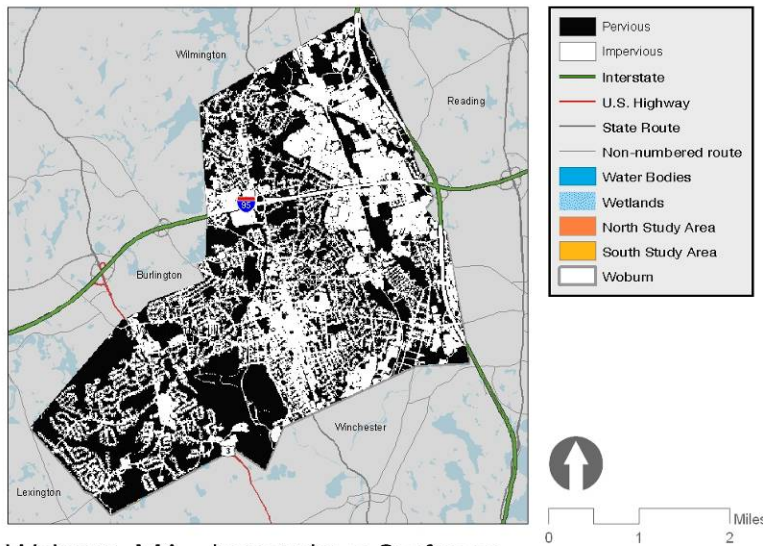


**Public Water Supply: Western Focus**

*Figure 1-18: Western Woburn Public Water Supply. (Mass GIS Public Water Supplies, Surface Water Protection Zones A,B,C, DEP Wellhead Protection Areas, and NHESP Certified Vernal Pools)*

Shannon Farm, Winning Farm, Whispering Hill, the Cummings property and Horn Pond are found in the western part of Woburn (Figure 1-21). As with any suburban neighborhood, the hydrology of west Woburn is affected by the amount of sealed, or impervious surfaces in the area. Woburn as a whole has approximately 70% pervious surface, and 30% impervious surface (Figure 1-22). Western Woburn, however, has a higher percentage of pervious surface than impervious, estimated at 80%. Because western Woburn has more pervious area, it provides an opportunity and advantage for forming green connections throughout this area. These green connections can protect small headwater streams and channels, and provide surface area for groundwater infiltration to recharge aquifers.

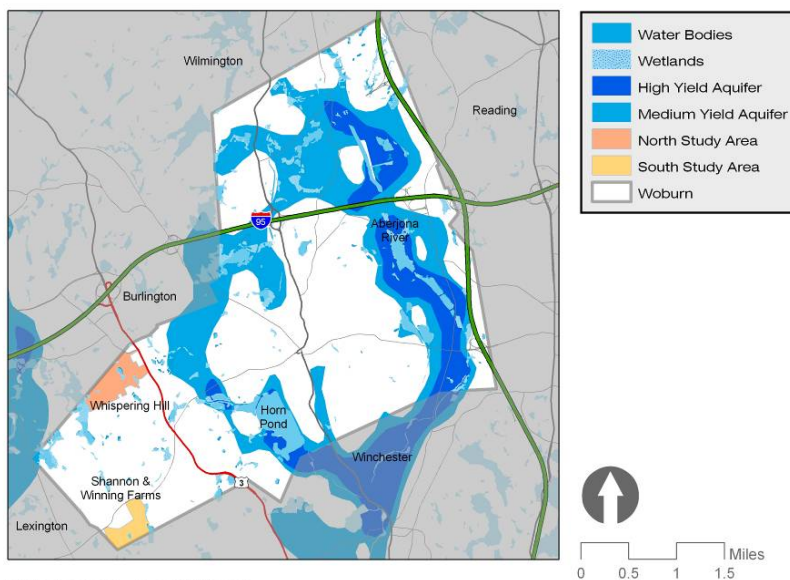




Woburn, MA - Impervious Surfaces

Figure 1-19: Woburn’s Impervious Surfaces. (Mass GIS Impervious Surfaces)

An aquifer is defined as a layer of water-bearing permeable rock or material from which groundwater can be extracted. Woburn has areas of medium and high yield aquifers (Figure 1-23). The medium yield is defined as between 100 and 300gpm (gallons per minute) and the high yield is defined as over 300gpm (MassGIS Aquifers Datalayer). The very eastern portion of the Woburn’s aquifers is contaminated – the area around wells G & H – but because of the structure of aquifers, sometimes pollution can be contained within one area and prevented from corrupting all the water in the larger aquifer that underlies the city.

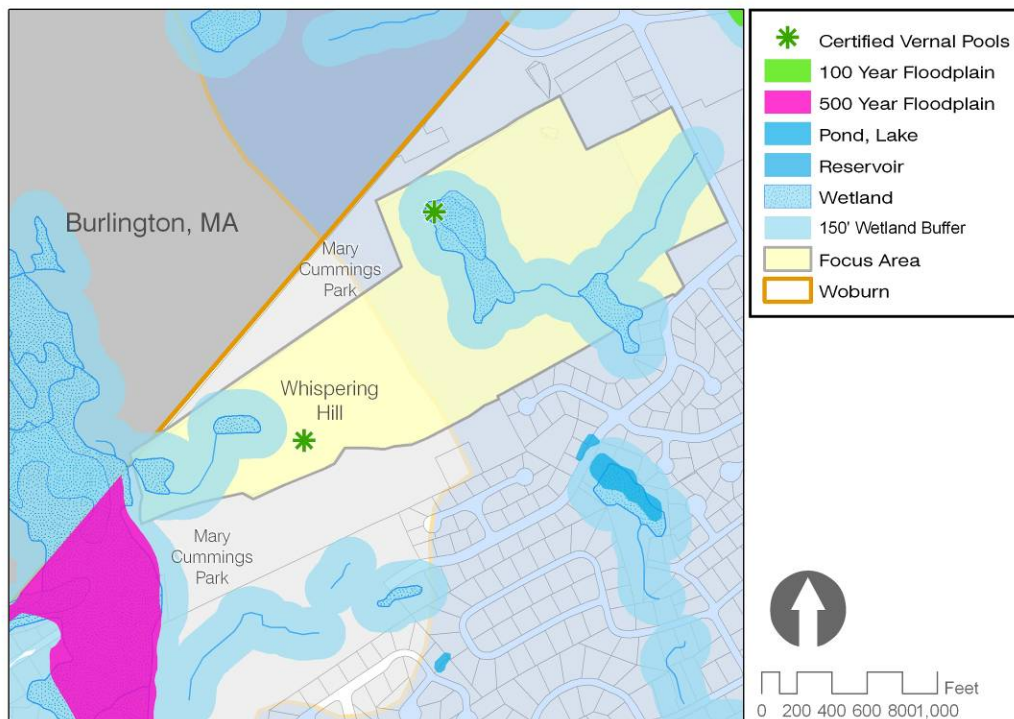


Woburn Aquifers

Figure 1-20: High yield is considered over 300 GPM, and medium yield is between 100-300 GPM. (MassGIS Aquifers, Mass GIS DEP Wetlands)

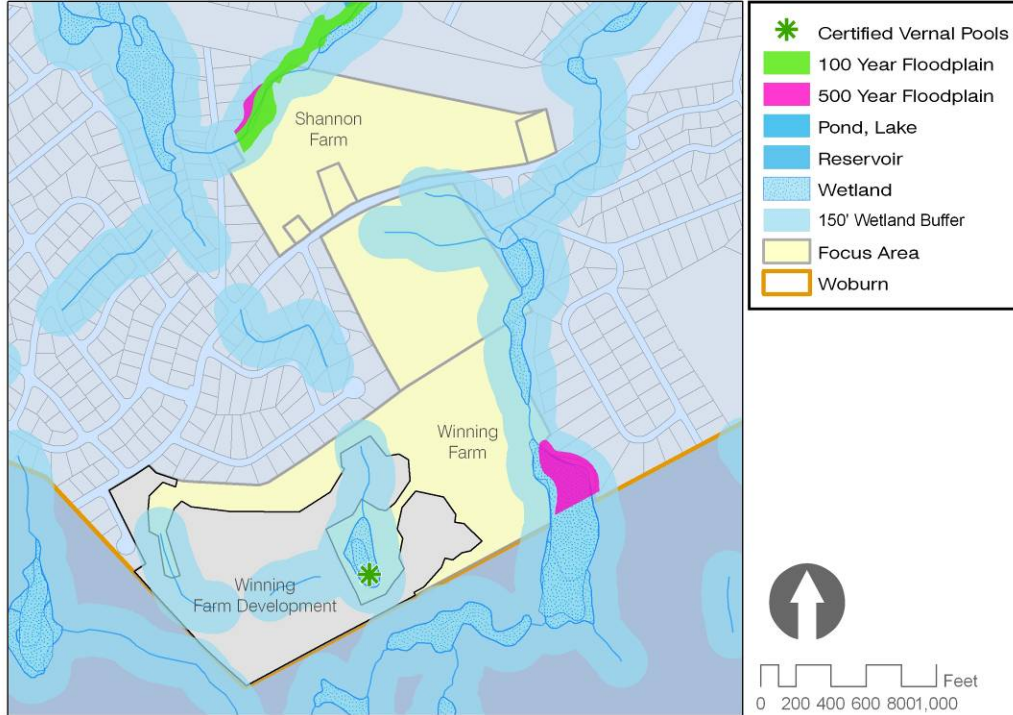
There are two zones of floodplains within the city. The 100 year floodplain is defined as the area that would be inundated by 100 year flooding, for which base flood elevations (BFE's) have been determined. A 100 year flood is a flood elevation that has a 1% chance of being equaled or exceeded each year (*FEMA*). The 500 year floodplain is defined as an area that would be inundated by 500 year flooding. Every flood season has exactly the same chance – one in 500 – of producing a 500-year-flood, even in areas that experienced a 500-year-flood in the recent past (*PBS*).

Whispering Hill has a 500 year floodplain located around a wooded deciduous swamp to the western side of the site (*Figure 1-24*). Winning Farm has two 100 year floodplains mapped, both located around shrub swamps in the southern portion of the site, and Shannon Farm has a wooded deciduous swamp located on the south eastern edge of the parcel (*Figure 1-25*).



### Hydrology: Whispering Hill

*Figure 1-21: Whispering Hill floodplains and wetlands. (Mass GIS DEP Wetlands & FEMA Q3 Flood)*

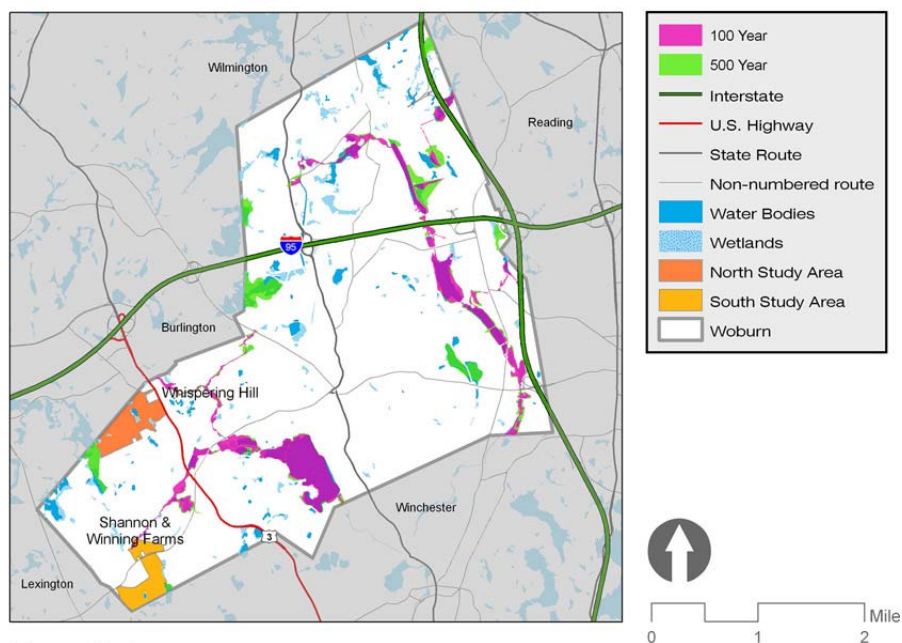


### Hydrology: Winning & Shannon Farms

*Figure 1-22: Winning/Shannon Farm floodplains and wetlands. (MassGIS DEP Wetlands & FEMA Q3 Flood)*

The area around Horn Pond has portions located in both 100 and 500 year floodplain zones. It is also important to note that Shaker Glenn Stream is within a 100 year floodplain zone, with some of its tributaries located within the 500 year floodplain zone. The only chronic flooding in Woburn is in the Middlesex Canal, around Hart Street (*Woburn Open Space Plan p. 135*).

The map of Woburn’s floodplains (*Figure 1-26*) shows that the floodplains overlay several delineated wetlands in the area. During precipitation events, wetlands can reduce potential damage by slowing and infiltrating water during the peak flow of the storm. Wetlands are also an important habitat for wildlife, providing breeding and nesting places, protective cover, and food. Because of these benefits to the community and wildlife in the area, it is important to continue to protect these wetland areas.



**Flood Zones**

Figure 1-23: *City-wide Floodplains Source: Mass GIS FEMA Q3 Flood, Mass GIS Hydrography 1:25,000, (Mass GIS DEP Wetlands)*

A wetland is an area where water is present in enough quantity that it determines the makeup of the soil: *hydric*, or anaerobic soil, lacks oxygen for significant portions of the year because it is saturated with water. The saturation level of soil determines which plant species are able to grow and reproduce in the unique environmental conditions of wetlands. In Massachusetts, the wetlands are delineated by obligate species – species of plants that are only able to grow and reproduce in the wetlands. These delineated wetlands are protected by the June 2009 Massachusetts Wetlands Protection Act, with a 100’ buffer mandated around delineated wetlands. Towns and cities in Massachusetts have the option to add to that protection: Woburn’s municipal code requires a 150’ wetland buffer in which no person shall “remove, fill, dredge, alter or build” (Title 7, Section 2).

## **F. Habitat**

### **I. Wildlife Habitat Assessment**

#### **A. Introduction**

Biodiversity is important as an indicator of overall environmental health. The healthier the environment the more biodiversity it will support. Thus planning for biodiversity is related to other planning goals. Biodiversity is directly related to habitat and habitat is under pressure from urban development in places like Woburn. In recent decades, the loss of habitat to development has been multiplied by ever-greater acreage used for each

residential unit: “from 1950 to 2000, the population of Massachusetts increased by 28%, but the area of developed land has increased by 200%” (Breunig, K. 2003).

In Woburn, Massachusetts, the decreasing amount of wildlife habitat has become evident. Woburn is a densely developed suburb - small city. The least developed area in the city is the southwestern portion, where there are still many views of fields and undeveloped spaces interspersed with residential development. The impact of additional development will be felt most strongly in this southwestern portion, which will greatly impact wildlife habitat areas as fewer large open parcels remain. The City of Woburn has a unique opportunity to ensure the preservation of its wildlife habitats throughout the city and in particular, in the southwestern area. This can be done through acquisition of the remaining open spaces, including the Whispering Hill and Shannon Farm properties. The goals of open space acquisition are to protect and perpetuate ecosystems that contain significant fish and wildlife resources, to conserve biodiversity, to provide adequate routes for public access to the lands and waters, and to support other community uses including recreation and agriculture.

## B. Background

### 1. Biodiversity

Biodiversity is important to people and to the health of ecosystems. Biodiversity is defined as “the totality, over time, of genes, species, and ecosystems...in a region... that support and sustain life” (Ahern et al, 2007). Biodiversity provides ecosystem services that directly benefit people, including: filtering carbon dioxide, regulating climate, and providing flood and water quality protection. Biodiversity represents a repository of genetic information, serving as a potential buffer against disease and famine and a source of biotechnological discoveries. Biodiversity describes the variety of life on earth. Current biodiversity loss is 1,000 to 10,000 times faster than at any other time in geologic history (E.O.Wilson, 1988). One third of the species of the US are threatened or endangered (Nature Conservancy Conservation Status Ranks for Native U.S. Fauna and Flora, Master et al. 2000).

There are many threats to biodiversity. Species are going extinct globally at an accelerated rate, because of environmental changes caused by human activities. Some of the activities have direct effects on species and ecosystems, such as habitat loss, fragmentation, over-exploitation such as overfishing, and the spread of non-native aggressive species. These are the primary threats to wildlife and the leading cause of global biodiversity decline. Some human activities have indirect but wide-reaching effects on biodiversity including climate change and pollution.

There are four fundamental ways in which Woburn can protect biodiversity:

- 1) enhancing the quality of existing habitat
- 2) reducing the impact of surrounding land uses
- 3) promoting the connections between natural habitats
- 4) increasing the areas of protected habitat

(Bennet, 1999)

Protecting present biodiversity will help to ensure the greatest variety of species and natural communities of our native plants and animals for generations to come.

Woburn has a unique opportunity at this point in its history to protect and enhance the existing wildlife habitat within its borders, and to establish connections with the habitats in surrounding towns. In so doing Woburn will not only contribute to its overall biodiversity, and to enhanced property values of nearby land, but also to increase the enjoyment of the land by residents themselves.

## 2. Protection and Regulation

There are many environmental regulations in Massachusetts that protect valuable wildlife habitats, endangered species, wetlands, and certified vernal pools. The major authority at the state level in Massachusetts is the Natural Heritage and Endangered Species Program (NHESP) part of MA Division of Fisheries & Wildlife. NHESP reviews the likely impact of proposed development projects or wetland alterations on rare species and their habitats. In addition to reviewing proposed projects, NHESP plays a critical role in implementing the state's environmental laws. For a description of these laws, please refer to Appendix L: Massachusetts Environmental Laws.

- a) Massachusetts Endangered Species Act (M.G.L c.131A and regulations 321 CMR 10.00)
- b) Massachusetts Wetlands Protection Act (M.G.L. c.131, s.40 and regulations 310 CMR 10.00)
- c) The Natural Heritage & Endangered Species Massachusetts Forest Cutting Practices Regulations (304 CMR 11.00)
- d) The Massachusetts Environmental Policy Act (MEPA) (M.G.L. c.30, secs. 61-62H)
- e) Certification of Vernal Pools

The NHESP is also responsible for the conservation and management of hundreds of species that are not hunted, fished, trapped, or commercially harvested in the state. The Program's highest priority is protecting the approximately 450 species of vertebrate and invertebrate animals and native plants that are officially listed as Endangered, Threatened or of Special Concern in Massachusetts (MA Division of Fisheries and Wildlife, 2006). MA Division of Fisheries and Wildlife determines a status category for each rare species listed under the MA Endangered Species Act, MGL c. 131A, and its implementing regulations, 321 CMR 10.00. Rare species, which are categorized as Endangered, Threatened or of Special Concern are defined as:

- Endangered species are in danger of extinction throughout all or a significant portion of their range or are in danger of extirpation from Massachusetts.
- Threatened species are likely to become Endangered in Massachusetts in the foreseeable future throughout all or a significant portion of their range.
- Special Concern species have suffered a decline that could threaten the species if allowed to continue unchecked or occur in such small numbers or with such restricted distribution or specialized habitat requirements that they could easily become threatened in Massachusetts.

NHESP produces various maps including Biomap (2001), Living Waters (2003), Estimated Habitats of Rare Wildlife (October 2008), Priority Habitat of Rare Species (October 2008), Potential Vernal Pools (December 2000), and Certified Vernal Pools (January 2010). These maps are available through the NHESP website at [http://www.mass.gov/dfwele/dfw/nhesp/gis\\_resources.htm](http://www.mass.gov/dfwele/dfw/nhesp/gis_resources.htm). The goals of these maps are to promote strategic land protection by showing the areas of unique value that if protected, would provide habitat over the long term for the maximum number of Massachusetts' terrestrial, wetland plants, animals, and natural communities. These maps are also produced in order to determine whether or not a proposed project or activity must be reviewed by the NHESP for compliance with the Massachusetts Endangered Species Act (MESA) and its implementing regulations.

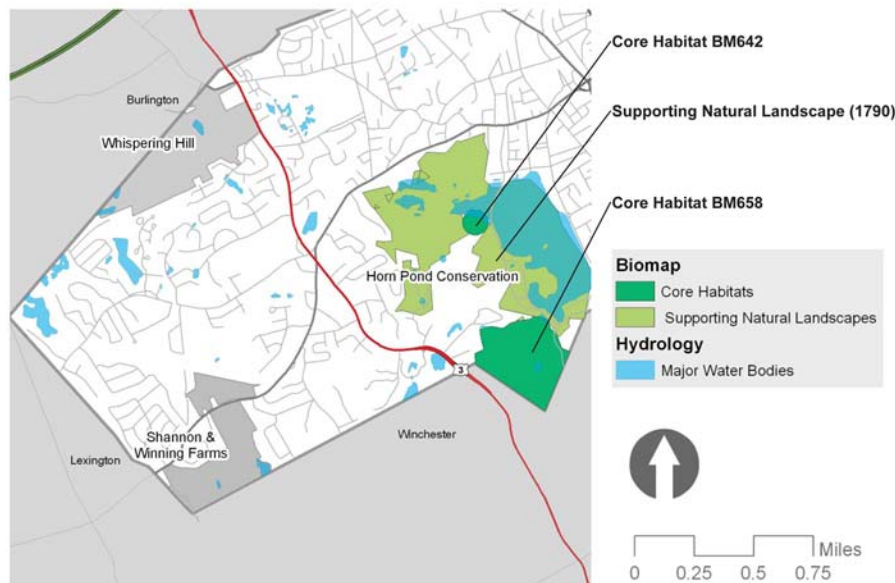
## C. Inventory and Analysis of Existing Wildlife Habitat

### 1. Biomap Core Habitat and Living Waters

In 2001 the Natural Heritage and Endangered Species Program (NHESP) published *BioMap: Guiding Land Conservation in Massachusetts*. *BioMap* identifies those areas of Massachusetts most in need of protection to conserve biodiversity for generations to come through a systematic evaluation of over 7,000 site-specific records of rare plants, rare animals and natural communities. *Living Waters: Guiding the Protection of Freshwater Biodiversity in Massachusetts* was published in 2003 by the NHESP. The purpose of *Living Waters* is to identify and map lakes, ponds, rivers and streams that should have the highest priority for freshwater biodiversity conservation in Massachusetts.

#### a) Biomap Core Habitat

There are two core habitats identified in Woburn: Core Habitat BM642 and Core Habitat BM658.



Core Habitat and Supporting Natural Landscapes

Figure 1-24: *Core Habitat and Supporting Natural Landscapes*. (MassGIS, 2002)

Core Habitat BM642, is a small core habitat located at the south end of Horn Pond that supports an unidentified Rare Plant with unknown status of endangerment. There is a Supporting Natural Landscape (1790) that buffers this core habitat from west, north, and east. According to MassGIS 2010 Protected



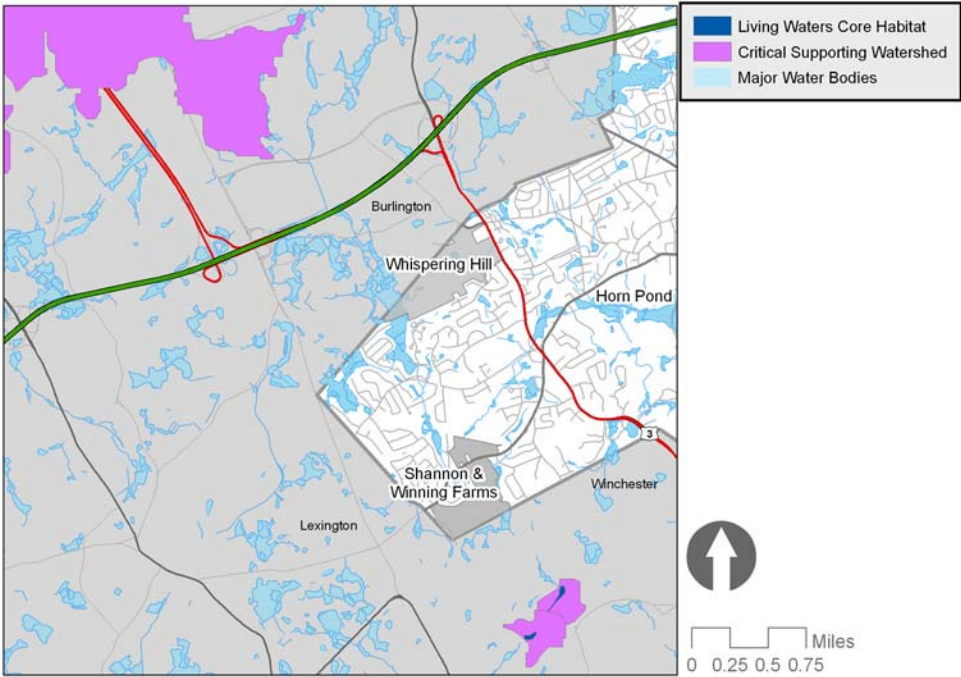
and Recreational Open Space Datalayer, both the Supporting Natural Landscape and the Core Habitat are protected with a level of in perpetuity.

This Core Habitat BM658 includes all of Horn Pond Mountain in Woburn, which has steep, rocky upland woods with granite rock ledges that are habitat for the invertebrate, Hentz's Redbelly Tiger Beetle, which is a very rare species that is not found anywhere outside of Massachusetts and Rhode Island. Several rare plant species, including: Linear-Leaved Milkweed, Long-Leaved Bluet, and Tiny-Flowered Buttercup, that are all endangered are found growing along the ledges, outcrops, and woodlands of this small mountain. Most of the Core Habitat is on municipal land and is protected in perpetuity. Although the surrounding suburban landscape is inhospitable, Core Habitat (Middlesex Fells Reservation) to the east is close enough that dispersal of individuals between these two sites is possible.

There is no supporting natural landscape that buffers Core Habitat BM658.

b) Living Waters

There are no designated Living Waters in Woburn; however there is a Living Waters Core Habitat and Critical Supporting Watersheds in neighboring Burlington along the Shawsheen River. The Whispering Hill study area lies within the Shawsheen watershed.



Living Waters

Figure 1-25: Living Waters in Woburn. (MassGIS, 2003)

## 2. NHESP Priority Habitat of Endangered Species

In 2008 the Natural Heritage and Endangered Species Program (NHESP) published 'Priority Habitats of Rare Species' These data are based on geographic extent of Habitat of state-listed rare species in MA within the last 25 years in areas delineated as wetlands, uplands, and marine habitats. These data are important because it determines whether or not a proposed project or activity must be reviewed by the NHESP for compliance with the Massachusetts Endangered Species Act (MESA) and its implementing regulations.

In Woburn, there were two NHESP Priority Habitats of Rare Species found in the City. One is located on Whispering Hill and Mary Cummings Park. This priority habitat is in both Woburn and Burlington. Currently within Woburn there is no level of protection, however the Burlington portion has a limited level of protection. The other Priority Habitat is located in the Horn Pond Conservation Area and is permanently protected.

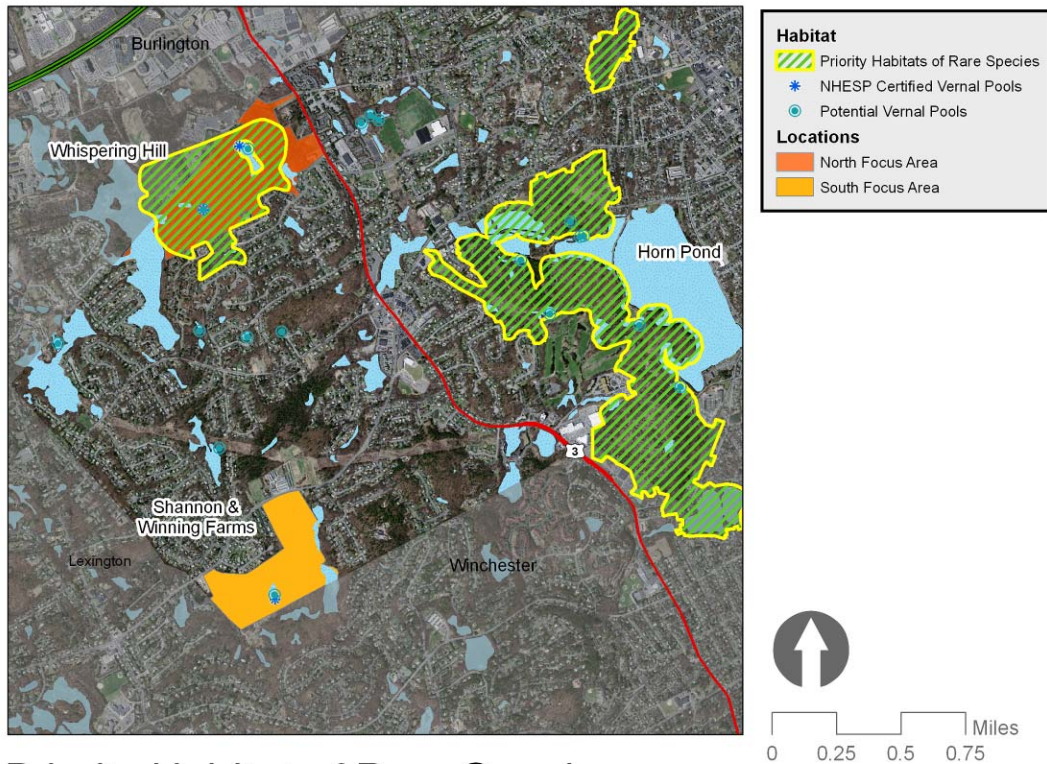


Figure 1-26: Priority Habitat of Rare Species. (NHESP Estimated Habitats of Rare Wildlife - October 2008, NHESP Priority Habitats of Rare Species - October 2008, NHESP Certified Vernal Pools - January 2010, NHESP Potential Vernal Pools - December 2000)

### 3. Vernal Pools

Vernal pool habitats are extremely important to a variety of wildlife species including some amphibians that breed exclusively in vernal pools, and other organisms such as fairy shrimp, which spend their entire life cycles confined to vernal pool habitat. Many additional wildlife species utilize vernal pools for breeding, feeding and other important functions.

Of the 41 Potential Vernal Pools in Woburn, six are within the areas designated as NHESP Priority Habitat of Rare Species. One is located on Whispering Hill, one within the non-developed portion of the Winning Farm, and 5 in the Horn Pond Conservation Area. There are six Certified Vernal Pools in Woburn, one within the NHESP Priority Habitat of Rare Species located on Whispering Hill. In addition there is another potential Vernal Pool on Whispering Hill which is in the process of being certified.

### 4. Conclusion

In considering the Whispering Hill and Winning Farm study areas, it is important to note that the majority of the Whispering Hill parcel and the Horn Pond Conservation Area have already been identified as Priority Habitats. Of these two habitats, Whispering Hill currently has no level of protection. Multiple vernal pools indicate the presence of obligate vernal pool species that depend on this habitat for their survival. Without a level of protection implemented by the City, the species that inhabit these vernal pools are threatened with future extinction.

## II. Assessment of Existing Wildlife Conditions

### A. Wildlife Habitat Changes

Recent trends in wildlife populations reflect land use changes throughout New England and in Woburn in particular. According to MassGIS Land Use Data, over the last 40 years, Woburn has shown a 28% decline of agricultural land and an 18% increase in forest land. A possible explanation for this trend could be the abandonment of farming during much of the twentieth century and the resulting successional forest growth taking over these lands. Parallel to this is a region-wide rapid decline in grassland and shrubland species, particularly birds. The decline of agriculture and reversion of forest have essentially eliminated grassland birds which were common 50 years ago, from most of New England. These include Ruffed Grouse, Bobolink and Eastern Bluebird. Another trend is forest fragmentation, yet birds have been less affected by the fragmentation of forest than have mammals, and many have increased in population. Forest birds which have increased include the pileated woodpecker, which requires trees over 20" in diameter for nest and roost cavities.

Among mammals, recent population changes that may be in evidence in Woburn include increasing coyote, fisher, deer and beaver populations. Declines in the New England Cottontail, Bobolink, and Ruffed Grouse, which favor old fields and brushy lands elsewhere in the region may be atypical around the fields and successional shrublands of the Shannon

Farm and the Mary Cummings Park. Forest fragmentation has caused the decline of a number of mammals. Greenways connecting these focus areas with larger tracts of protected land such as Horn Pond and the Middlesex Fells will impact connectivity for other mammals in addition to humans.

Anecdotal reports of wildlife sightings by neighborhood residents and hikers encountered on our site visits and at meetings, as well as the Friends of Mary Cummings Park website include: Fisher (rare), rabbits (numerous), White-tailed Deer, Wild Turkey, fox (not lately), Raccoon, many hawks and owls, Striped Skunk. Birds we observed or heard on our visits include: Song Sparrow, White-breasted Nuthatch, Black-capped Chickadee, Bobolink, Bluejay, Red-tailed Hawk, a Mallard pair. The Woburn Resident's Environmental Network website lists 140 species of birds that have been sighted in and around the Mary Cummings Park and Whispering Hill lands.

Figure 1-30 illustrates the 80 year decline in species preferring a successional habitat, such as ruffed grouse and vesper sparrow. Concurrently, populations of deer, beaver and coyote which inhabit forests are increasing.

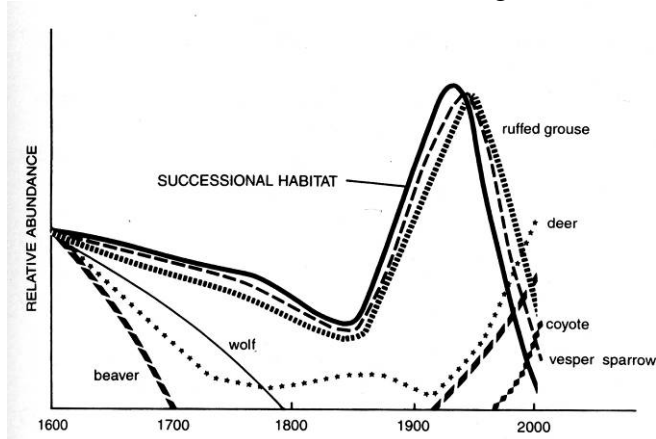


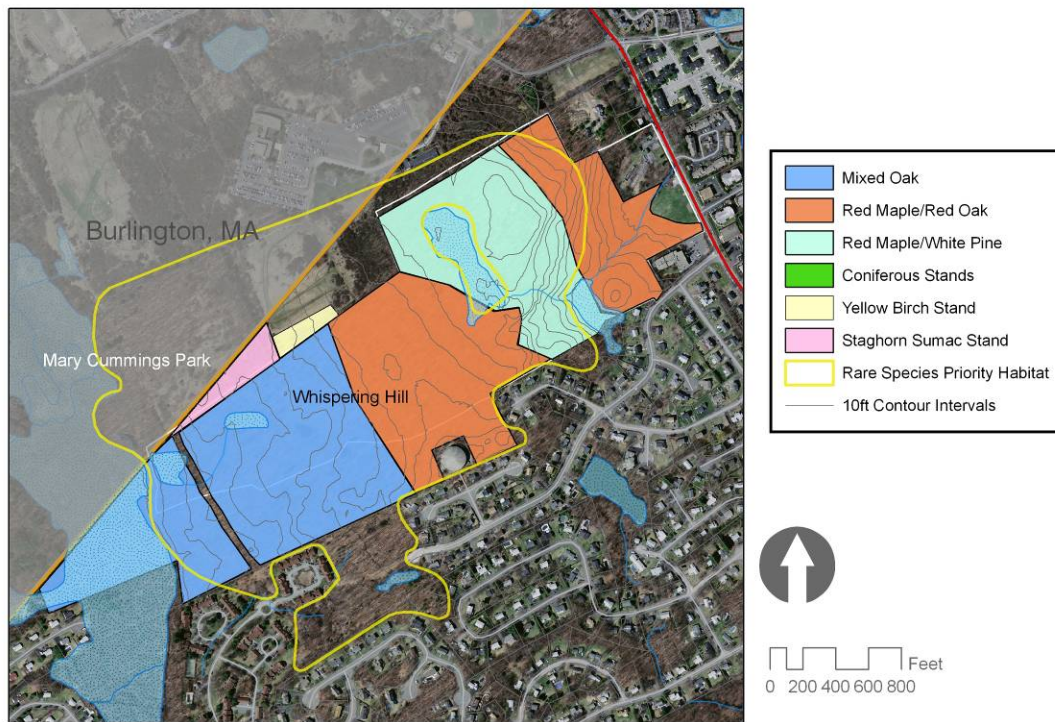
Figure 1-27: Schematic depiction of historical changes in representative wildlife species and successional habitat in New England. (Modified from Bickford and Dyman, 1990 in DeGraaf and Yamasaki, 2001)

## B. Forest habitat

The Whispering Hill and Winning Farm parcels combined represent approximately 100 acres of forested land. We analyzed the vegetation within these forests based on dominant plant species.

Whispering Hill has 75 acres of forest with a majority of mixed deciduous forest and small stands of conifers. Mixed oak dominates 40% of the parcel, 40% is red maple/red oak, and 20% red maple/white pine. The majority of the soils are dry, with the exception of two large wetland areas on the northeast and southwest sections. Understory species include shadbush, low-bush blueberry, spice bush, striped maple, and mountain laurel. The forest within the Mary Cummings Park contains far more invasive species than does the adjacent land at

Whispering Hill. Invasive plant species on the Mary Cummings property include: winged euonymous, oriental bittersweet, multiflora rose, barberry, Japanese honeysuckle, Russian Olive, and garlic mustard. Winning and Shannon Farms' invasives include: privet, winged euonymous, oriental bittersweet, grapevine and poison ivy. These invasive species can be controlled by physical pulling or herbicide treatment. They cannot be controlled by cutting as they will resprout.



Whispering Hill - Dominant Woody Vegetation

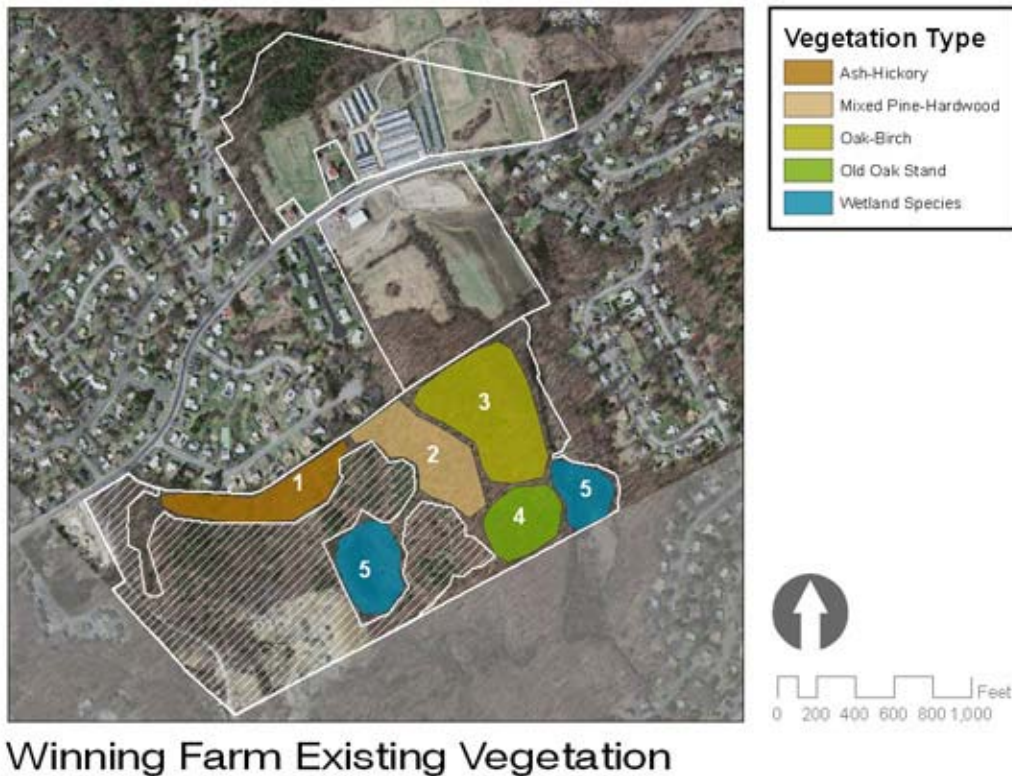
Figure 1-28: Dominant Woody Vegetation in Whispering Hill.

De Graaf and Yamasaki (2001) combine analysis of forest species with the types of habitat they occupy to produce data analysis pertinent to our site. These data as displayed in matrices indicates that Whispering Hill's red oak and red maple forest and wetlands may provide good habitat for the following species: Marbled Salamander, Wild Turkey, Downy, Hairy and Pileated Woodpecker, Veery, Thrushes, Cedar Waxwing, Opossum, Beaver, White-footed Mouse, Gray Fox, Raccoon, White-tailed Deer.

The vegetation of Winning Farm include Oak-Ash deciduous, mixed grey Birch/Pine, Oak-Gray Birch, black-birch along wetlands and stream, and an old oak stand. Forest cover species are similar to Whispering Hill, What distinguishes this southern forest from the northern one is a preponderance of downed trees, fragmentation of forest cover types, and climbing invasives such as poison ivy, grape vine, and oriental bittersweet. This southern forest is therefore somewhat less hospitable to the species listed above.

### C. Fields and Successional Open Land Habitat

The non-forested species/habitat matrix in New England Wildlife for cultivated land, grass land, shrubland and old fields suggest the presence of the following species: Turkey, Vulture, Barn Owl, Northern Flicker, Barn Swallow, Cliff Swallow, American Robin, Northern Mockingbird, Brown Thrasher, Song Sparrow, Bobolink, Red-Winged Blackbird, Eastern Meadowlark, New England Cottontail, Woodchuck, White-footed Mouse, Meadow Vole, Red Fox, Raccoon, Striped Skunk.



*Figure 1-29: Winning Farm Existing Vegetation.*

### D. Regional Connections

As the two focus areas occupy land at or near the border of the city, and as wildlife tends to be oblivious to such borders, we need to consider adjacent habitat for the wildlife that we find in these areas. At Horn Pond, which occupies 500 acres, forty-four species of birds were identified on June 12<sup>th</sup> 2005. The largest protected forest and open land in western Woburn's vicinity is the 2500 acres of the Middlesex Fells Reservation, 5 miles to the southwest of Horn Pond. The Fells is the third largest public park inside of Route 128, Horn Pond is the eighth largest, Mary Cummings Park is the twelfth but combined with Whispering Hill they would climb to number ten. In the vicinity of the southern focus areas we find the 120 acres

of Whipple Hill in Lexington, with a varied landscape including forest, meadow and wetlands. Arlington’s Great Meadows is a 184 acre public open space bordered by the Minuteman Bikeway. Species found there include 56 species of nesting birds, 12 species of amphibians and reptiles, and 251 species of plants growing in the wetlands, meadows and steep uplands. On a recent “Biodiversity Days” survey, nearly 400 plant and animal species were recorded in the Great Meadows area. The above properties are all found in the Mystic River watershed. Within the Shawsheen River watershed, Lexington also contains the 100 acres of Willard’s Woods Conservation Area which maintains agricultural land much as it existed 140 years ago. Little Brook Conservation Area in Burlington, also in the Shawsheen River watershed, has 36 acres of steep land with some low lying wetlands. The largest conservation area in Burlington is the Mill Pond Conservation Area with 400 acres of rolling and steep terrain.

#### E. Summary

The presence of mixed deciduous hardwood forests, wetlands, successional shrublands, and open fields indicates a rich diversity of wildlife habitation within our focus areas. Whispering Hill is significant as it contains a fairly large climax deciduous forest only 10 miles from Boston. The agricultural fields of Shannon Farm and those fields in both focus areas at the beginning of forest reversion offer the most desirable habitat for those regional species which are presently in decline. The wetlands and vernal pools, as mentioned above, are essential for the obligate species which depend on them. These properties also serve as an essential link for wildlife between neighboring conservation areas, particularly given the fragmentation of unbuilt land in this heavily populated region.

### III. Levels of Protection

As shown in Figure 1-33, the total open space in Woburn comprises only 723 acres or 9% of total acreage. Of the 723 acres of open space, only 552 acres or 7% are protected with a level of perpetuity, as shown in Figure 1-33.

#### Percentage of Open Space in Woburn

Owner	Acres	Percentage
Municipal	686	8.28%
Non-Profit	26	0.31%
Public Non-Profit	11	0.13%

Total Acres in Woburn                      8284

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Total Open Space                              723                      8.7%

*Source: MassGIS "Protected and Recreational OpenSpace - February 2010"*

*Figure 1-30: Percentage of Open Space in Woburn (MassGIS Protected and Recreational OpenSpace, 2010.)*

Of all the open spaces parcels in Woburn, the only level of protection found in our focus areas is Shannon Farm. Shannon Farm is protected under M.G.L. Chapter 61A as protected agricultural land. Major portions of Whispering Hill and the Mary Cummings Park are certified by the MA Division of Fisheries and Wildlife’s Natural Heritage and Endangered Species Program as a priority habitat for endangered species, however, do not receive any protection in Woburn. The portion of Mary Cummings Park that extends into Burlington does have a limited level of protection.

The proposed greenway project gives Woburn an opportunity to preserve and protect significant additional open spaces for future generations.

**Open Space By Level of Protection**

Level of Protection	Acres	Percentage
In Perpetuity	552	6.66%
Limited	170	2.06%
None	0	0.00%
<b>Total</b>	<b>723</b>	<b>8.72%</b>

Source: MassGIS 'Protected and Recreational OpenSpace - February 2010'

*Figure 1-31: Open Space by Level of Protection. (MassGIS Protected and Recreational OpenSpace, 2010.)*

**Open Space By Primary Purpose**

Primary Purpose	Acres	Percentage
Recreation	144	1.74%
Recreation + Conservation	3	0.04%
Conservation	474	5.72%
Historical/Cultural	102	1.23%
Unknown	0	0.00%
<b>Total</b>	<b>723</b>	<b>8.72%</b>

Source: MassGIS 'Protected and Recreational OpenSpace - February 2010'

*Figure 1-32: Open Space by Primary Purpose. (MassGIS Protected and Recreational OpenSpace, 2010.)*



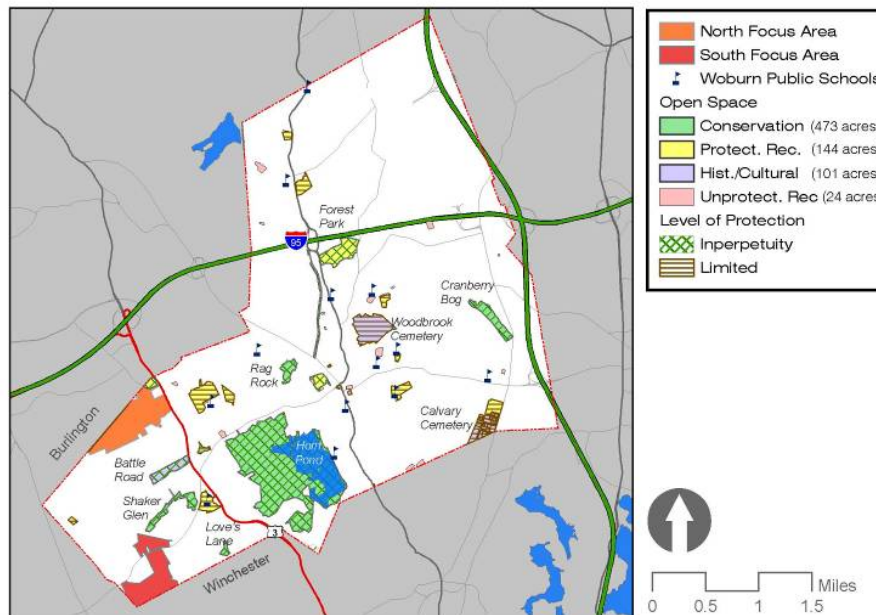
## G. Recreation

### Open Space and Recreation

The City of Woburn Open Space and Recreation Plan (2004) states that the primary and overarching goal of the plan is to “protect the natural resources of the City and to ensure that sufficient recreational opportunities are available to all of Woburn’s citizens.” The major goals of the Open Space Plan are to:

- Provide active and passive recreational opportunities for all residents
- Protect Woburn’s natural resources
- Acquire new open space lands
- Consider regional connections in open space planning efforts
- Protect cultural and historic resources
- Manage existing recreation and conservation lands for maximum benefits

An analysis of Massachusetts GIS data (Protected and Recreational Open Space, 2005) shows the recreational areas throughout the city, many of which are located on or adjacent to public school properties.



Open Space and Recreation

Figure I-33: Open Space and Recreation in Woburn. (MassGIS, City of Woburn )

Open Space is defined as “parklands, forests, golf courses, playgrounds, wildlife sanctuaries, conservation lands, water supply areas, cemeteries, school ball fields, and other open land that may be classified as protected and/or recreational in use.” Most of these lands are under some level of protection, although there are approximately 15 recreational fields/facilities in Woburn that are not protected.

There are five conservation areas in Woburn (Horn Pond and the Horn Pond Mountain Area, Shaker Glen, Cranberry Bog, Love's Lane, and Rag Rock) with a total area of 473 acres. Four large historical/cultural open spaces (Battle Road, Middlesex Canal, Woodbrook Cemetery, and Calvary Cemetery) and several smaller spaces in the historic district comprise 101 acres. Other protected recreational space (parks, playgrounds, etc.) totals 144 acres. Finally, an additional 24 acres for active participation recreation are not protected, but they help to meet the recreational needs of the residents of the city.



*Figure 1-34: Entrance to walking trail at Battle Road Woodland Area, one of the city's protected historic sites.*

As can be seen in Figure 1-36 above, the majority of the open space in Woburn is located in the central and western portions of the city. The addition of the two focus areas in this study as conservation and/or protected open space would make the geographic distribution of recreational space heavily weighted to the western half of the city. To address this issue, the greenway connections proposed in this study will provide safe routes for all residents of the city to access and benefit from this new open space.

## **Horn Pond**

Because it represents the largest recreational and conservation space in the city, Horn Pond and the Horn Pond Mountain Area are described below. They comprise a total conservation area of 500 acres and managed by the Woburn Conservation Commission. The pond itself is 133 acres and offers a 2-mile trail around it, with a well-established and maintained trail system connecting the pond to other parts of the conservation area, including the mountain. Horn Pond Mountain (elevation 287 feet) is southwest of the pond and covers 40 acres.

Activities supported include kayaking, sailing, fishing, walking, and bird watching, as well as ice fishing and snow shoeing in the winter. Wildlife habitats include lake, pond, stream, cattail marsh, bog, dry oak-hickory woods, open fields and grassy slopes, rocky outcrops, reclaimed sandpit, and a loosestrife swamp (source: <http://www.waldenfont.com/wren/>).



*Figure 1-35: Horn Pond*

It is important to note that the Open Space Plan states that the city is interested in providing its residents with additional recreational alternatives to this site, which is considered over-used. Goal # 6 in the plan states: “Many of Woburn’s open spaces are unknown or under-utilized by its residents. In order to improve the quantity and quality of visitation at these sites, an effort must be made to increase the public’s awareness of the variety of recreational opportunities that are available. Existing areas should be enhanced to provide better access.” One of the specific objectives of that goal is to “Increase the use of lesser known conservation areas to reduce the pressure on popular areas such as Horn Pond.”

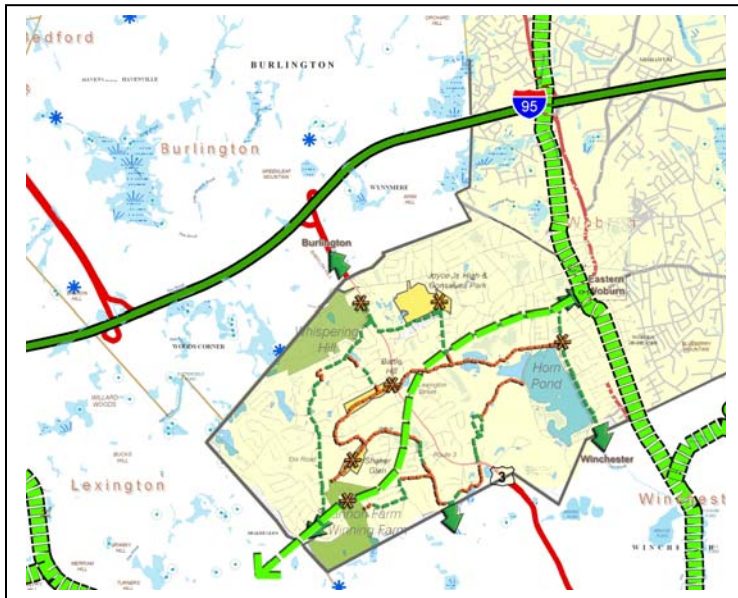
### **New Recreational Space and Connectivity**

To aid the city in realizing its goal to provide additional recreational space for its residents, this study identifies opportunities in Woburn that could be realized with the acquisition of the Whispering Hill property and the careful planning of the open space to remain after the development of the Winning Farm property. Additional opportunities may be realized if the city is able to purchase the Shannon Farm property in the future. An analysis of the suitability for specific recreational uses has been conducted for each parcel and will be presented in this report in Chapters 2 and 3.

We have also examined how best to connect these new open and recreational spaces with existing open space in Woburn through a concept for a “Western Woburn Greenway.” Recommendations are presented in Chapter 4 of this report, “Greenway Connections.” We will provide options for a greenway that could link Horn Pond with Whispering Hill, the Battle Road Conservation Area, Shaker Glen, and Winning Farm, providing residents of the entire city with a special network of spaces for passive and active recreation, including trails, fields, educational opportunities, and more.

## H. Bikability and Walkability

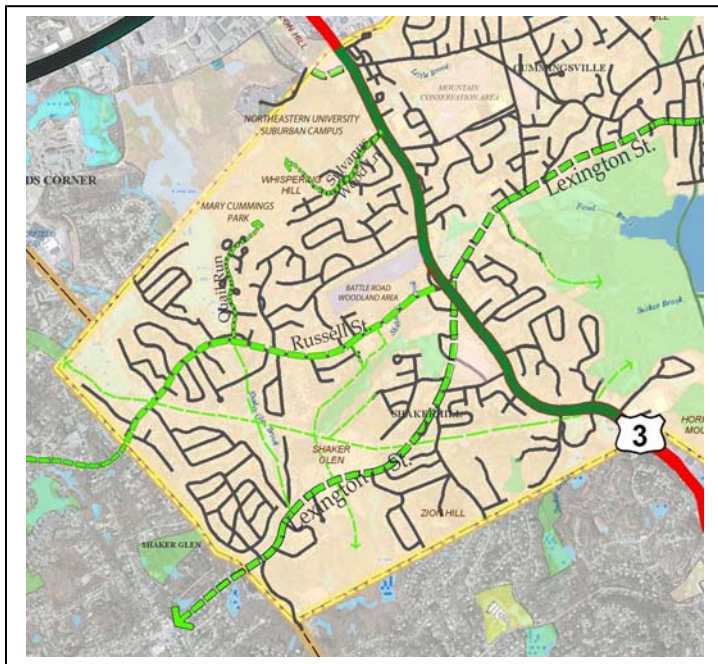
Bicycle accessibility and design have developed greatly in the U.S over the last few decades. The current system to evaluate how well a city provides such infrastructure is commonly known as the Bicycle Level of Service (BMC, '04), first adopted by the Baltimore Metropolitan Council. In 1988 the towns of Woburn, Winchester, and Stoneham began the planning of a comprehensive network of streets and designated bike paths. Known as the Tri-Community Bikeway, it is a system of roadways, converted railroad tracks and paths along the Middlesex Canal. Three municipalities have currently proposed 6.6 miles of bikeways that will eventually connect to the MBTA Alewife station via the Minuteman Parkway. Key connections include Horn Pond, Forest Park, the Montvale Avenue businesses, and the MBTA express bus connection at Hill St (WREN '09).



*Figure 1-36: Existing Tri-Community Bikeway connections to Winchester and Woburn and the future Lexington St. expansion to connect to the Minuteman Parkway.*

After going under I-93 through an existing tunnel via Montvale to connect to Stoneham, the bikeway is planned to follow local roadways and a former railroad corridor for about 1.7 miles and connect to Main St. in Stoneham. A Horn Pond spur is also planned to go from Lake Street in Winchester to Lake Avenue in Woburn, following an existing path on town owned property and public roadways. Signs and pavement markings are critical to the creation of a cohesive biking and walking system. Marked bike lanes on roadways with other necessary pavement markings at intersections are critical to the safety and success of an effective bikeway (BMC '04). Pedestrian-actuated flashing beacons are recommended at Schillings Road in Winchester, Washington Avenue in Woburn, and at Montvale Avenue and Pleasant Street in Stoneham (Gatehouse '10). Eventually the Bikeway will connect to the Middlesex Fells Reservation which consists of 2500 acres and is an important recreational opportunity for the region.

The Southwest study has great potential for additional bikeway development on Russell Street with numerous residential streets that will connect to the proposed Lexington Avenue bikeway expansion. With the addition of the Whispering Hill parcel as well as the possibility of Shannon and Winning Farm for community agriculture, other biking and walking connections will allow for multiple routes throughout Western Woburn. This will be sufficient for east-west pedestrian and bike travel. However, necessary expansion is still needed for an efficient north-south route, specifically linking Whispering Hill and Mary Cummings Park to the north with Zion Hill, and to Shannon and Winning Farms to the south via Shaker Glen and Battle Road Conservation areas as well as Dix Road Extension. There is also an opportunity to use the existing power line corridor to the north of Shannon Farm as it continues on to the Muller Road Conservation Area and terminates at the Middlesex Shopping Mall. This could provide a unique opportunity for pedestrians interested in taking a short cut to a local commercial power center, without having to drive. The power lines are currently used by ATV's as well and could continue to be used as a secondary multi-transportation corridor, as shown in Figure 1:40 below.



*Figure 1-37: The potential for power-line, Russell St. and Lexington St. with recreational connections can help to create a more continuous system for walking and biking accessibility.*

It is unrealistic to plan for such costly infrastructure improvements without the ability to execute such a plan. Originally the proposed cost estimate for the entire Tri-Community Bikeway was \$5.7 million. However, that was at the design's conception and current estimates may exceed \$7 million when complete (Winchester Star '09). In order to afford the +/-2 miles of surface street improvements and +/-3 miles of proposed off-road development, we would have to acquire some of the already allocated funds from the existing Tri-Community Bikeway budget. This may fall short of the necessary funding, in which case it may make sense to propose high intensity mix-used corridors where possible. This also helps to ensure the maximized use of the Bikeway and make pedestrian activity more welcoming along these routes (BMC '04). Most importantly, if

we are serious about preservation of existing and future open space, it is necessary to accommodate population increases with higher density development.

## **Summary**

Woburn has a rich historic and cultural background. It also has significant natural resources including large areas of core priority habitats for wildlife and vegetation species. Its hydrologic history is important and every effort must be made to protect the quality of the city's water. The overall context of the city has informed this study, and we have focused on protecting and expanding the city's current assets, as well as considering new assets of open space land that city might obtain in the future.

## **CHAPTER 2: WHISPERING HILL**

### **A. Introduction**

The northern focus area centers on the 75 forested acres of the Whispering Hill property. This land is currently owned by Northeastern University which has a satellite campus across the town line in Burlington. The University wants to sell the land, and the City of Woburn is in active negotiation to purchase the property. One of the prime objectives of our study has been to assess this site, inform the city of our findings, and make recommendations for its future use. This is a remarkable opportunity for the City of Woburn. The chance to buy a large undeveloped parcel of land with unique wildlife habitat is increasingly rare, and the value of this particular parcel to the city, its people, and its wildlife cannot be overstated.

### **B. Description of Site**

Whispering Hill is surrounded on 3 sides by the Mary Cummings Park, a 210 acre public park given in trust to the City of Boston 78 years ago by Mary Cummings. Mary Cummings Park is intended to be kept in perpetuity as a recreational park. It consists of a variety of fields, forest and wetlands. The City of Boston has tried to discourage public access and to sell the land to fund the Rose Kennedy Greenway, though they were unable to do so because of the wording of the original trust agreement.

A non-profit organization, Friends of Mary Cummings Park, was formed in 2007 to defend the park against development pressure and to promote sustainable uses for the park while respecting its original recreational purpose. Mary Cummings Park is presently the 12<sup>th</sup> largest park within the Route 128 beltway. Although the Mary Cummings Park is beyond the scope of our project, it surrounds the Whispering Hill parcel, and this abutment results in a combined nearly 300 acres of undeveloped land in Woburn and neighboring Burlington. This aggregation of undeveloped land is an extremely valuable resource for present and future generations, for recreation, for the protection of clean water, and for wildlife habitat. Recent development pressure at Whispering Hill, as well as the legal challenges to the Mary Cummings bequest, underscores the urgency of action by the City of Woburn.

Based on observations made within the last twenty five years, scientists at the Natural Heritage and Endangered Species Program, part of the Massachusetts Division of Fisheries and Wildlife, have designated the majority of Whispering Hill as priority habitat for state-listed rare species. (*Please see Chapter I.F for a thorough discussion of wildlife habitat*) Currently there are no levels of protection in Woburn for this area, however there is limited protection for priority habitat in neighboring Burlington. The purchase of Whispering Hill by the city would serve to protect this land for future generations.

### **C. History**

Mary Phelps Cowles Cummings (1927) was a prominent philanthropist. (*Figure 2-1*) Born to educators, she was highly educated for a woman of her day. She taught at the first school for girls in New England, the Abbott Academy in Andover, (which merged with Phillips Academy in 1973). She married a prominent Boston physician, Dr. Adino Brackett Hall, in 1864 and lived in Boston until his death in 1880. The following year Mary married John C. Cummings (*Figure 2-2*) of Woburn. He owned a tannery and farm on the land that later became the park in Woburn

and neighboring Burlington, and was president of the Shawmut Bank of Boston for thirty years. John Cummings' primary avocation was the study of natural history, which led him to join the Boston Natural History Society, eventually becoming chairman of their Botany section. He donated his natural history collection to the Woburn Public Library. One of the founders of Massachusetts Institute of Technology, he served as its treasurer and is credited with saving the Institute with his own funds. He also provided land for a fire station in Woburn.



*Figure 2-1: Mary Cummings*



*Figure 2-2: John Cummings*

The park and playground movement of the late 19<sup>th</sup> century was an inspiration to Mary Cummings. When she died in 1927 she left her 236 acre farm (*Figure 2-3*) to the City of Boston *“To hold and keep the same forever open as a public pleasure ground, and to maintain and care for the same in a suitable manner in accordance with that purpose.”* She also provided a substantial endowment for its maintenance. According to her friends, this land was given to Boston because Mrs. Cummings assumed that the City would annex its suburbs, such as Woburn and Burlington, as New York City had done, but she intended the park to serve the public at large. In addition she donated the 6 acre Gonsalves Park for a playground in Woburn.



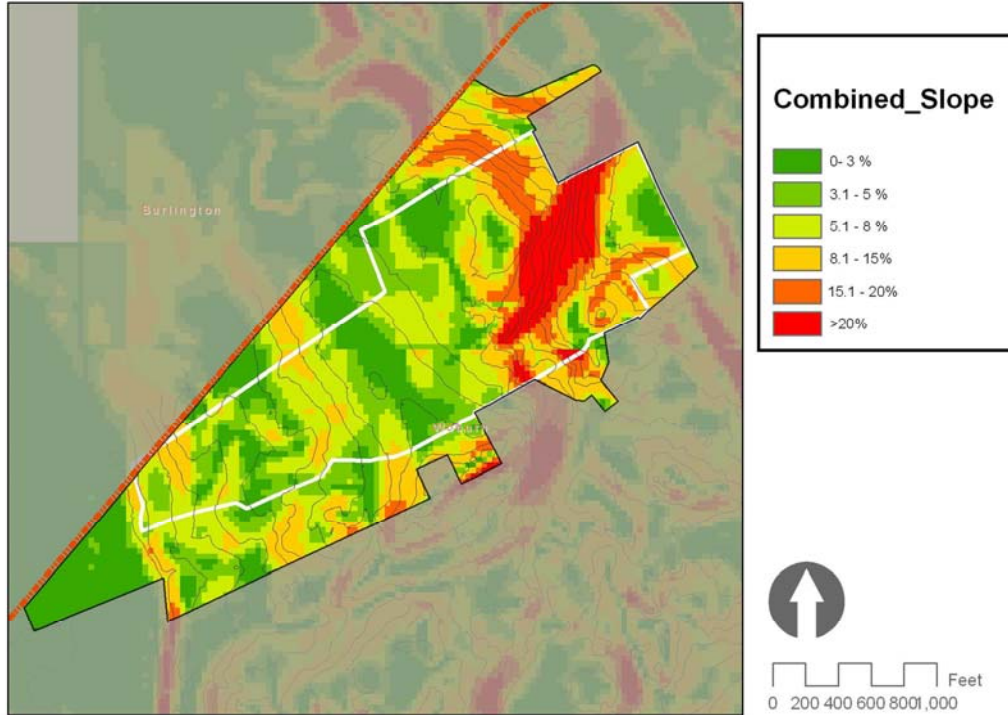


Figure 2-3: The Mary Cummings Property

## D. Site Assessment

### D-1 & D-2 Slope & Topography

The Whispering Hill area includes the highest elevation in Woburn at 275 feet above sea level, while the lowest is 118 feet above sea level. Most of the change in elevation occurs along a steep escarpment running North-South on the eastern half of the site (*Figure 2-4*). This escarpment divides the site into two unequal but distinct areas: the flat forested western area, and the smaller lower eastern portion. Maturing trees cover most of the larger western portion with a number of paths running through it. The area is relatively flat with a number of lower areas that collect water and have formed wetlands. On the eastern side, the ground rises up a long hill before dropping sharply downhill. The steepness of the escarpment ranges from 15-60% slope before leveling off again at the base. The base is a relatively narrow area that runs parallel to Route 3. Currently the base of the escarpment is divided into two areas: the southern area is flat and covered in turf grass, while the northern contains a residence and other supporting buildings. Most of the drainage of the Whispering Hill site collects in the wetland areas, or runs down the escarpment.



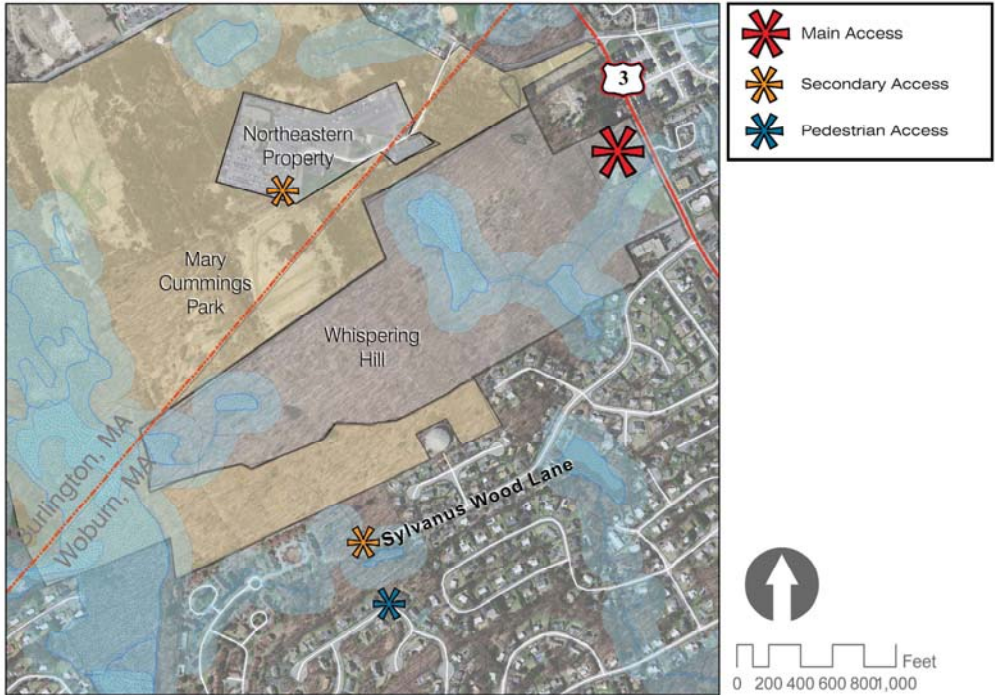
**Whispering Hill Slope Analysis**

*Figure 2-4: Whispering Hill Slope and Topography Analysis contour lines are at 10' intervals (Data: Massachusetts GIS )*

### *D-3 Access Points*

The current major access point to Whispering Hill and the Mary Cummings Property is the Northeastern University Suburban Campus parking lot. At this time, parking and entry to the park from the Northeastern lot is officially prohibited. There appears to be ample parking for cars in the Northeastern lot and we recommend that the City pursue permission to gain access to the Mary Cummings property and Whispering Hill via the Northeastern lot.

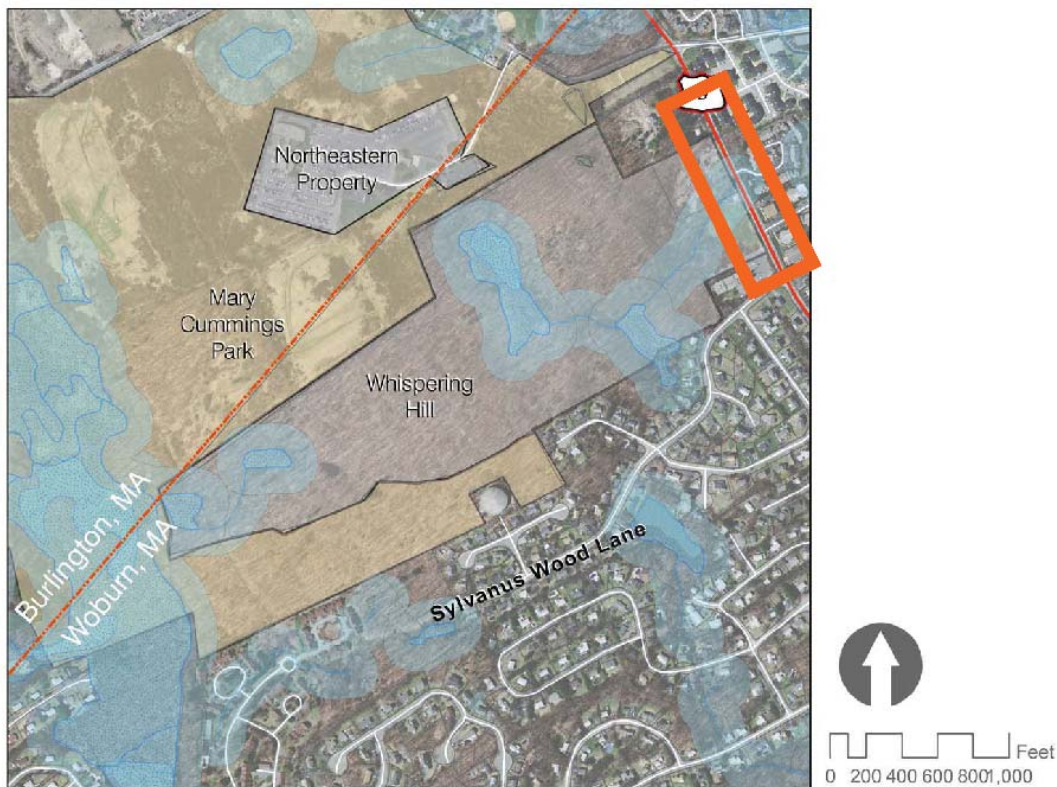
Another current access point is found at the end of Sylvanus Wood Lane: a cul-de-sac, Sylvanus Wood Lane does not currently allow for on-street parking. There is an existing trailhead with an information board as well as enough room to allow for limited (4-6 cars) parking. This access point abuts a delineated wetland (*Figure 2-5*) and is an opportunity for a green parking lot with a bioswale to clean runoff before it enters the wetland. These additions and changes to the Sylvanus Wood Lane entry point would improve public access to both Whispering Hill and the Western Woburn Greenway system, as well as the water quality and habitat value of nearby wetlands.



### Whispering Hill Access Points

*Figure 2-5: Key access points to Whispering Hill. Wetland buffers of 150' are included in blue. (Data: Massachusetts GIS, City of Woburn, Field Observations)*

A proposed parking area for access is located along Route 3 / Cambridge Street (*Figure 2-6*). Not only would this area provide access to the proposed recreational fields and trail system, but it has the potential to act as a major node in Woburn's proposed greenway system. This access point would allow visitors to park in the lot, and continue on to bike or walk in a circuit to other conservation areas and destinations within the greenway system.



**Proposed Route 3 Green Street Location**

*Figure 2-6: Orange box indicates proposed green street location along Route 3 (Data: Massachusetts GIS, City of Woburn)*

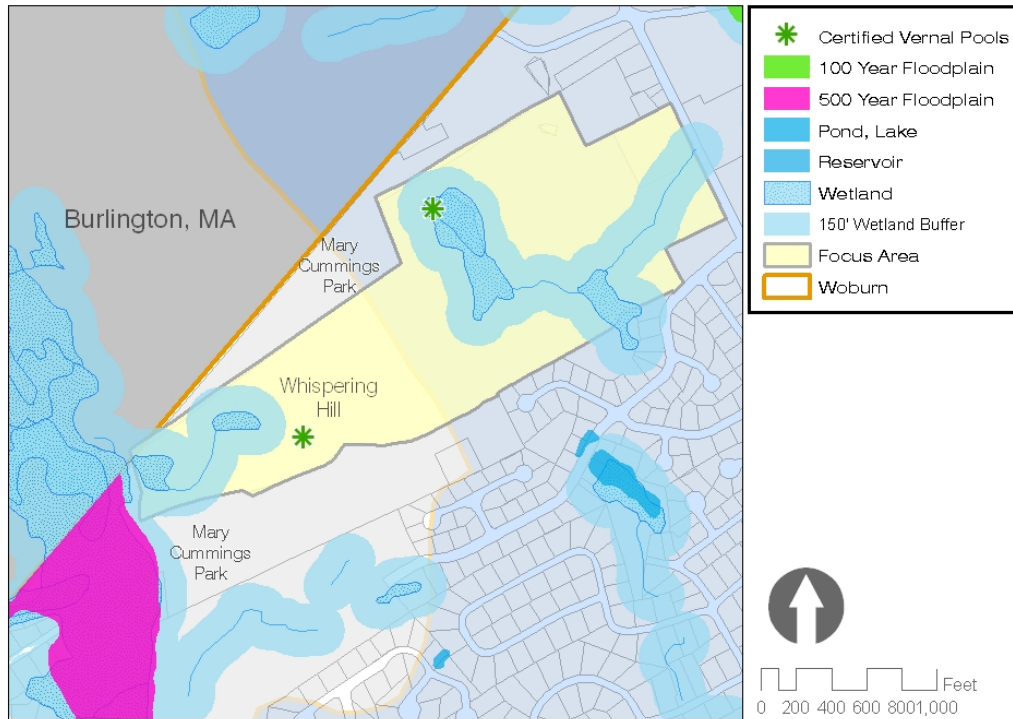
Pedestrian access to the Whispering Hill parcel is important as well. There is a potential access point for pedestrians entering through a right of way on Windsor Drive, which can lead into the overall greenway system as it moves down Stevin Drive to Dix Road, and the Shannon & Winning Farms properties.

#### *D-4 Hydrology & Drainage*

Whispering Hill has a large wetland area on the west side of the parcel that extends into neighboring Burlington (Figure 2-7). This wetland provides potential habitat and environmental educational opportunities for both children and adults. The majority of this wetland falls within a 500 year floodplain at an elevation of 160ft.

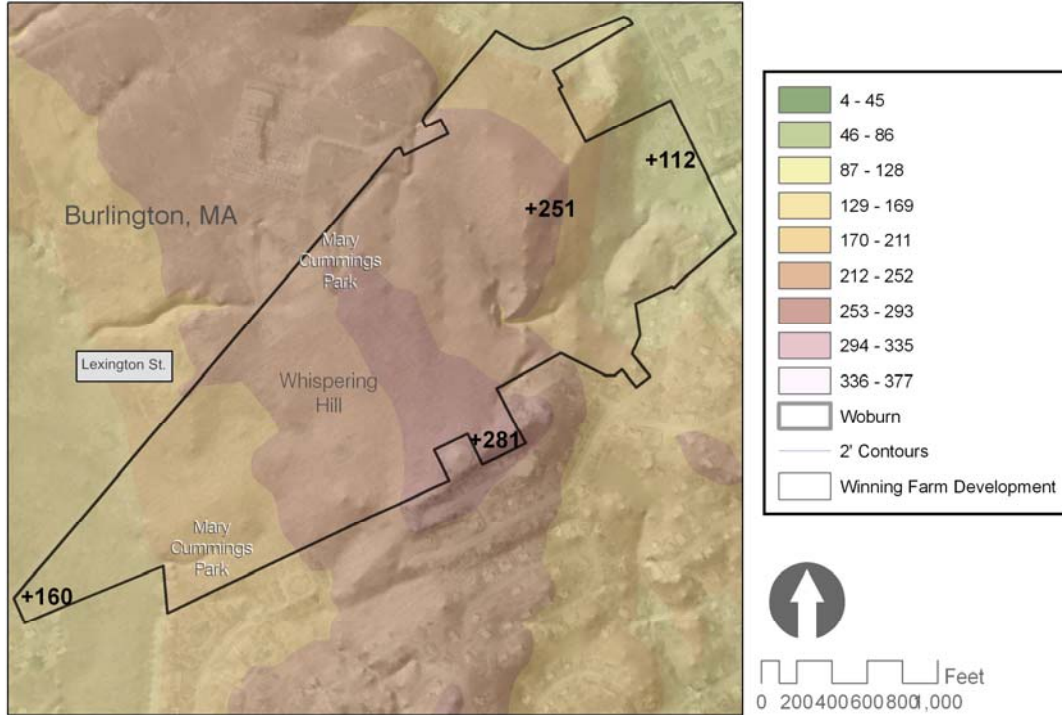
A high point of 281' is found in the middle of the site, near the water tower, and causes water to run east and west towards wetlands on the site (Figure 2-8). There are also smaller wetlands extending into the Whispering Hill parcel with connecting streams, totaling roughly 1.25 acres. There is another wetland around the center of Whispering Hill, approximately 3 acres in size, which contains a certified vernal pool. This wetland is connected by a stream to another 1.4 acre

wetland found at the southeast side of the parcel. And from this wetland runs yet another stream, this one exiting the site on the east side near Route 3. There is a second vernal pond, found in the middle of the western half of the Whispering Hills parcel – a great opportunity to educate residents about the unique reproductive habitat it provides to wildlife species such as frogs, toads and salamanders.



Hydrology Focus: Whispering Hill

Figure 2-7: Hydrologic features of Whispering Hill. (Data: Massachusetts GIS)



**Whispering Hill Elevations**

*Figure 2-8: High and Low Points of Whispering Hill. (Data: Massachusetts GIS)*

*D-5 Soil Conditions*

Whispering Hill contains a variety of soil types: each of these different types of soils have unique characteristics which best support different types of land use. This section will provide a description of the soil makeup of Whispering Hill and provide a brief analysis of the soil types, their capabilities and limitations, and how those factors inform potential land use.

Most of Whispering Hill, with the exception of a central rocky outcrop around the wetland, is covered by Montauk fine sandy loam. This soil is well drained: water is removed readily but not rapidly through it, and depth to bedrock is around 60". There are severe limitations that reduce the choice of plants for agricultural use or require special conservation. Several variations of the Montauk fine sandy loam soil type can be found throughout the property, though each has the same description for potential uses as listed above.

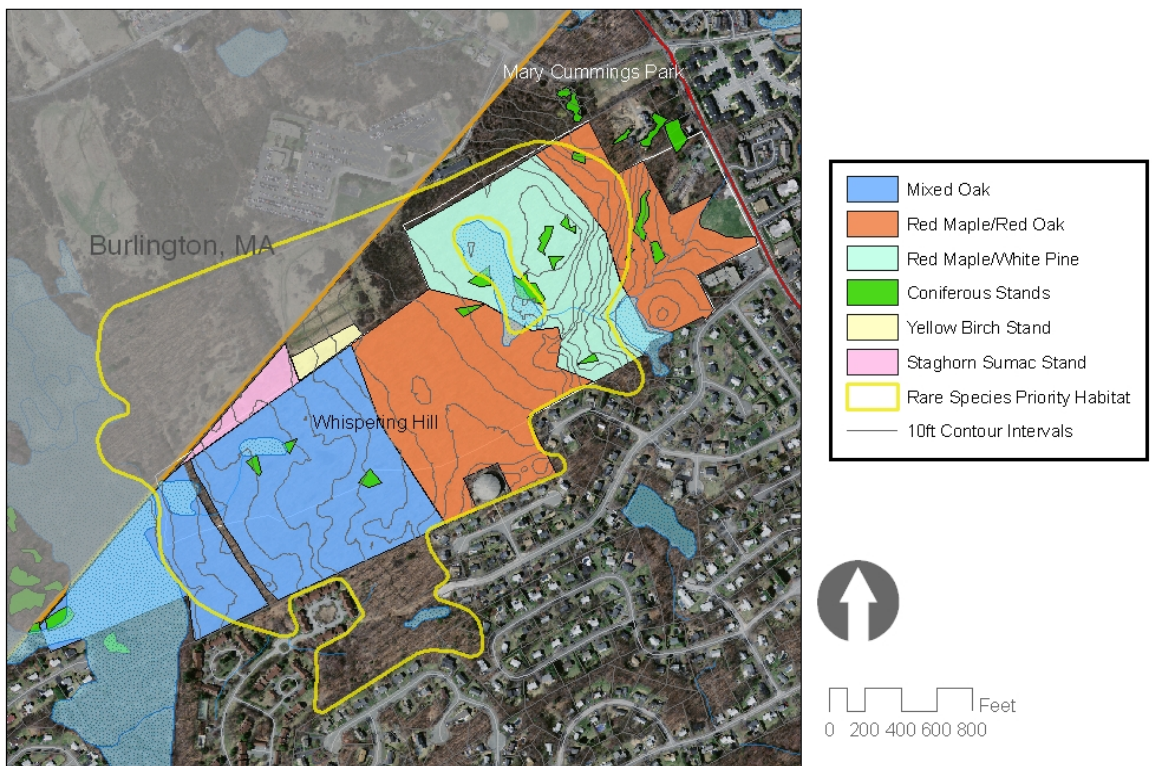
The soils around the wetland are Hollis-Rock outcrop, consisting of up to 90% exposed bedrock and often too hard to be broken up and mixed by tillage. The shallow depth to bedrock and high amount of exposed rock severely limit this soils tillage potential, making it unsuitable for cultivation and limiting its use to primarily pasture or conservation purposes. In the event that Woburn would like to explore other land uses for this area of Whispering Hill, we recommend an

on-site geological study to determine the exact suitability and limitations of the Hollis-Rock outcrop.

Whispering Hill's soil conditions are conducive to an ecologically sound, biologically diverse environment, reinforcing the need to conserve Whispering Hill.

#### D-6 Existing Vegetation

The Whispering Hill property is covered by several healthy native stands of mature forest. (Figure 2-9) Following is an overview of the dominant woody vegetation on Whispering Hill, the habitat conditions and microclimates that allow for this vegetation to prosper, and what this forest means for the possible future use of the property. The property was analyzed by field identification and map analysis using aerial photography. A handheld Global Positioning System (GPS) was also used to plot tree locations.



Whispering Hill - Dominant Woody Vegetation

Figure 2-9: This map shows the varying dominant woody vegetation species and community types, in relation to wetlands (Data: Massachusetts GIS, City of Woburn, Field Observations)

The western portion of the property does not change much in elevation and has moderate slopes. This portion of the property is also quite wet during most of the year. There are a few wetlands in the area as well as an intermittent stream. These factors provide an exceptional location for

several species of oak to grow, including Northern Red Oak, White Oak, Chestnut Oak, and Bur Oak, with a few stands of White Pine saplings scattered around seasonally wet areas.

To the east of this area the elevation increases gradually and soil drainage is improved. Here the forest is dominated by Northern Red Oak, but also includes Red Maples, which are more prevalent in this section than the other Oak species. Red Maples are native, and the stand here is also in good health.

Moving further east is the highest and wettest area on Whispering Hill. This portion of the site has a perched wetland that is present year around and supports wetland species. This area includes a forest dominated by Red Maples: highly adaptable trees which are well established in this section. There are also several large rock outcroppings and smaller outcrop fragments throughout this area. These conditions are prime habitat for the second most common tree species in the area, White Pine.

On the easternmost side of Whispering Hill, there is a change in elevation and a significant rock escarpment. The surrounding healthy mature forest is dominated by Red Maples and Red Oaks, though to the east, there is a field that has created a forest edge condition: a prime opportunity for invasive plants to spread.

The Whispering Hill property is of great value to both the wildlife and the residents of Woburn – this area is special – and is something Woburn should celebrate and enjoy. When the forests of a town are healthy, they indicate a healthy town.

#### *D-7 Adjacent Land Use: Whispering Hill*

75% of Whispering Hill is bordered by conservation land with mixed density residential making up the remaining 25%. (*Figure 2-10*) To the south, the Mary Cummings Park provides a buffer of approximately 400' between Whispering Hill and the surrounding medium density residential development, as well as the 22 acre higher density Quail Run development to the southwest. To the west lies the wettest portion of the Mary Cummings Park, the 500 year flood plain (1,000 feet wide), and medium-density housing.

To the north, Whispering Hill is bordered by the Mary Cummings Park and Northeastern University's campus and parking lot. The eastern edge is bordered by Route 3, and across that arterial road is 37 acres of a high density residential development, which surrounds 4.8 acres zoned for industrial use.

Areas shown on the map as agricultural land on the western side of Route 3 have changed since the data was gathered. The parcel to the north, across the street from the former Cummings Estate, has seen recent rapid growth in predominantly invasive vine plant species. The land designated as agricultural is now managed as turf. The southeastern edge of Whispering Hill borders medium-density residential, and this land use continues for 1/2 a mile to Shaker Glen.



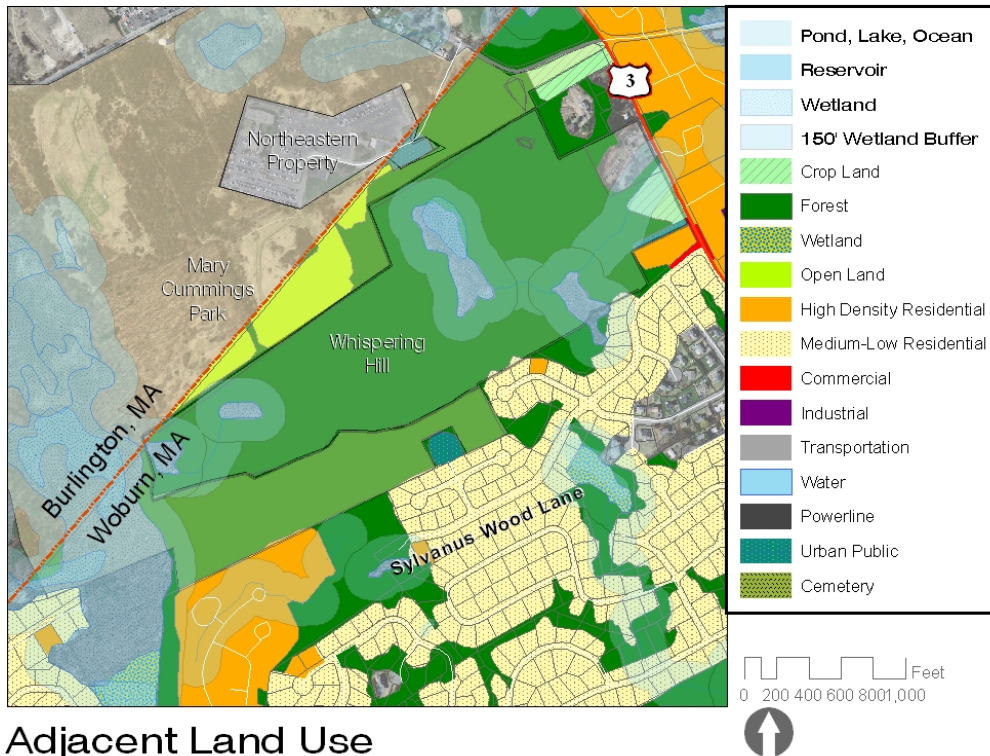


Figure 2-10: Land use around Whispering Hill

## E. Land Use Suitability

### E-1 Cemetery

In order to site a cemetery, one must consider the underlying characteristics of the land in terms of public health and water quality considerations. Massachusetts Title XVI, Chapter 114: Section 35 states that land may not be used for burial

“if it be so situated that surface water or ground drainage therefrom may enter any stream, pond, reservoir, well, filter gallery or other water used as a source of public water supply, or any tributary of a source so used, or any aqueduct or other works used in connection therewith, until a plan and description of the lands proposed for such use have been submitted to, and approved in writing by the department of environmental protection.”

According to these statewide regulations, potential traditional cemetery land in Whispering Hills would need to be well drained, outside of any 150’ wetland buffers (per the City), and must not drain to any city drinking water sources. In addition to drainage requirements, there are additional factors to consider. The World Health Organization has guidelines for the burial of bodies designed to safeguard public health. Some of the more applicable guidelines to this site include:

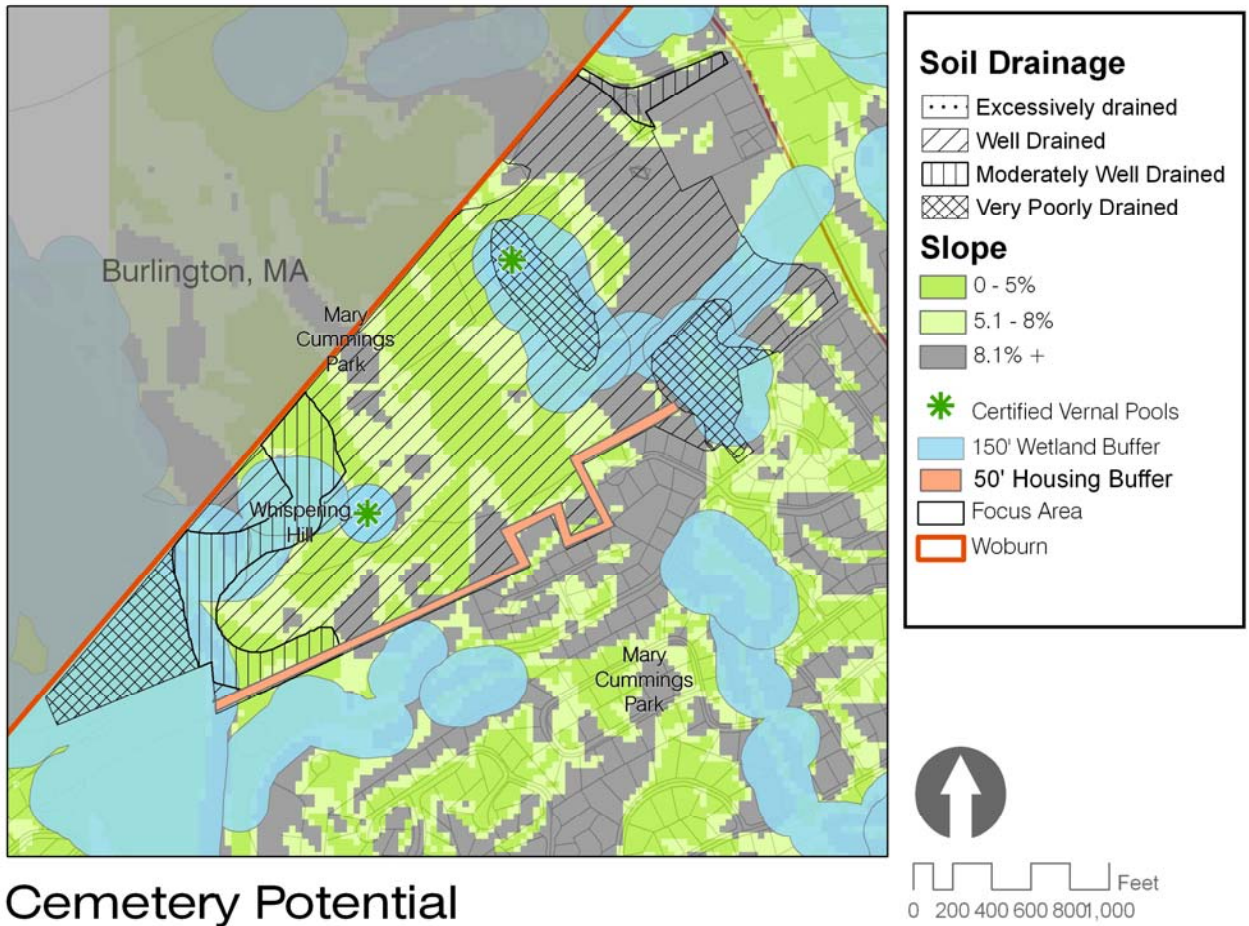
- All burial pits on the site must maintain a minimum of one metre of subsoil below the bottom of the burial pit (i.e. the base of the burial must be at least one metre above solid

- The base of all burial pits on the site must maintain a minimum of one metre clearance above the highest natural water table.
- Burial excavations should be backfilled as soon as the remains are interred, providing a minimum of one metre soil cover at the surface.

(Ucisik & Rushbrook, 1998)

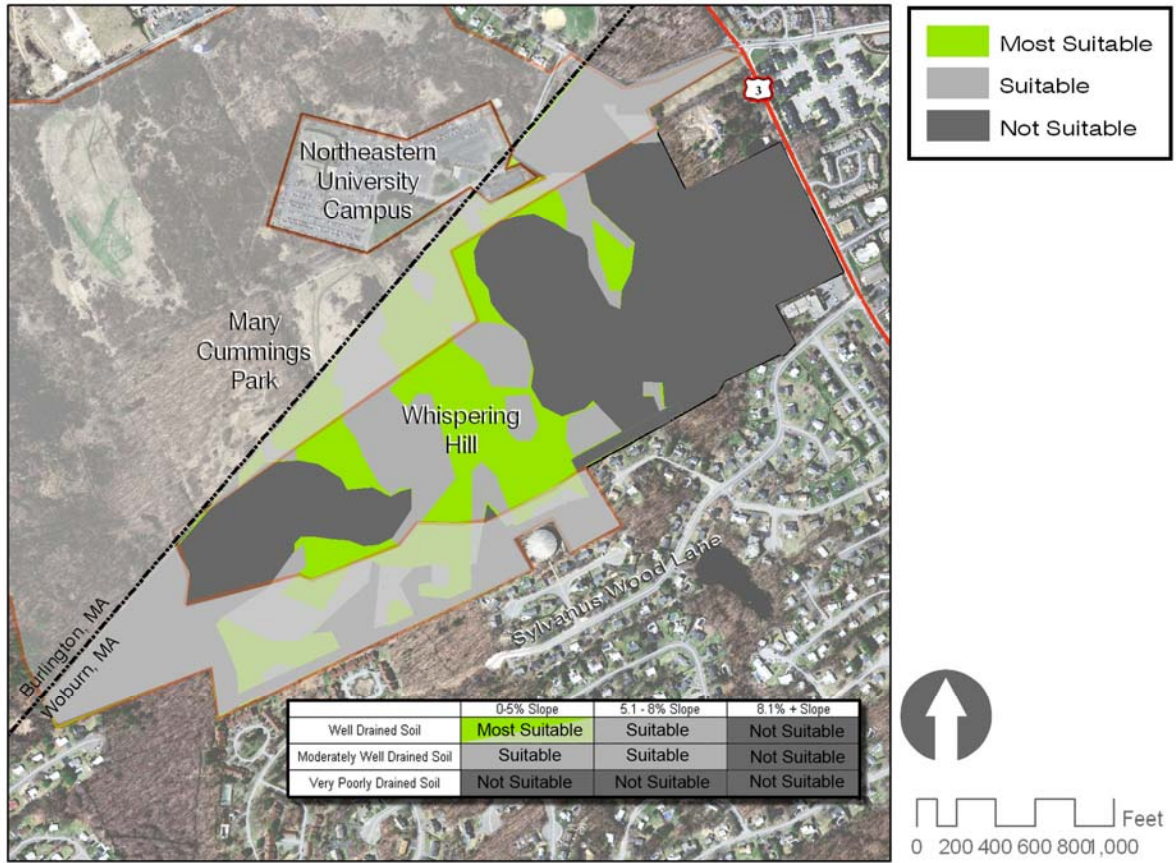
Per these recommendations, in examining Whispering Hill, we are looking for areas that do not abut or drain into wetlands, are at a relatively low slope to prevent drainage that is too fast, and have soil that is well-drained. Data regarding the height of water tables and depth to bedrock was not available for this report. If funding sources allow for cemetery use, and the City of Woburn actively pursues the placement of a cemetery in Whispering Hill, we recommend that the City complete a more detailed site survey.

In analyzing the cemetery suitability for Whispering Hill (*Figure 2-11*), soil drainage and slope were considered as a preliminary step in siting a cemetery. In addition to drainage and slope, it is also important to include a buffer from existing homes as a courtesy to neighbors, as well as to delineate the 150' buffer from water as required by the City of Woburn. Those factors were all mapped and considered before making final suitability diagrams (*Figure 2-12*) indicating that the most suitable land for cemeteries (in green) is located at the center of Whispering Hill.



## Cemetery Potential

Figure 2-11: Considering slope and soil drainage, as well as a housing and wetland buffer, to determine potential cemetery locations in Whispering Hill (Data: Massachusetts GIS & City of Woburn)



## Cemetery Suitability Assessment

Figure 2-12: The most suitable land for burials – lower slope and good drainage – is shown in green

### E-2 Trails

In evaluating the Whispering Hill property for potential trails, we examined the existing conditions using the SWOT method. This involves identifying Whispering Hill’s **S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats, and using that analysis to inform a trail system. A trail system for Whispering Hill can connect to greenway access points and promote the use of trails, encouraging health and recreation for Woburn residents.

Whispering Hill certainly has strengths: its variety of healthy and established habitats (wetlands, brooks, steep slopes, forests) provide homes and sustenance for native wildlife and plants. But with those strengths, there are also weaknesses: the steep slope can be problematic for mobility, and the property lacks a parking lot and convenient public access to the land.

These strengths and weaknesses provide opportunities for the design of trails in Whispering Hill. By conserving the land, diverse wildlife and supporting habitat can be maintained. There are potential threats to Whispering Hill – namely erosion and destruction of the existing ecological system due to overuse – but these can be avoided with an ecological approach to trail design.

The current trail in Whispering Hill is a one-mile loop on that connects with the Mary Cummings Park trails, though it is not in compliance with the Americans With Disabilities Act (ADA).

We propose the augmentation of this existing trail with two new trails, and that all three trails are connected together to form a network. The first proposed trail is a universally accessible trail (ADA compliant) and will connect to a proposed parking lot for access and incorporate part of an existing trail that surrounds the wetlands. (Figure 2-13) Because this trail moves through the wetlands, it will include a boardwalk (Figure 2-14) and function as an educational tool so that everyone has access to and can learn about the wetlands.

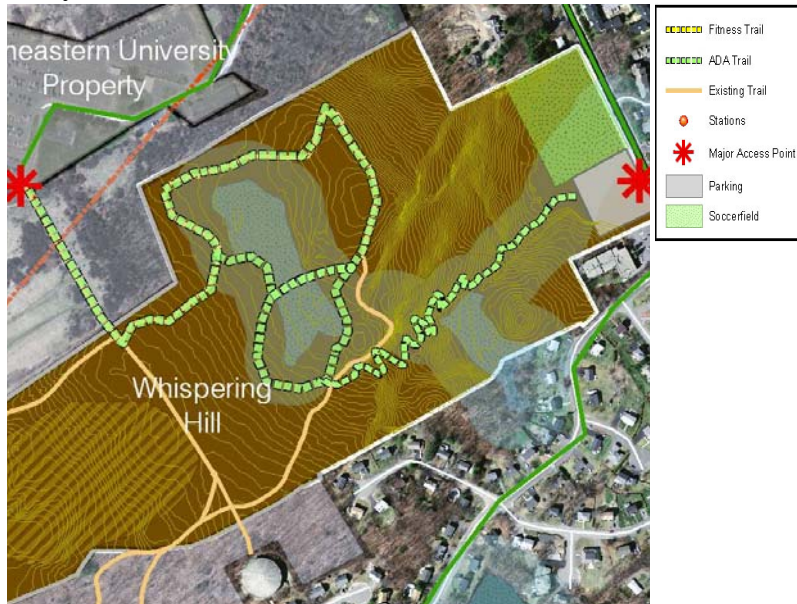


Figure 2-13: Proposed 1/2 mile Americans With Disabilities Act-compliant trail



Figure 2-14: A section of the boardwalk: visitors can get close to the wetlands regardless of their physical condition.

The proposed fitness trail would be 4/5 of a mile long and designed to take advantage of the steep slope found in Whispering Hill. (Figure 2-15) Users would be able to have an intensive workout on the fitness trail while enjoying the wetlands around them. (Figure 2-16) The fitness trail is modeled on the Par Course concept: created by a Swiss architect, a par course acts as an outdoor gym and provides a series of physical challenges, like stretching or pull-up stations, along a trail. (Figure 2-17)

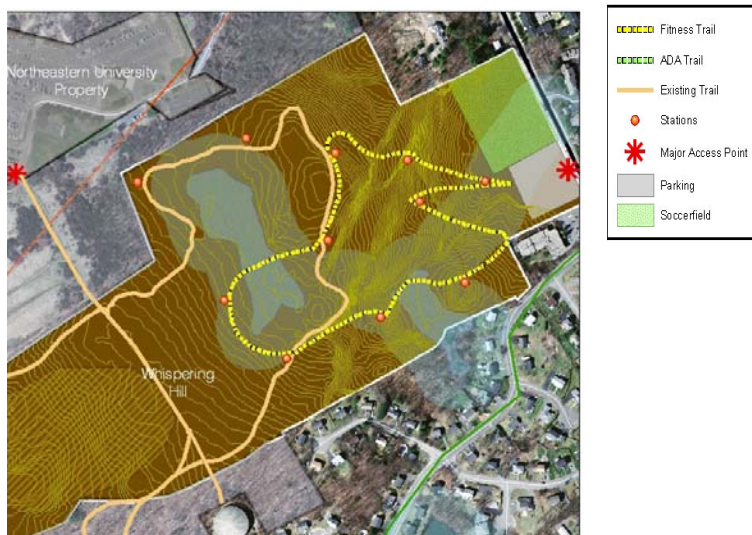


Figure 2-15: Proposed 4/5 mile fitness trail taking advantage of slope



*Figure 2-16: A fitness station located between two types of trails*



*Figure 2-17: Detail of a Par Course fitness station*

### *E-3 Recreational Fields*

The placement of a sports field requires planning and evaluation in order to work well and prevent needless damage to the surrounding environment. While looking at Whispering Hill, we primarily considered slope and drainage to determine suitability. Although much of the site is flat, we completed a slope analysis of Whispering Hill: an area of sufficient size (200' x 325') with a slope of less than 5% is ideal for a sports field. Land with a slope greater than 5% would require significant grading to create a sports field. In evaluating the site for suitable sports field locations, areas with low slope are shown in green, while unsuitable slopes are shown in shades

of grey. Overlaid on top are line textures that indicate drainage categories: drainage is an important aspect of site planning as it shows where water will collect during precipitation events.(Figure 2-18)

Shown in yellow in Figure 2-19 are the combined assessments of 0-5% slope and identified well-drained soils. A large portion of Whispering Hill is delineated as a Massachusetts State Priority Habitat: this is an important place for wildlife, and construction within this boundary is not recommended. Once Massachusetts State Priority Habitat is noted on the map, there remains only one area ideally suitable for a sports field. This location, on the eastern edge of the site, has access from Route 3 and does not directly impact the Priority Wildlife Habitat.

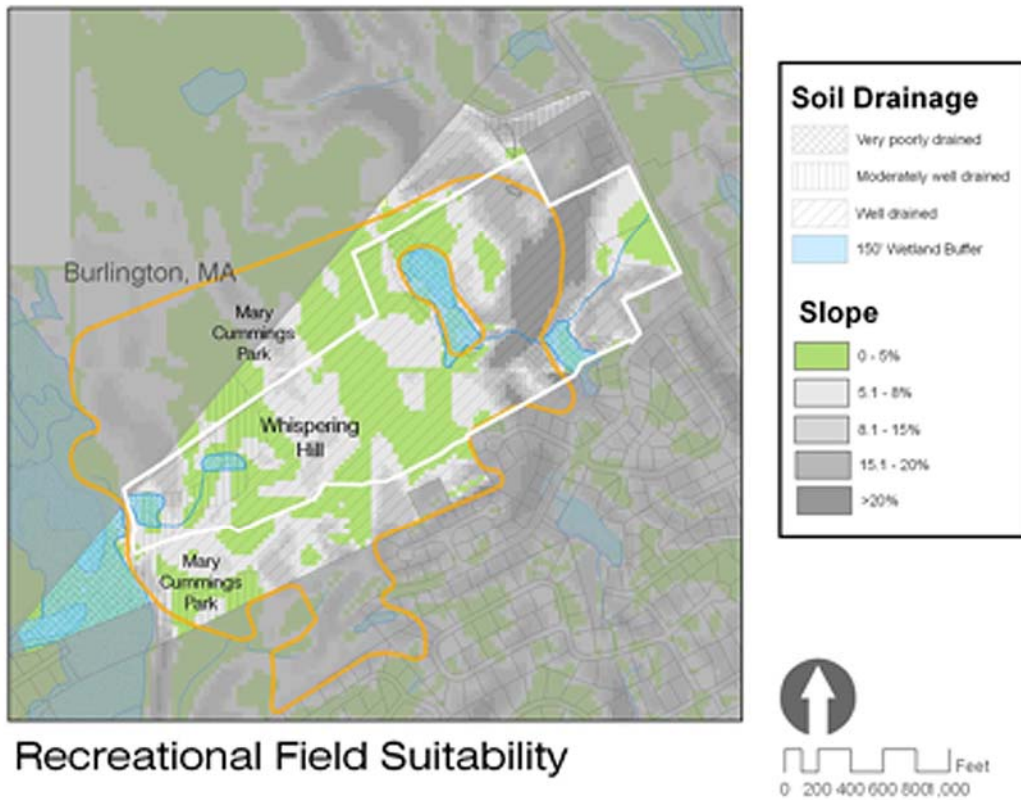


Figure 2-18: Slope, drainage and priority habitat features help determine the best location for a recreational field (Data: Massachusetts GIS )



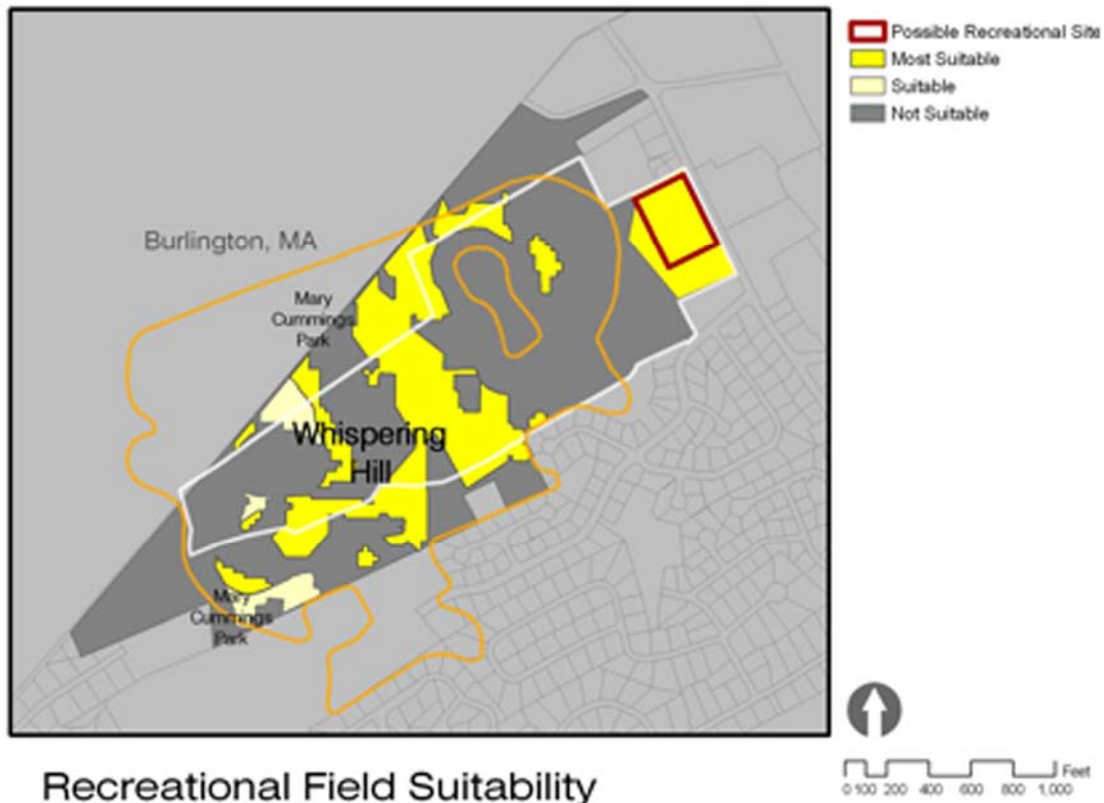
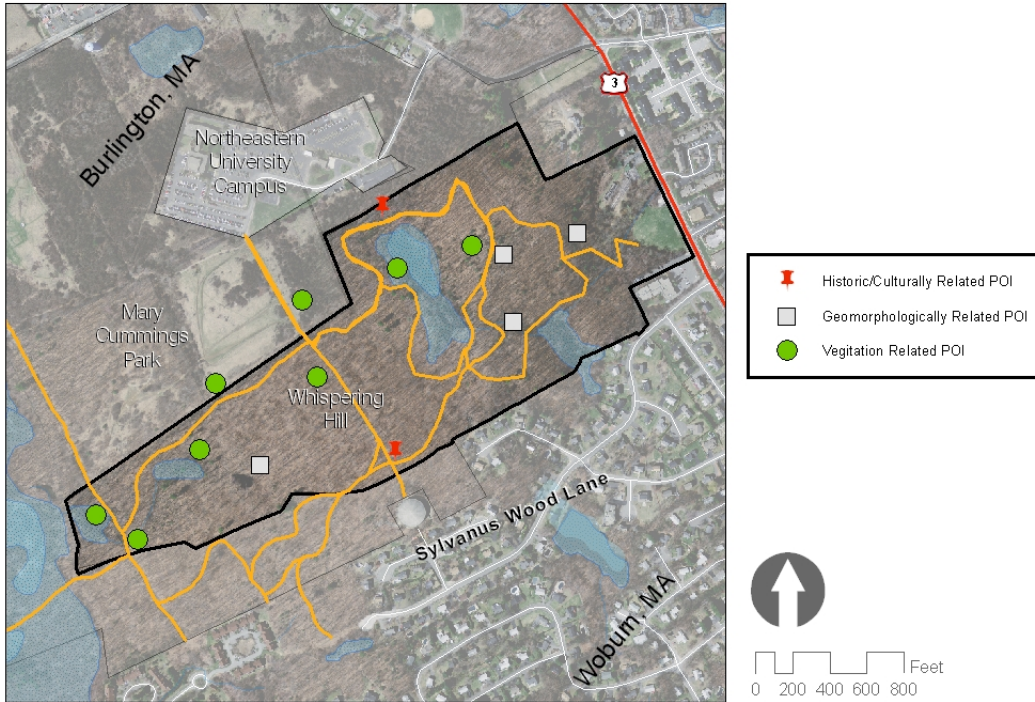


Figure 2-19: Yellow areas are most suitable for recreational fields. The red square indicates the final proposed site. Data: Massachusetts GIS

#### E-4 Education

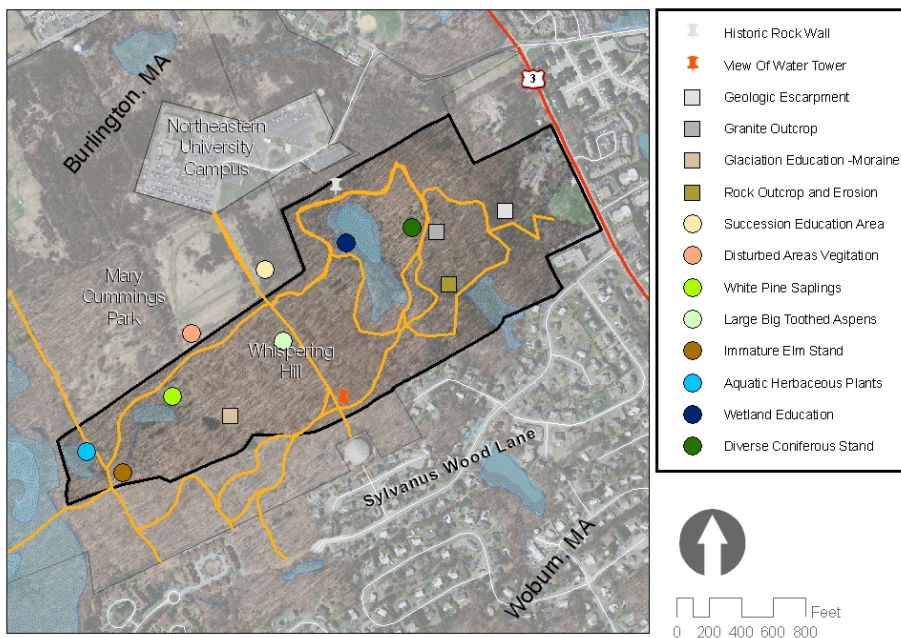
The Whispering Hill property, with its beautiful, healthy, and diverse woodlands, streams, wetlands, and wildlife, is unique in that it also has historical and cultural significance as well. There are several existing trails located throughout the property that have the potential to be a draw for residents and visitors alike to visit the site. The trails also provide a catalyst for the education of visitors about the property’s environmental conditions, habitats, and history.

Located throughout Whispering Hill are points of interest (Figure 2-20) well-suited for learning about ecosystems, habitats, and wildlife as well as the history of the property. The diverse forest structure and vegetation, varied wetland types, and prime habitat designation provide opportunities to educate the public about ecosystem services and their importance. These points of interest are not located in one specific area of Whispering Hill, but are scattered throughout the site.(Figure 2-21) This distribution makes an ideal circuit for an interpretive trail that may include signage at specific points of interest, describing the environmental conditions and historic or cultural significance of the location. Access to the educational points of interest is provided by the existing trail system. Along with these existing trails, the proposed Americans with Disabilities Act compliant trail for universal access would allow these educational stops to be accessed by an audience with a wide range of mobility.



Whispering Hill - Environmental Education, Points of Interest (POI)

Figure 2-20: This map shows points of interest in Whispering Hill property

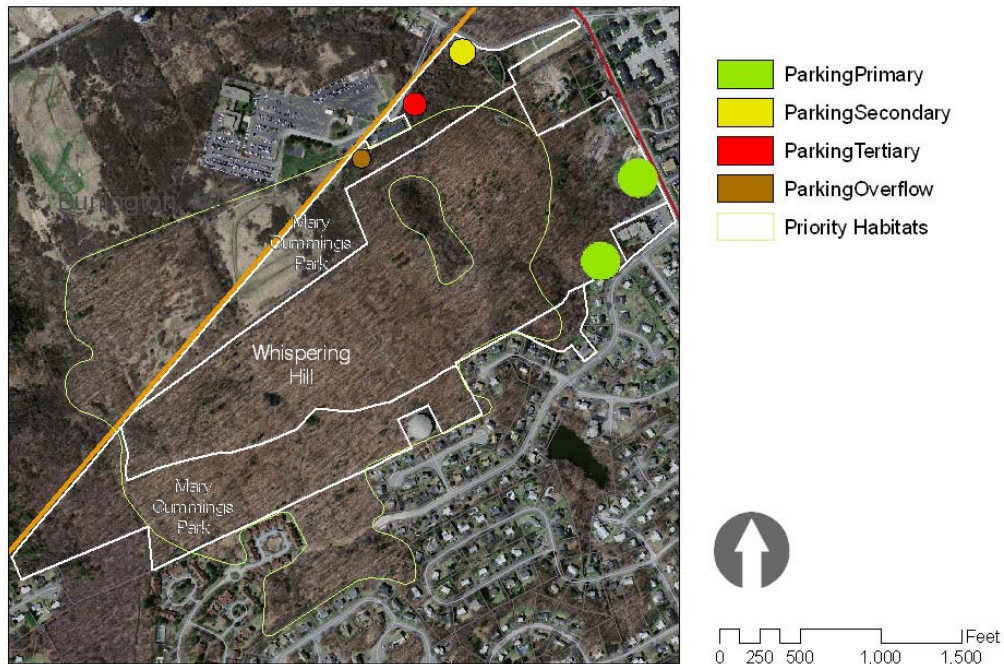


Whispering Hill - Environmental Education, Points of Interest

Figure 2-21: This map shows each point of interest – note the distribution throughout the site

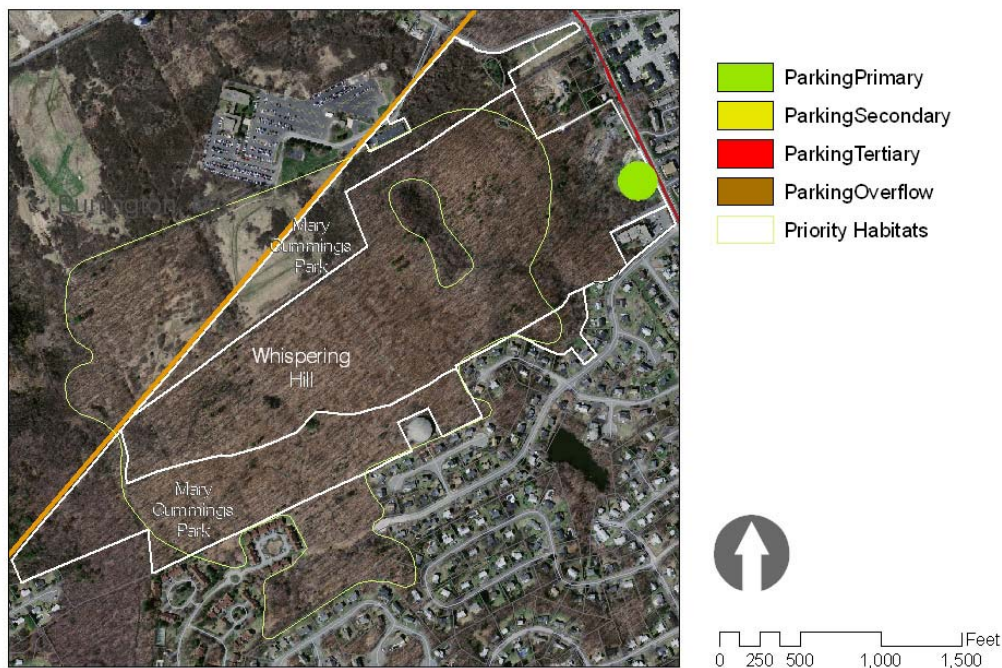
### E-5 Parking Lot Suitability

Suburban cities like Woburn tend to allocate a significant amount of land for parking. In order to make Whispering Hill successful, we propose a main parking area that provides easy access to the amenities of the site. When siting a parking area, the main characteristic to consider is the proximity to amenities and outside connections. Proposed parking access points include locations along Route 3, Sylvanus Wood Lane, and the Northeastern University parking lot. (Figure 2-22) In addition to providing access to the cemetery, trails and soccer field, an entrance must be compliant with the Americans With Disabilities Act regulations. Northeastern is not recommended as a main access point because it is private property, though because it is close to the upper portions of the site, we recommend that the city negotiate for public access via the Northeastern lot. We propose that a new parking lot be built at the base of the escarpment on the Route 3 frontage (Figure 2-23). This location is best suited for a parking lot: it provides a flat, reasonably well-drained location while minimizing intrusion into the site and maximizing accessibility for visitors.



### Proposed Parking Access Points

Figure 2-22: Suitability of parking sites on the Whispering Hill property



## Proposed Parking Access Points

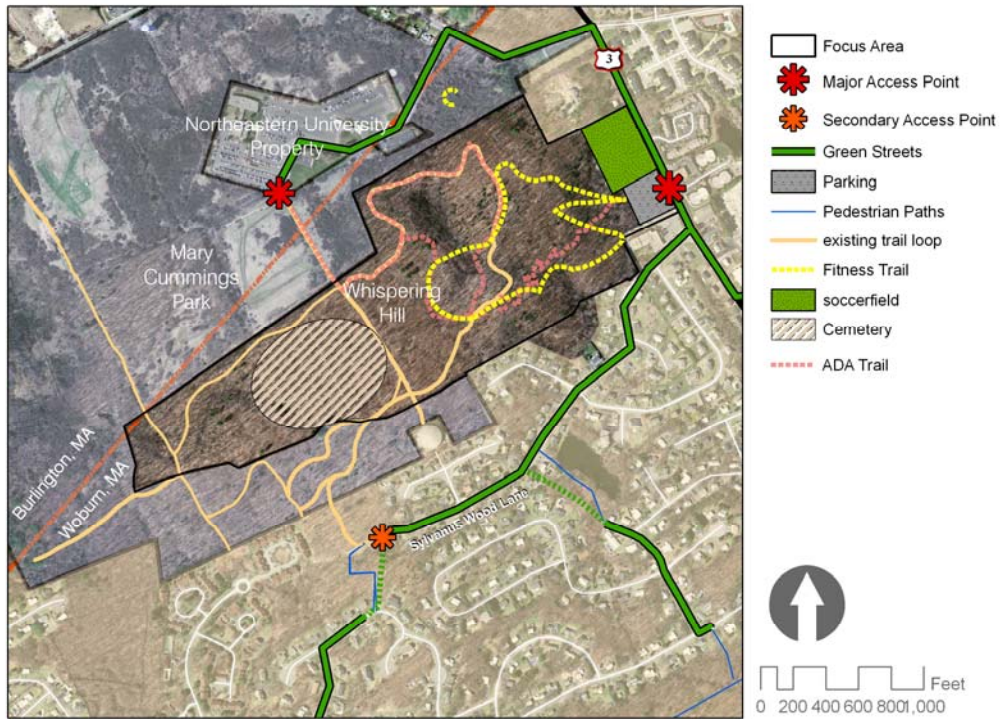
*Figure 2-23: Proposed green parking location for Whispering Hill*

### **F. Master Plan**

The proposed Master Plan for Whispering Hill (*Figure 2-24*) presents complementary uses which preserve and enhance the existing forest and meet the needs of the residents as expressed in the 2004 Open Space plan and at our public meetings in Woburn. These priorities include the augmentation of existing trails with an Americans With Disabilities accessible wetlands trail (to include a boardwalk) and a fitness trail that takes advantage of the slope; highlighting those features of the site that will be destinations for an interpretive trail; recommended uses for the area at the access point along Route 3 – including a possible visitor’s center in the existing house and use of the greenhouses for education uses, in addition to parking and restrooms; the potential for a conservation cemetery (if allowed by funding sources); identification of pedestrian and vehicle access points to link the site with proposed greenways, Shannon and Winning Farms, and Horn Pond.

Our proposed land use for Whispering Hill is intended to encourage multiple uses without causing disruption to the habitat of this forested site. It augments the existing recreational uses, primarily trails, of the surrounding Mary Cummings Park. This plan protects valuable open space and wildlife habitat, simultaneously improving water and air quality. It also offers recreational and athletic opportunities for residents. Given the many assets of these 75 acres and their value

to hikers, birders, walkers, children, athletes, and the abundant wildlife sustained by this forest, we believe that the City of Woburn will be well served for generations to come with the purchase and conservation of Whispering Hill.



**Whispering Hill Master Plan**

*Figure 2-24: Proposed plan for Whispering Hill*

## Chapter 3: Winning Farm and Shannon Farm

### A. Introduction

Two large parcels in the southwest portion of Woburn provide unique and exciting opportunities for the city. The first, Winning Farm, represents an immediate opportunity to create a network of trails within the context of an environmentally sensitive, newly-acquired conservation area to greatly benefit the residents of Woburn and surrounding communities.

The second, Shannon Farm, represents an opportunity that could be realized in the future, should the parcels be offered for sale by the landowners. It should be emphasized that the parcels are currently not for sale. The purpose of including them in this study is to provide the city with advance information to aid in their decision about purchasing the parcels if that opportunity were to arise in the future.

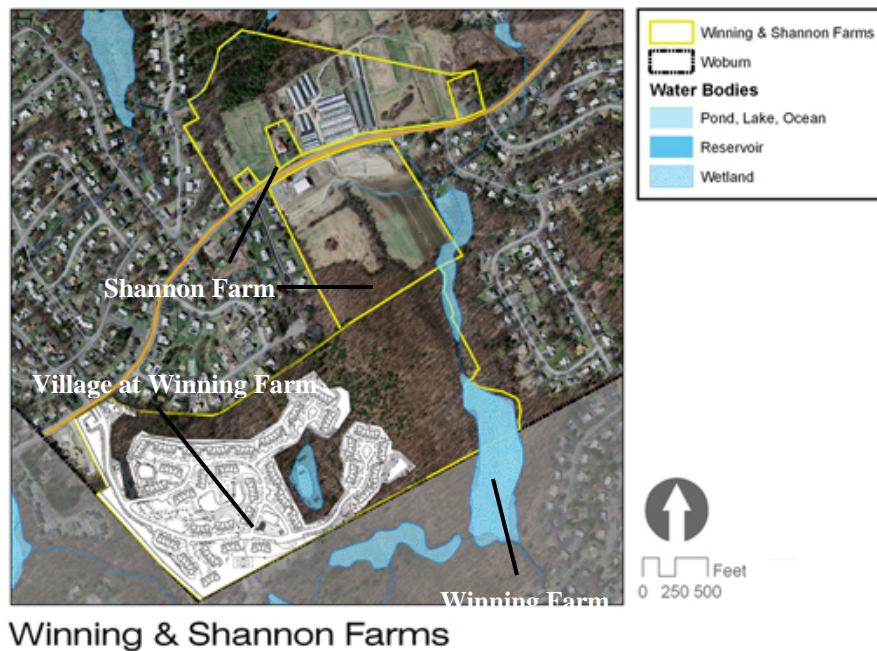


Figure 3-1: Property Lines of Winning Farm and Shannon Farm (MassGIS, 2010)

### B. Description and Opportunity at Winning Farm

Winning Farm is a beautiful, 60-acre parcel of open space located in the southwest corner of Woburn. The parcel was originally part of a 114-acre farm that spanned the cities of Woburn, Lexington, and Burlington. When the parcel was put on the market in 1996, the

city of Woburn passed on its first right of refusal to purchase the portion of the farm within its city limits, clearing the way for it to be bought by developers. (Tarallo, 2010)

The negotiation and approval process for the sale to the developers was lengthy and at times contentious due to neighbors' concerns about potential drainage and flooding problems that could be exacerbated by the development, as well as concerns that there was a toxic landfill on the site. After a thorough review by the Department of Environmental Protection (DEP,) the sale was ultimately approved by the city council, and construction on the "Village at Winning Farm," a townhouse complex, is expected to be constructed as the economy recovers. Terms of the sale include numerous conditions to protect the health of the site, chief among them wetland protection and the fulfillment of the DEP's remediation plan to clean up the landfill on the site, all paid for by the developer. ([http://www.winninghome.org/winning\\_future.html](http://www.winninghome.org/winning_future.html))

In addition, as a condition of the sale, city officials negotiated a change in zoning regulations that modified Section 14 to allow the townhouse development to occur in R1 and R2 Zones, which was previously not permissible. (Tarallo , 2010.)

The development will be located on the western 30 acres of the site. (Figure 3-1) Of primary importance to our study, the remaining 30 acres of land has been deeded to the city for passive recreation (including a trail system) under the purview of the Woburn Conservation Commission. Finally, the developer will provide the city with 15 parking spaces and permanent public access to the trail system to be enjoyed by city residents.

The trails to be developed throughout the site would incorporate existing trails into a 2-3 mile network that is compliant with the Americans with Disabilities Act (ADA), as well as a 1.25 mile fitness loop. The trails would be carefully designed not to harm the ecologically sensitive woodlands. A number of distinct features, including wetlands and streams, rocky outcrops, a beautiful vista on top of "Winning Hill," mature forests, and an elevation change of more than 100 feet make this property an ideal setting for passive recreation and environmental education for adults and children alike.



*Figure 3-2: Existing Trail at Winning Farm*

It is important to note that a second portion of the farm (40 acres) lies in Winchester. The city bought the property and sold a 12.5-acre parcel for the development of an assisted living facility. The rest of the property, which abuts the new conservation space in Woburn, will remain as open space, effectively enlarging the area for the enjoyment of residents from both cities and throughout the region, and combining to create a significant area of protected forest. There is already an existing trail system in Winchester that would be connected to the new system in Woburn. The remaining nine acres of the farm in Lexington are being developed for residential use.

A short history of Winning Farm can be found later in this chapter and will aid in understanding how the site has evolved and how this new use complements and honors the history of this important piece of land.

### **C. Description and Opportunity at Shannon Farm**

Directly to the north of Winning Farm, several privately owned parcels totaling more than 40 acres make up the Shannon Farm. The land has been actively farmed for more than a century and is one of the last remaining active farms in all of Woburn. It possesses prime agricultural soil (MassGIS Soils, 2008). Currently, it is privately owned and is registered under the M.G.L. Chapter 61A as agricultural land. This classification provides a tax abatement to the owners. Should the property owners of Shannon Farm



decide to sell it, under the Chapter 61A provisions, the city has right of first refusal if they wish to purchase it.

A rare and special opportunity for the city exists with respect to Shannon Farm, which could provide a direct corridor between two open spaces in the city, Winning Farm (discussed above) and Shaker Glen, a well-loved existing conservation area in Woburn.

This link would be part of a larger greenway system that would connect residents to a number of beautiful, protected open spaces in Woburn, including the north focus area of this study, Whispering Hill. (See Chapter 4 for discussion of Western Woburn Greenway.) This corridor would also create and connect habitat for the wildlife that live in those protected areas, allowing movement from one area to another and helping many species to thrive.

In addition, the possible purchase of Shannon Farm would offer the opportunity for a number of compatible uses that have been identified by the city of Woburn as desirable, including cemetery space, agricultural land, and recreational fields. We have analyzed the suitability of the properties of Shannon Farm for these land uses, and our findings are included in this chapter. Portions of the properties are uniquely suited for a number of uses and, in addition to serving as a vital link in a greenway system, could provide Woburn residents some wonderful benefits.

## **D. History**

### **Winning Farm**

Over a century ago, Winning Farm was a 114-acre site that spanned three communities: Woburn, Winchester, and Lexington. The original owner of the property was William Henry Winning. Shortly before his death at the turn of the 20<sup>th</sup> century, Mr. Winning placed his land “in trust to be used and appropriated for the establishment and maintenance of a home for orphans and other destitute children, either for their permanent or temporary care.” (Lucero, 2010) Within two years of Winning’s death, work began on converting the stately Winning homestead into a refuge for children who needed a home. During the first summer, more than 160 children were brought to the Winning Home.

Throughout the first half of the 20<sup>th</sup> century, the property was renovated and maintained as a summer camp with hiking, horseback riding, petting zoos, swimming, and other activities enjoyed by hundreds of children each year from the greater Boston area. Unfortunately, changes in regulations regarding camps and childcare throughout the 1960s and 1970s ultimately caused the camp to close.

Given this financial reality, the trustees of the property decided in 1996 that the best way to honor Mr. Winning’s wishes to benefit the children of the area was to sell the property

and establish a charitable trust (“Winning Home, Inc.”) to manage and invest the assets from the sale. The trust would then award grants from the interest on the investments to organizations in the area like the Boys and Girls Club, the Mission of Deeds, and the Woburn Council for Social Concern.

For non-profit organizations whose mission is to help children in the city of Woburn, the sale of this property has meant an increase in donations by Winning Home, Inc., which to date has given more than \$1.6 million in grants as a result of its strong financial position.

Historical information can be found on the Winning Home, Inc. website:  
[http://www.winninghome.org/winning\\_future.html](http://www.winninghome.org/winning_future.html) and  
<http://www.winninghome.org/news.html>.

## **Shannon Farm**

James Shannon arrived in Woburn from Cork, Ireland in the spring of 1881. He and his family were a small part of the Irish Diaspora that began with the famine in 1841 (Coady, 2010). Originally a dairy farm, the Shannon farm has passed through 4 generations of Shannons. It has also gone through a variety of farm operations from dairy farming to its current operation of greenhouse flower production. Today, J. Shannon and Sons supplies cut flowers and perennials to over one hundred wholesalers throughout New England from Falmouth, Maine to Falmouth, MA on Cape Cod.

The Shannon Farm property is still private property and will remain so until the current owners decide to sell the property. Because the farm is a Chapter 61A property, if the farm is for sale, the city has the right of first refusal to purchase the property. As part of this study, the city is interested to explore what use(s) may be appropriate for the site, and how such uses could relate to and connect with the new city-owned lands that are part of the Winning Farm development. With the information in hand, the city would be better prepared to make a decision about purchasing the Shannon Farm, should it be offered for sale.

## **E. Site Assessment**

### **1. Topography and Slope**

The topography of Winning Farm creates a diverse terrain and greatly influences the suitability of particular land uses. (Figure 3-3) Steep slopes and flat areas were analyzed to determine the best use for that area and which uses would have the least impact on the existing topography.

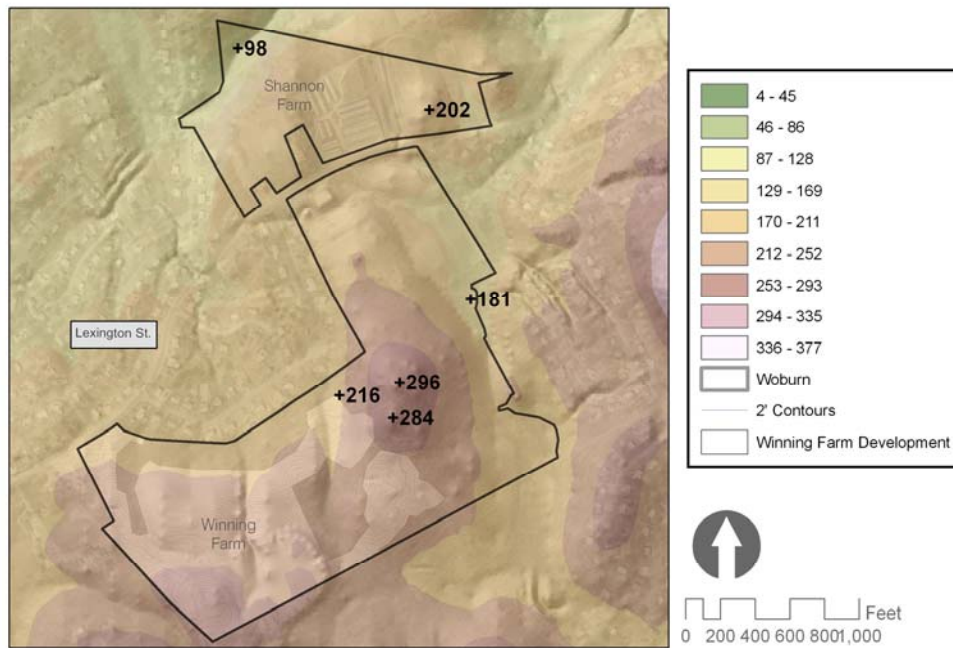


Slope Analysis

*Figure 3-3: Topography and Slope at Winning and Shannon Farms (MassGIS, 2003)*

We did not analyze the topography of the portion of the site that has been approved for the development, as the developer will be regrading the site. There is, however, a narrow strip of land adjacent to Canterbury Road on the north side of the new development that is included in the conservation land. This strip is relatively flat, with slope between 0 - 10%, providing an opportunity for ADA-accessible public access points from the development to reach the new trail system through paths between the town house clusters.

Winning Farm has a distinct high point of two small peaks known as “Winning Hill,” with elevations of 296’ and 284’ creating potential viewing points. (Figures 3-4 and 3-5.)



Winning & Shannon Farm Elevations

Figure 3-4: High and Low Points of Winning Farm Topography (MassGIS, 2003)



Figure 3-5: View from Winning Hill High Point, 296' Above Sea Level

Winning Hill with (elevation 296') is the predominant feature of the site. The east and west sides of the high point have a fairly steep grade (at least 15-20%) which presents opportunity for challenging hiking and fitness trails. From the high point down the hill to the east there is a steady slope that ends at a wetland and stream with an elevation of 181'. The north and south sides of the hill have a more gradual slope (8-15%) leaving more potential for creating ADA accessible trails to the top of the Hill with a maximum grade of 8%. These significant changes in slope also create a variety of habitats for plants and animals.

The Shannon Farm property also has significant elevation changes. The property directly abuts Winning Farm, and the southwest corner shares the topography of nearby Winning Hill. This area slopes down north/north-east to Lexington Road where it flattens out as it approaches the road around an elevation of 180'.

North of Lexington Road, Shannon Farm is relatively flat where current working greenhouses are located. The northeast portion of the site has a bit of topography with a small knoll. The northwest corner has more distinct topography as it slopes down to the ravine at Shaker Glen.

## **2. Points of Access and Circulation**

The primary vehicular access point to the conservation area in Winning Farm will be at the entrance to the approved development, "Village at Winning Farm." A 15-space public parking area is planned at the northwest corner of the development and will serve as the primary public entrance. Smaller points of access between buildings within the development will allow for more private means of entry for residents of the future development. Another point of entry could be from the existing Tennessee Gas Authority easement on Canterbury Rd. This could be a small entrance primarily for the local residents. (Figure 3-6)



*Figure 3-6: Access points for Winning Farm*

In addition, there is currently a system of roads entering Shannon Farm that is used for farm activities. Considering the compaction of the ground and existing minimal slope on the portion of the farm directly to the north and south of Lexington Street, it would be most cost effective to utilize these dirt and paved roadways for any future vehicular access into the site. Lexington Street is currently the primary vehicular arterial street and bisects the Shannon Farm. Any future proposals for vehicular entry into the site, whether for recreation fields, cemetery, or community agriculture will have to be from Lexington Street.



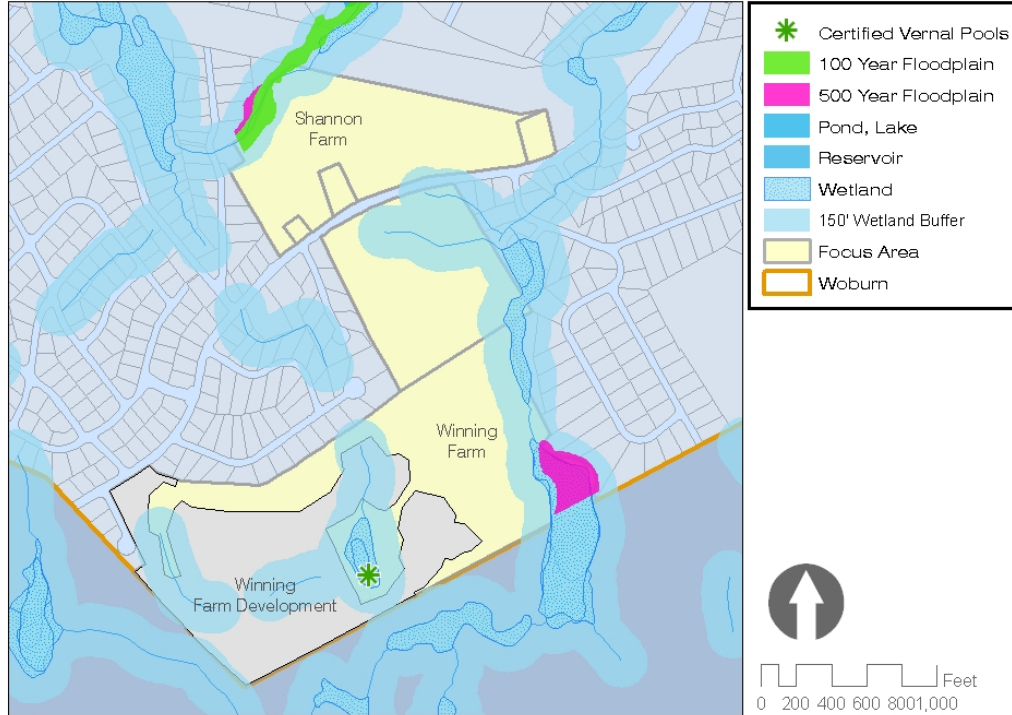
*Figure 3-7: Access point for Shannon Farm*

For pedestrians, an existing easement on Grace Road could serve as a pedestrian access point and would provide access for residents in the adjacent neighborhoods to the east. This would link directly to the proposed trail system and any future conservation areas. The primary pedestrian circulation will be a series of trails connecting the conservation area to the proposed cemetery in Master Plan B, discussed later in this chapter. Secondary trail access via Dix Road, and the power lines to the north of the Shannon Farm property will allow for continuous pedestrian access connecting Shaker Glen and the Whispering Hill focus area.

### **3. Hydrology and Drainage**

It is important to understand water as part of a hydrologic system moving through the site to take advantage of the opportunities it offers and to respect the limitations necessary to protect this vital asset. An understanding of the hydrology helps determine uses that will provide the most benefit to the site users and to the environment they are experiencing.

The opportunities presented at Winning Farm include scenic wetlands that could be enjoyed by the construction of a boardwalk, offering education and awareness of the importance of wetlands. There are restrictions against non-compatible uses near the wetlands, and Woburn's Conservation Commission mandates a 150' wetland buffer. There is also a certified vernal pool on the site, and portions of it are within 100 and 500 year floodplains. (Figure 3-8.)



### Hydrology Focus: Winning & Shannon Farms

*Figure 3-8: Hydrology focus area of Winning and Shannon Farms. (MassGIS)*

Two wetlands run along the east side of the parcels with a stream connecting the two. The southernmost wetland crosses over into Winchester, and includes a 500 year flood plain. The new development at Winning Farm has been designed around a designated wetland area and certified vernal pool at the same point.

The wetland and stream on the east side of Winning Farm would be a very pleasant hiking destination. The stream is calm and peaceful and the well-established wetland gives potential for viewing of aquatic plants and animal sightings. The area next to the water has very little slope and already has an established trail running along side it. People of all hiking abilities would be able to enjoy this feature. (Figures 3-9 and 3-10)

The high points at Winning Hill in the middle of the site cause the water to flow east and west from this high point. Two small streams that run along the south side of Lexington Street on Shannon Farm are currently surrounded by agricultural fields. These streams do not appear as significant or established as the other streams on the site.





*Figure 3-9: Stream at Winning Farm*



*Figure 3-10: Wetland at Winning Farm*

At the north end of Shannon Farm is the beginning of Shaker Glen Conservation Area, a well-known and prided destination of Woburn residents. A small stream runs through Shaker Glen, which is within a 100 year flood zone, with some portions within the 500 year flood zone.

#### 4. Soil Conditions

Soil conditions on the three parcels making up Winning and Shannon farms vary significantly. The north parcel of Shannon farm has mostly consistent soil, while the other two parcels have a variety of soil types. The soil types were examined as well as information concerning prime farmland soils. (MassGIS, 2010) These types are seen on the Agricultural Suitability – Soil Type Map (Figure 3-11) and described in detail below.

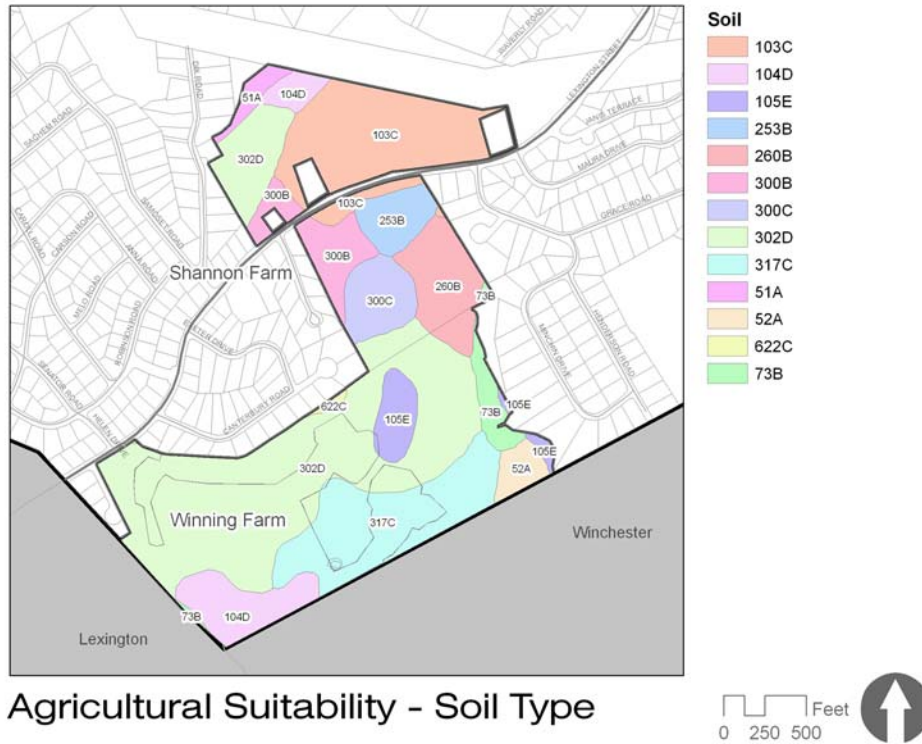


Figure 3-11: Agricultural Suitability – Soil Type (MassGIS, 2010)

Soil #	Soil Type	Soil Classification
51A	Swansea muck, 0 to 1 percent slopes	Farmland of unique importance
52A	Freetown muck, 0 to 1 percent slopes	Farmland of unique importance
73B	Whitman fine sandy loam, 0 to 5 percent slopes, extremely stony	Not prime farmland
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	Not prime farmland
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	Not prime farmland
105E	Rock outcrop-Hollis complex, 3 to 35 percent slopes	Not prime farmland
253B	Hinckley loamy sand, 3 to 8 percent slopes	Farmland of statewide importance
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	All areas are prime farmland
300B	Montauk fine sandy loam, 3 to 8 percent slopes	All areas are prime farmland
300C	Montauk fine sandy loam, 8 to 15 percent slopes	Farmland of statewide importance
300D	Montauk fine sandy loam, 15 to 25 percent slopes	Not prime farmland
302D	Montauk fine sandy loam, 15 to 25 percent slopes, extremely stony	Not prime farmland
317C	Scituate fine sandy loam, 8 to 15 percent slopes, extremely stony	Not prime farmland
622C	Paxton-Urban land complex, 3 to 15 percent slopes	Not prime farmland

*Figure 3-11a: Soil Types Key (MassGIS, 2010)*

The north parcel of Shannon Farm consists mainly of Charlton-Hollis-Rock outcrop complex. It consists of strongly sloping, very deep and shallow soils on uplands where the relief is affected by the underlying bedrock. The soil is somewhat excessively drained with stones and boulders covering up to 15 percent of the surface. This soil is completely unsuitable for agricultural uses.

The remaining soils of the north parcel of Shannon Farm are in small patches in the western portion of the site. These patches are made up mainly of Hollis-Rock outcrop-Charlton complex and Montauk fine sandy loam. Hollis-Rock outcrop consists of exposed bedrock and moderately steep, shallow and very deep soils on hills and ridges where the relief is highly affected by the underlying bedrock. This soil is also completely unsuitable for agricultural uses. The Montauk fine sandy loam is a very deep, moderately

steep, well drained soil. It is classified as prime farmland. However, because of the small area of this soil, it is not useful for any significant agricultural uses.

The south parcel of Shannon Farm is dominated by three soil types. It consists of Montauk fine sandy loam, Hinckley loamy sand, and Sudbury fine sandy loam. As seen in the northern parcel, Montauk fine sandy loam is classified as prime farmland and provides opportunity for that use in this location. Hinckley loamy sand is sited on 3-8 percent slopes and consists of very deep excessively drained soil situated on glacial outwash plains and terraces. This soil is farmland of statewide importance. MassGIS classifies farmland of statewide importance as land that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. It includes nearly prime farmland that economically produces high yields of crops when treated and managed according to acceptable farming methods. (MassGIS Soils, 2010) Sudbury fine sandy loam is sited on 3-8 percent slopes and consists of very deep moderately well drained soil in low areas and shallow depression on glacial outwash plains and terraces. It is classified as prime farmland.

The portion of Winning farm within the study consists of patches of five types of soil: Scituate fine sandy loam, Freetown muck, Whitman fine sandy loam, Paxton-Urban land complex, and Rock outcrop – Hollis complex. The Scituate fine sandy loam consists of moderately well drained soils that are very deep to bedrock and is moderately well drained. The soil is completely unsuitable for agricultural uses. Paxton-Urban land complex includes well drained Paxton soils and urban land. The complex is typically situated on glacial till uplands and drumlins in densely populated areas. It is also completely unsuitable for agricultural uses. Rock outcrop – Hollis complex consists mainly of exposed bedrock and moderately steep soils which makes it unsuitable for agricultural uses.

The soils provide opportunities for agricultural use only on the Shannon Farm parcels. This prime farmland is located nearly entirely on the south parcel. With soils classified both as prime farmland and farmland of statewide importance located on one parcel, a unique opportunity for agriculture is presented on this site.

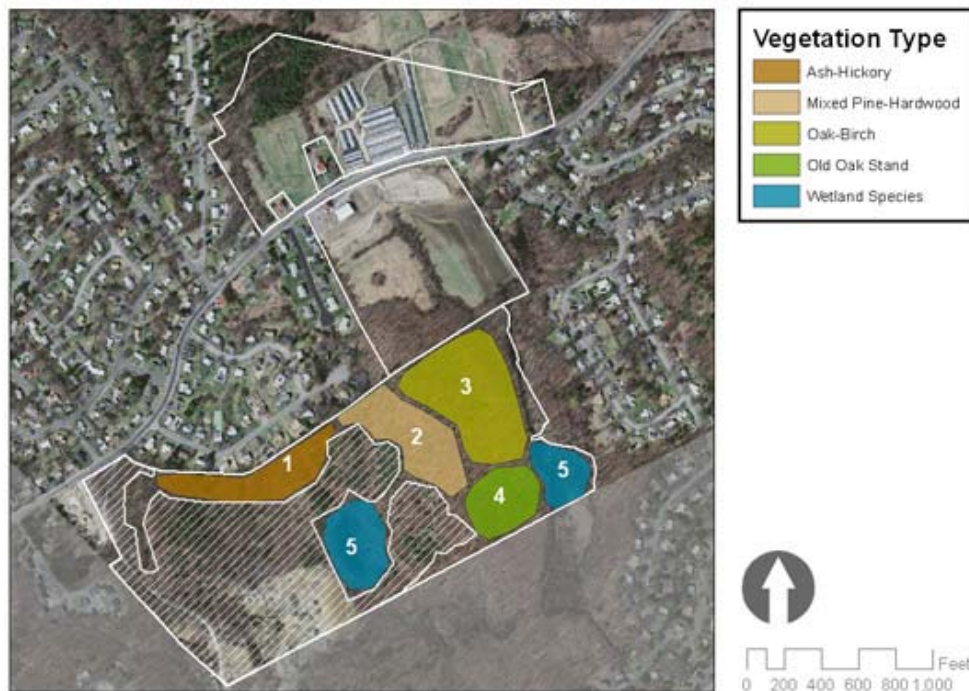
## **5. Existing Vegetation**

The existing woody vegetation and remnants of single stone walls at Winning Farm suggest a former agricultural landscape. Overall, the vegetation is a mature mixed deciduous forest, with some areas that contain mixed conifers, mostly white pines. There are also two wetlands on the site with a variety of wetland species including highbush blueberry, winterberry holly and alder.

Invasive species (poison ivy, burning bush, glossy buckthorn, multiflora rose) can be found throughout the site. The section of the forest where there are most prevalent, along the southern edge of the site, will be cleared and graded as part of the new development. The city should consider a program of invasive plant management for this area in the future.

As shown below in Figure 3-12, the vegetation can be roughly categorized into five sections:

1. Mixed Ash-Hickory. In addition to the dominant ash and hickory with a 50-60 foot canopy, this section included cherry, maple, and hornbeam. There were numerous 2-3 foot diameter boulders.
2. Mixed Pine-Hardwood. At the top of Winning Hill, a rocky outcrop, the canopy is 30-40 feet and consists of birch, oak, and a small stand of quaking aspen. White pine is mixed with the deciduous trees. Spicebush is also present.
3. Mixed Oak-Gray Birch. Halfway down Winning Hill, headed east toward the stream, the forest consists of large oak, beech, and birch trees of 50-60 feet.
4. Old Oak Stand. In this section, towering oaks of 70-80 feet dominate. The understory is sparse, with young pine saplings. Cedars indicate the pastoral history of the site, while princess pine indicates a healthy forest.
5. Wetland Species. At the stream and wetland on the east side of the site, we found highbush blueberry, summersweet, river birch, and a variety of wetland grasses. Around the wetland at the center of the site, there was red maple, beech, witchhazel, and skunk cabbage.

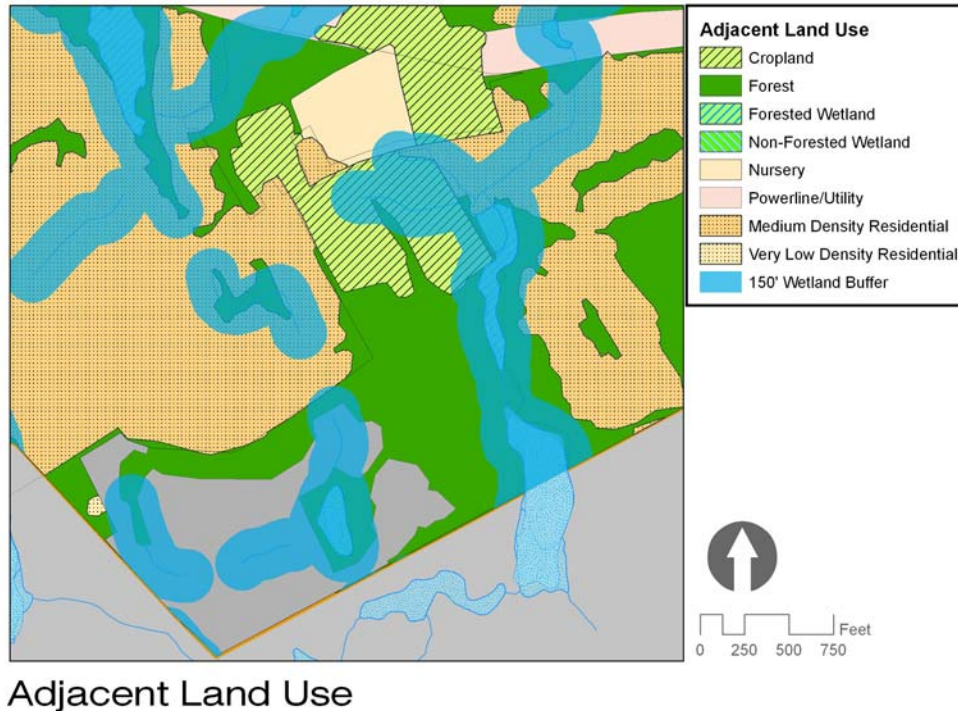


Winning Farm Existing Vegetation

Figure 3-12: Existing Vegetation

At Shannon Farm, to the north of Winning Farm, the majority of the land has been cleared for agricultural use. On the northern portion of the site, however, there is a conifer stand where the topography drops dramatically to the ravine at Shaker Glen.

## 6. Adjacent Land Use



*Figure 3-13: Adjacent Land Uses to Winning and Shannon Farms (MassGIS, Land Use, 2005)*

Winning Farm straddles Lexington to the south-west and Winchester to the south-east. The new 147-unit residential development within Winning Farm, “Village at Winning Farm” is largely buffered by forest from the existing neighborhoods. Medium density residential development is located to the north and east of the forest.

Shannon Farm has forest buffering to the south and north of the farm, and forested wetland to the northeast. Medium density residential development can be found to the west and east of the farm. To the north of Shannon Farm is a city owned utility corridor, and the beginning of city owned conservation area, Shaker Glen, which is permanently protected.

There is a stream to the east of both the Shannon and Winning Farms that flows at the periphery as well a stream to the northwest of Shannon Farm. Under the Woburn Municipal Code, “Wetland Protection and Conservation” a 150’ buffer is mandated from any future development.

## **F. Land Use Suitability**

### **1. Cemeteries**

Cemeteries are sited according to a number of suitability considerations. The criteria used in this process differ with the type of cemetery being proposed. For example, an ash-scattering area for cremated remains will differ greatly in size and vary greatly in land use suitability than a mausoleum or for a conventional burial cemetery. Because of Woburn's general need for cemetery space and limited opportunities for expansion, traditional plots were included in the plan.

The design considerations of traditional burial plots consist of the following:

- Depth to bedrock (6-10' preferred)
- Depth to water table (7' or deeper preferred)
- Slope (0-8% preferred)
- Soil types
- Adequate drainage
- Surrounding land uses
- Views into and out of the site
- Distance from road edges for access
- Distance from hydrological features (150' wetland buffer required in Woburn)

A depth of bedrock of 5 feet is the minimum needed to establish traditional burial plots. It is overly expensive and inefficient to be forced to utilize large excavation equipment for simple burials. In many cases, it is simply impossible to dig through bedrock. Shallow bedrock can also cause significant drainage issues, such as a perched water table. Thus, depth to bedrock is an important criterion to be considered when siting a cemetery.

The depth to water table is very important as well. The ground in a cemetery cannot remain saturated for long periods of time. This is also tied in with the drainage of the soil. A poorly draining soil is unsuitable for cemetery use. It is also important to keep some distance from hydrological features in order to not contaminate the local groundwater table.

There are many other factors that influence the suitability of a cemetery location. Surrounding land uses have to be compatible. The cemetery must also be situated in such a manner that there is quality access from all road edges for occasions of burial.

In studying the cemetery suitability in the Shannon and Winning Farm parcels, it was found that the primary areas for cemetery use are located strictly on the Shannon Farm parcels. The primary areas of suitable cemetery land are shown in the Cemetery

Suitability Map (Figure 3-14).

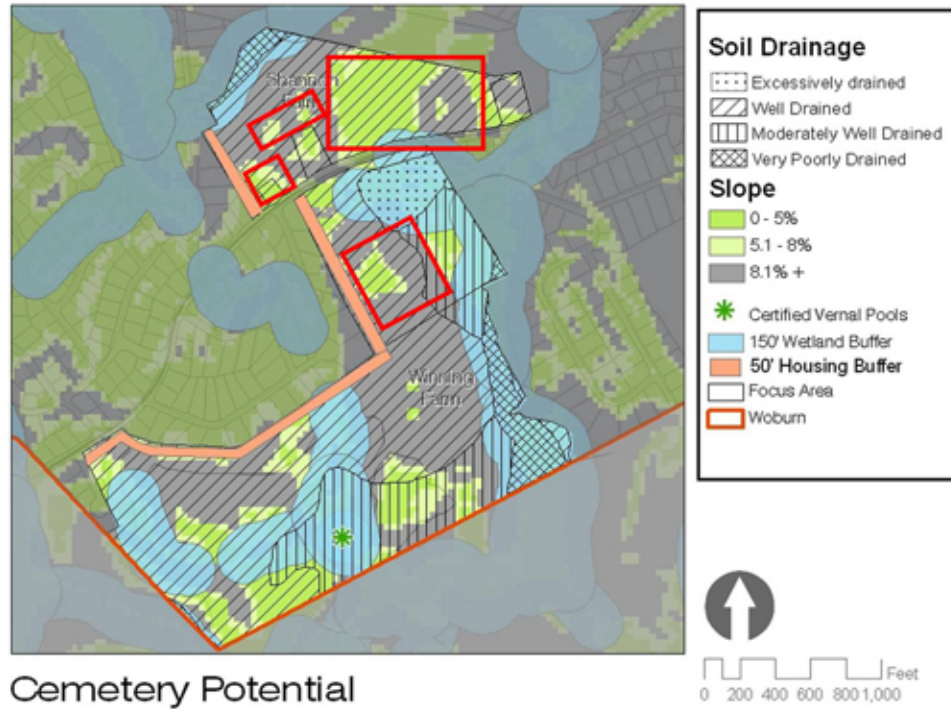


Figure 3-14: Cemetery Suitability (MassGIS)

As it is shown in the map, the largest area of the most suitable land is located on the south parcel of Shannon Farm. The north parcel holds a small area of the most suitable land surrounded by a large portion of suitable land for cemetery use. This area totals over 20 acres in size.

## 2. Recreational Fields

The need for additional recreational fields in Woburn was identified in the 2004 Open Space Plan (see Appendix A) and emphasized by the community in public meetings. To determine whether any portion of the Winning or Shannon Farm sites is suitable to build recreational fields, we first calculated the area necessary to accommodate a Little League baseball field (approximately 225' by 225') as well as a High School soccer field (minimum 300' by 165'.) Many communities design and build fields that overlap in order to maximize the use of the land designated for fields. For purposes of this study, we assumed a combined field design with two baseball fields and one soccer field. Such a design would require an area of approximately 300' by 450', which equates to roughly 3 acres of land. A parking lot to accommodate vehicles of spectators at the games would also need to be constructed, adding to the required acreage.

The next step was to look at the city's 150' wetland buffer requirement. Although exceptions can be made for certain land uses within this buffer (including trails and



agricultural fields), we do not advocate for an exception to construct a recreational field. As stated throughout this report, the protection of the quality of water in Woburn, including its wetlands, is one of our primary objectives.

We analyzed the portion of the site outside the wetland buffer according to the two requisite characteristics for a recreational field:

1. Good to excellent soil drainage
2. Relatively flat slope of existing topography

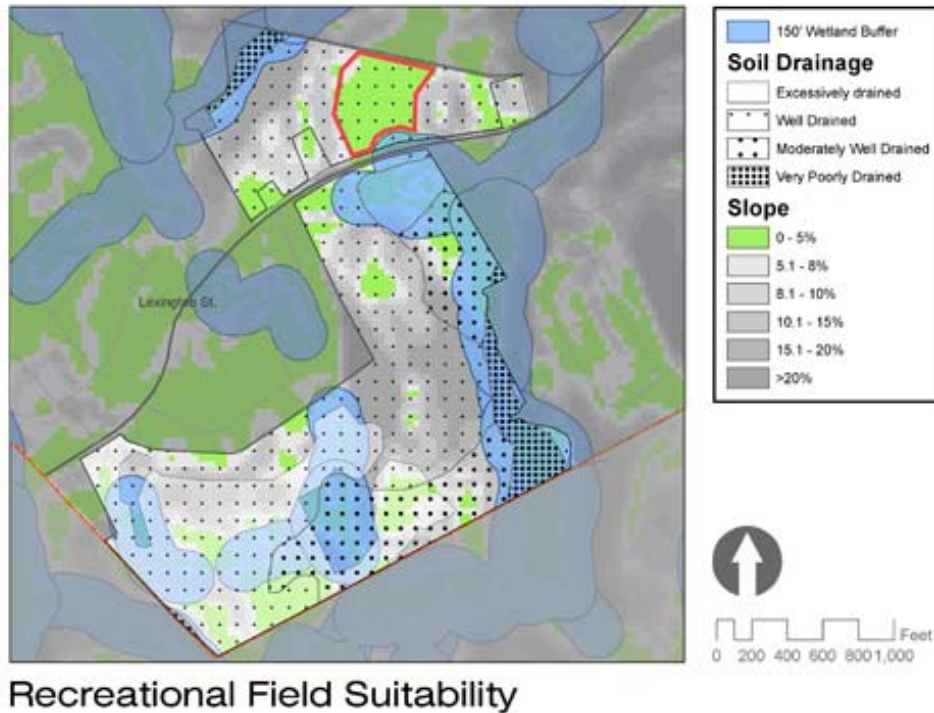


Figure 3-15: Recreational Field Suitability (MassGIS)

The results of this analysis are shown above in Figure 3-15. The majority of land on these two farms is well-drained, as indicated by the spacing of the black dots. Well-drained soil is important as a site requirement to avoid the pooling of water on a field during and after rain events.

The areas in green represent a slope of 5% or less. Fields can be constructed on areas with a higher slope, but it will be expensive and require a great deal of earth moving.

When the required space (3 acres) for combined fields is overlaid on this analysis, it becomes clear that the only area suitable for recreational fields is on Shannon Farm, north of Lexington Street, which is indicated with the red line in Figure 3-15. Based on this

analysis, we have included recreational fields on this area of the site in our first conceptual master plan, presented later in this chapter.

### 3. Trails

As mentioned previously, when the City of Woburn granted the approval for the development of the “Village at Winning Farm,” they also were very clever in negotiating that the remaining 30 acres of the parcel would remain conservation land that would be managed by the Conservation Commission. See Figure 3-1, *Property Lines of Winning Farm and Shannon Farm* which identifies the “Village at Winning Farm.”

The city’s “new” 30 acres are located in the eastern portion of the Winning Farm parcel, and they also include “borders” around the development and the wetland located in the center of the parcel. This area offers numerous features including diverse topography, wetlands and streams, mature forests, and rocky outcrops that make it possible to create a trail system that will be accessible, interesting, and enjoyable to all residents who use it.

In considering how this system could be designed, it is vital to make connections to the larger greenway that has been proposed for the city. In Figure 3-16 below, the connections to Shaker Glen, Horn Pond, and the existing trails in neighboring Winchester are highlighted.



Figure 3-16: Greenway Connections and Neighborhood Access Points

Other access points are also important. A public access point at the entrance to the new development will provide 15 parking spaces for Woburn residents from outside the

neighborhood who wish to park and use the trails. In addition, access points throughout the development should be negotiated with the developers to ensure that the new residents are able to access the trails easily. Finally a Right of Way at the Tennessee Gas Line as shown below in Figure 3-17 could provide an opportunity for the residents who live on Canterbury Road and the surrounding neighborhood to easily reach the trail system.



*Figure 3-17: Tennessee Gas Line Right of Way on Canterbury Road*

Two kinds of trails can be designed to meet the needs of residents. As discussed above, the topography of the site offers the opportunity to create a fitness trail that takes advantage of the slopes on Winning Hill, with a high point of 296' and a low point of 182' at the base. The fitness trail is shown in green in Figure 3-16 above. It is also possible to design an ADA-accessible trail that will enable residents with disabilities, or physical limitations, to traverse the topography in a series of gentle switchbacks so that they may also enjoy the views from the top of Winning Hill. The ADA trail is shown in orange in Figure 3-16, and a section that shows the mid-point on the hill is shown below in Figure 3-18.



*Figure 3-18: Section of ADA trail at mid-point of Winning Hill.*

The trails will cross and converge at some points, including at the stream and wetland on the far east side of the site, where a boardwalk could be built to allow residents to enjoy being close to the water. Wherever possible, the new trail system will incorporate the trails that already exist on the site.

Destination points will be built into the trail system that will take advantage of the unique ecological and geological features of the site. Potential destinations include the rocky outcrop at the top of Winning Hill (shown below in Figure 3-19), the two wetlands on the site, the mature Old Oak forest, old stone walls, and others.

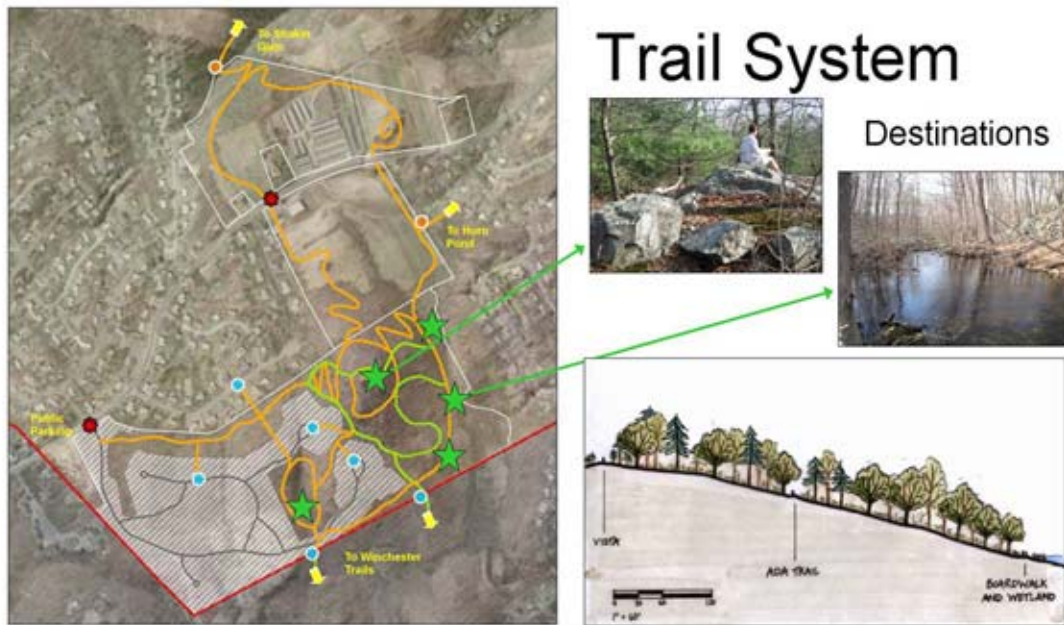
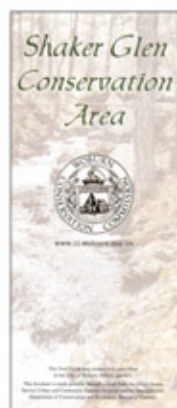


Figure 3-19: Examples of Trail Destinations

These destinations offer an opportunity to provide environmental education for the users of the trails. The Woburn Conservation Commission has produced a trail guide (Figure 3-20) for Shaker Glen, and they could help to create a similar guide for the new trail system at Winning Farm, perhaps with interpretive signs along the trail.

## Environmental Education



- Wetlands
- Old Oak stand
- Mixed forests
- Rocky outcrops
- Invasive trees and vines
- Wildlife

Figure 3-20: Sample trail guide designed by Woburn Conservation Commission

#### 4. Parking

Parking lots are sited for both suitability considerations and access to roadways. Sensitivity to existing agricultural conditions and potential conservation areas is the primary concern. Parking lots are almost universally paved with asphalt or may be graded earth composed of decomposed granite or crushed stone. In recent decades, however, many innovations and alternative materials for parking have become available. Permeable paving materials that allow for on-site and direct infiltration of water can now be obtained for reasonable costs. This helps to mitigate the amount of storm flow demand on the municipal drainage system. It is important to not only consider the configuration and placement of parking lots but to also think about landscape design, drainage and pollution abatement issues. Vehicular access from Lexington Street and existing sites already graded from farming would be ideal for any future parking considerations.

Parking lots are sources of water pollution because of their extensive impervious surfaces which hold and direct oil and other car fluids (Sorvig, 2008). Almost all the rain that falls on a parking lot, with the exception of evaporation, will eventually be channeled to the storm water and sewer over flow. They are also a primary source of water pollution in urban areas. Gasoline, motor oil and other polycyclic aromatic hydrocarbons or (PAHs) as well as various heavy metals can come from both cars and paving materials such as asphalt as well as tar-based sealants. All of these may end up directly in surface bodies of water and eventually the ground watertable. This is exactly why the city has a great opportunity to set an example for the region just how to create a parking lot that will have minimal negative impact on the quality of water available.

There are many alternative paving materials available on the market today. Permeable paving surfaces such as brick, pervious concrete, stone, concrete paving blocks, and recycled materials such as tire-tread woven mats or simply be using crushed stone or decomposed granite to minimize both cost and run-off. These materials allow rain to soak directly into the ground through leaving the ground somewhat contaminated directly under the surface of the parking lot. However, this tends to stay in very thin horizon of the soil and as the water permeates through the ground the natural filtration essentially starts immediately. This can become a problem if the parking lot is located close to the existing water table. That is why parking lots were not considered within the 150 ft wetland buffer on Winning or Shannon Farms. The primary determining factors for the placement of parking lots in the study areas are as follows:

- Depth to water table: (> 2' preferred)
- Slope (0-2% preferred)
- Adequate drainage (moderately drained or better)
- Surrounding land uses (avoid residential uses if possible)
- Distance from 150' wetland buffer required in Woburn

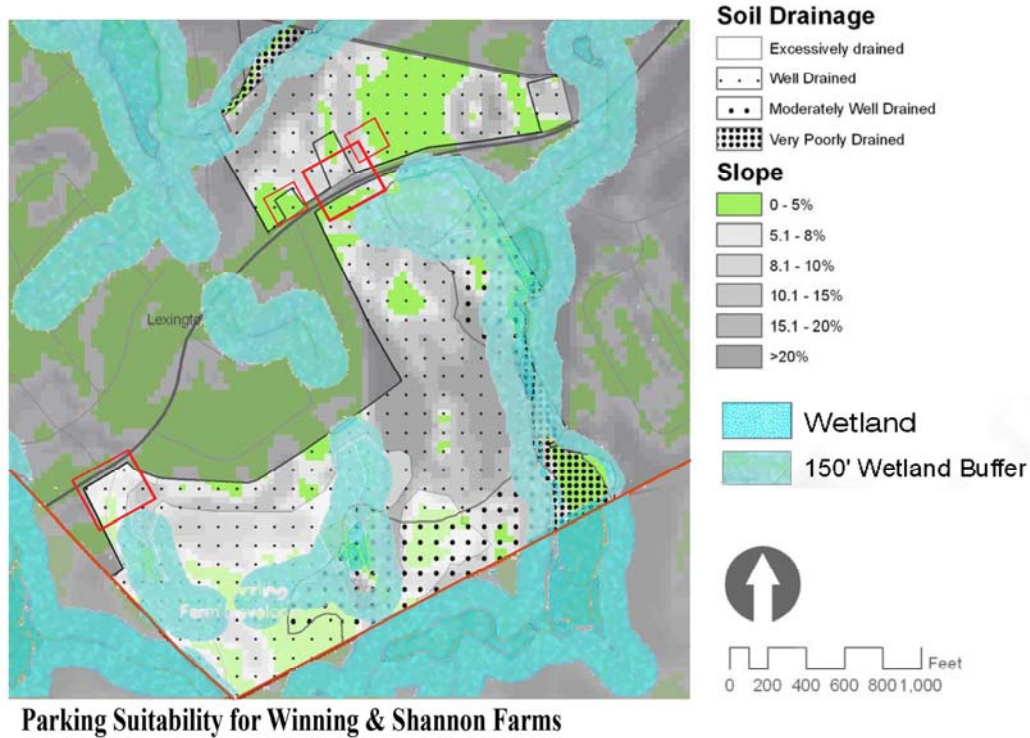


Figure 3-21: Parking Suitability for Winning and Shannon Farms

Figure 3-21 shows the areas of adequate drainage, slope and proximity to wetlands and wetland buffers. The potential for parking areas are indicated with red boxes and are within existing and potential access points to Lexington Street.

## 5. Agriculture

Local agriculture is important for our health, our environment and our communities. In addition to producing fresh, nutritious, high-quality foods, local agriculture provides a wealth of benefits for local communities and its surrounding region. It provides food security for the local region. Local farmers serve as responsible stewards of the land. They live on or near their agricultural land and strive to preserve the surrounding environment for future generations. Since these farmers have a vested interest in their farm and community, they are more likely to use sustainable farming techniques to protect natural resources and human health. The existence of local agriculture also guarantees the protection of open space within the community with various protection programs at the federal, state, and local levels. Local agriculture also contributes to the local economies by providing jobs to local residents. Local farms help to preserve an essential connection between consumers, their food, and the land upon which this food is produced.

As discussed, agriculture in Woburn has significantly decreased over the last 40 years with only 67 acres of cropland and pasture lands left in Woburn, representing only 1% of the total land area in the City. According to MassGIS Land Use, 2005, most prime agricultural soils have been transformed into forested wetland, forest, residential

development, and commercial use. The city has expressed concern about the declining amount of farm land. In the 2004 Open Space Plan, one of the objectives is “to preserve the remaining agricultural lands for open space and recreational purposes by acquisition subsidized through limited development” for these reasons, Winning Farm and Shannon Farm were both assessed for agricultural suitability.

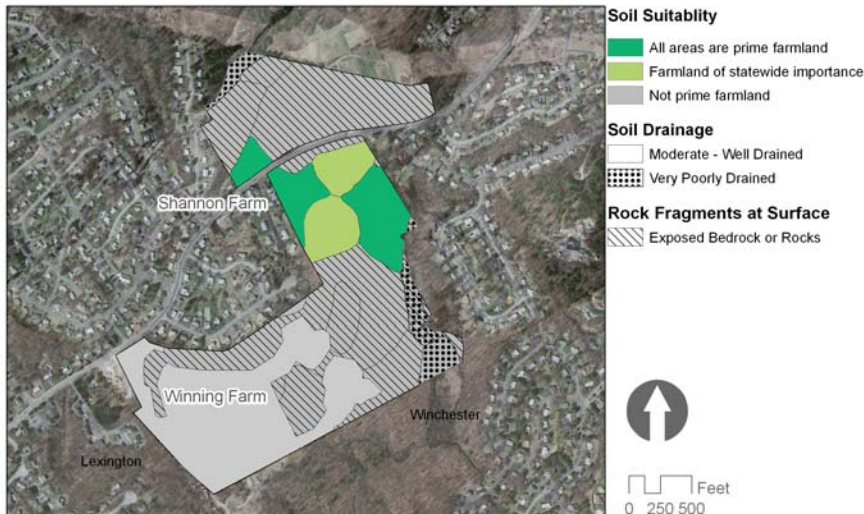
Classification of farmland is conducted by the U.S. Department of Agriculture’s Natural Resources Conservation Service. This classification is assessed and reported in The National Soil Survey Handbook (NSSH).

There are four farmland classifications, which include prime farmland, farmland of unique importance, farmland of statewide importance, and farmland of local importance. The significance of classification is to identify the location and extent of the most suitable land for producing food, feed, fiber, forage, and oilseed crops. This identification is useful in the management and maintenance of the resource base that supports the productive capacity of American agriculture. Figure 3-22 provides a brief description of each farmland classification.

Figure 3-22: Farmland Classification	
Prime farmland	Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water).
Farmland of unique importance	Land other than prime farmland that is used for the production of specific high value food and fiber crops. Examples of such crops are citrus, tree nuts, olives, cranberries, fruit, and vegetables.
Farmland of statewide importance	This is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops, as determined by the appropriate state agency or agencies. Generally, these include lands that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.
Farmland of local importance	In some local areas, there is concern for certain additional farmlands for the production of food, feed, fiber, forage, and oilseed crops, even though these lands are not identified as having national or statewide importance. Where appropriate, these lands are to be identified by the local agency or agencies concerned. In places, additional farmlands of local importance may include tracts of land that have been designated for agriculture by local ordinance.
Source: <a href="http://soils.usda.gov/technical/handbook/contents/part622.html#04">http://soils.usda.gov/technical/handbook/contents/part622.html#04</a> .	



The criterion for Farmland classifications are based on multiple factors, including: amount of rock fragments in the soil, exposed bedrock, slope, permeability, available water capacity, soil pH, soil fertility, depth to bedrock, and hydrologic groups. As shown below in Figure 3-23, a large portion of Shannon Farm is classified as ‘Prime Farmland.’



**Agricultural Suitability**

Figure 3-23: Agricultural Suitability (MassGIS Soils – October 2008)

<b>Figure 3-23a: Agricultural Suitability Key</b>		
<b>Slope</b>	<b>Drainage</b>	<b>Rock Fragments/Exposed Bedrock</b>
0 – 8%	Well Drained	No Rocks/No Exposed Bedrock
8 – 15%	Moderately Drained	Few Rocks/No Exposed Bedrock
≥ 15%	Poorly Drained	Extremely Rocky/Exposed Bedrock

<b>Key</b>		
Most Suitable	Suitable	Not Suitable

These soils have gentle slopes ranging between 3 – 8%; are well drained, and have few to no rock fragments/exposed bedrock at the surface. These areas are well-suited for cultivated crops, orchards, and pasture. These soils include Sudbury fine sandy loam, 3 to 8 percent slopes, and Montauk fine sandy loam, 3 to 8 percent slopes.

Suitable areas for agriculture in the South Focus Area are soils classified as ‘Farmland of Statewide Importance.’ These soils have slopes ranging between 3 – 15%, moderately drained, and have few to no rock fragments/exposed bedrock at the surface. These areas are well suited for cultivated crops, orchards, and pasture. These soils include Hinckley loamy sand, 3 to 8 percent slopes and Montauk fine sandy loam, 8 to 15 percent slopes. Unsuitable areas are soils that are extremely wet, poorly drained and have rocks or bedrock at the surface. Slopes range from 0 to over 25%. These soils are frequently covered with ponded water for long periods of time. These soils include: Swansea muck, 0 to 1 percent slopes; Freetown muck, 0 to 1 percent slopes; Whitman fine sandy loam, 0 to 5 percent slopes, extremely stony; Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes; Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes; Rock outcrop-Hollis complex, 3 to 35 percent slopes; Montauk fine sandy loam, 15 to 25 percent slopes, extremely stony; Scituate fine sandy loam, 8 to 15 percent slopes, extremely stony; Paxton-Urban land complex, 3 to 15 percent slopes.

Of the three parcels examined, the most suitable areas for agriculture are soils that are classified as Prime Farmland and are of statewide importance. These soils are located on the south parcel of Shannon Farm. They are highly valued for their rich fertile soils that are well drained, they do not have rocks or exposed bedrock at the surface, and have gentle to moderate slopes ranging from 0 – 15%. Within these areas, the soils that have slopes ranging from 0 to 8% should have more consideration of using the land for cultivated crops due lower erosion potential. Hillside areas within this parcel should be considered for orchards because of the air drainage which provides some protection from frost. Please refer to Figures 3-11 and 3-11a for the complete listing of soil types.

Since Shannon Farm is still a working farm and possesses prime and statewide significant soils, we recommend agriculture as a potential land use for the south focus area.

## **G. Master Plans**

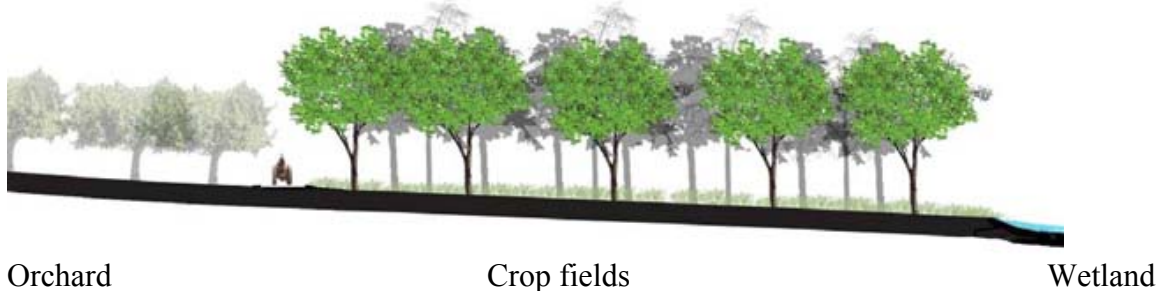
### **1. Master Plan A for Winning and Shannon Farms: Focus on Agriculture and Recreation**

The city of Woburn’s 2004 Open Space and Recreation identifies several city-wide needs. One of these is a need for additional recreational playing fields, which was also a voiced concern at town meetings. Through observing land use change trends it can be seen that farmland has been declining in the city of Woburn over the last three decades. The remaining portion of farmland is less than five percent of current land use (MassGIS Landuse 2005). These two facts were driving forces in the layout of the Master Plan A, which has a focus on agriculture and recreation.



*Figure 3-24: Master Plan A for Winning and Shannon Farms: Focus on Agriculture and Recreation*

In this master plan, it is proposed to keep a portion (eight acres) of the Shannon Farm property as a working agricultural land, specifically as a Community Supported Agriculture (CSA) project to maximize benefits from the site. A CSA farm provides opportunity to promote the local economy while giving residents of Woburn the option of purchasing local food. It also provides an opportunity for residents to be active community members and offers social benefits. As shown in the figures below, the CSA would include two large farm fields (Figure 3-25) and well as ‘pick your own’ orchard and fruit (Figure 3-26), totaling three acres in size.



*Figure 3-25: Crop Fields*



*Figure 3-26: Seating Area at the Top of the Orchard*

The upper hillside of the southern parcel of Shannon Farm presents good opportunity for fruit production due to its prime agricultural soil and higher elevation to protect it from the early spring frost (MassGIS Soils, 2008). Closer to Lexington Street, the soil is not suitable to a variety of crops and is adjacent to a small stream, would be a desired area for planting native wetland tolerant species, specifically blueberry, in this berry planting. On the north side of Lexington Street, three of the existing greenhouses would be saved for production with the CSA. Taking up an acre of space, it would be an opportunity to start early crops and have potential for growing crops for a winter farmers market. The barn and small house on the south parcel would also be saved for use by the CSA.

As shown in Figure 3-27, a parking lot in the area of the barn would have twenty spaces for weekly CSA pickups and worker parking, with overflow parking available behind the barn. This parking lot would be proposed to be paved with pervious asphalt, due to its proximity to a wetland.



*Figure 3-27: Proposed Pervious Parking Lots*

The parking lot would also have bioswales to collect water runoff from Lexington Street. The slope of the street causes water to run toward the southern parcel and the agricultural farmland. Bioswales and rain gardens around the parking lot would not only be aesthetically pleasing, but would help improve water quality.

Both sides of the Shannon Farm would have a 100 foot conservation strip of land, creating a buffer between the adjacent neighborhoods and the agricultural land. The minimum city buffer is twenty feet between different land uses (Woburn Zoning Code). This buffer would help create a wildlife connection between the Winning Farm property and trail system to the Shannon Farm property and into the Shaker Glen Conversation Area.

The Winning Farm portion of the site will remain as conservation land, and a trail system will be developed to include ADA-accessible trails (2.25 miles) as well a fitness trail (1.25 miles.) The trail system will connect the two farms, offering important connections to other destinations along the greenway system, including a pedestrian path to Whispering Hill through Shaker Glen and Battle Road, as well as a combined pedestrian and vehicular path to Horn Pond. The trail system that takes advantage of the topography of the Winning Farm site will be very similar in both the master plans of this area.

The north parcel of the Shannon Farm property is mainly designated for recreational fields, due to the combination of relatively flat slope and well-drained soil. As this is the largest portion of land on either of the farms that shares these characteristics, this area

represents the greatest potential for a combined recreational space that could be enjoyed by many residents. The combination layout of the recreation fields would also provide the most recreational fields possible in a space that will have the least impact on the environment as possible. There is enough square footage on the suitable land for two little league baseball diamonds combined with high school sized soccer field, for a total of five acres.

There would be forty proposed parking spaces for this north area, for users of the recreational fields and also those hiking into Shaker Glen. This parking area is not as close in proximity to the wetland, so pervious paving would not be as strongly recommended due to high cost of installation. However, bioswales would create a buffer between the greenhouses and the parking lot, as well as between an abutting house and the parking lot. Rain gardens would be located roadside, in view of people moving through Lexington Street, as well as in the middle of the parking lot, and at the exit toward the recreational fields and Shaker Glen. It is our intention to make these parking lots visible to as many people as possible as an introduction to the concept of a more “green” parking system. The potential for more green parking lots throughout the city is great, and represents one of the most immediate steps that the city could take in its efforts to be a leader in the region.

## **2. Master Plan B for Wining and Shannon Farms: Focus on Cemetery**

The City of Woburn's 2004 Open Space identifies the desire for additional cemetery space within the city. Through public meetings, it was identified that Woburn would be running out of cemetery space in the near future, and the need was understood to be a minimum of 20 acres that could be devoted to cemetery use. Master Plan B focuses on this need while incorporating some agricultural use in compliance with the city-wide needs stated in the Master Plan A section.

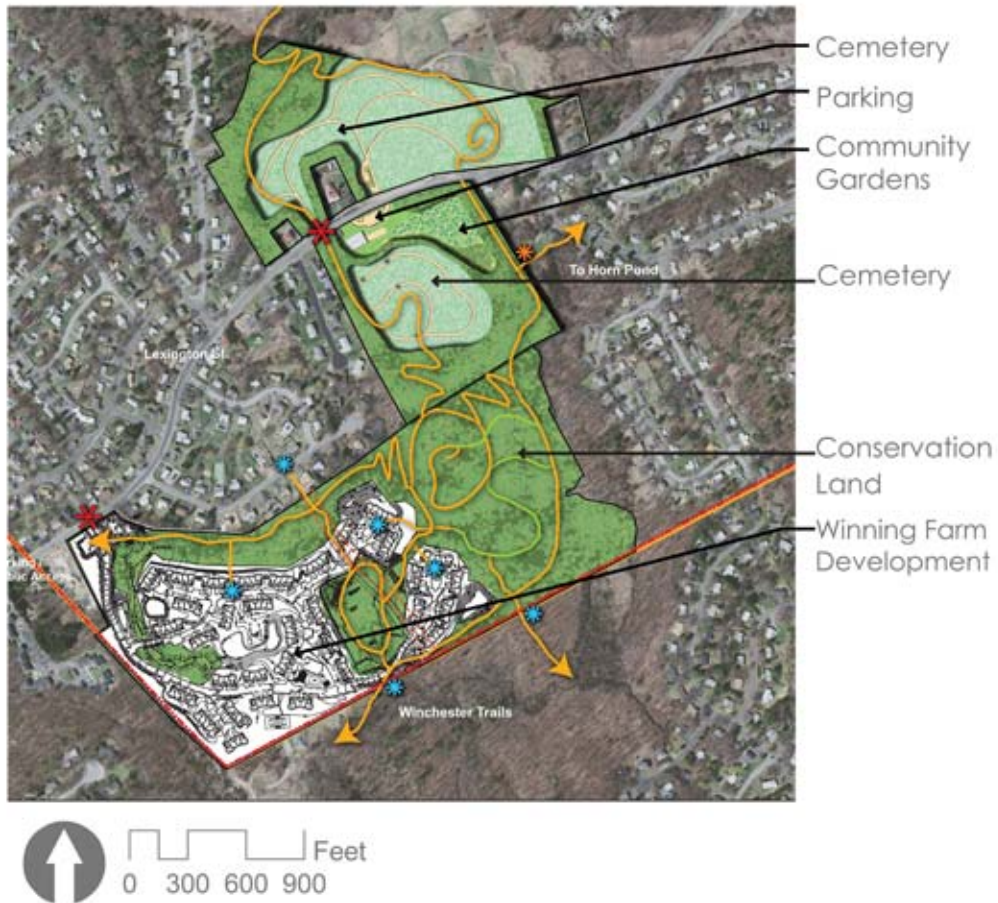


Figure 3-28: Master Plan B for Winning and Shannon Farms: Focus on Cemetery

The proposed cemetery would be managed in a manner that is combination of a natural cemetery and a conventional cemetery. In deciding where the respective cemetery types would be located, a stress would be placed on the ecological habitats within and surrounding the cemetery space. The cemetery space will be maintained as meadow land filled with regionally-native plants surrounded by woodland dominated conservation land.

The burial plot density of a natural cemetery (30 plots per acre) is significantly less than the density of a conventional cemetery (up to 1,000 plots per acre). Because cemetery space is limited in the city of Woburn, it is important to capitalize on every opportunity that is available for cemetery land. The density of the proposed cemetery will be closer to that of a conventional cemetery in order to provide for the demands of the city. However, the proposed plan would integrate both conventional and natural burial methods within these woodland and meadow areas.

In this master plan, it is proposed to create a cemetery that will be split between the two Shannon Farm parcels. A majority (14 of the 20 total acres) of cemetery land would be located in the north parcel (14 acres). A series of roads will meander around the site in order to provide access to all areas of the cemetery. The roads are located for the least

amount of topographical and geological impact on the site. A 10 car parking area will be located on the north site just inside the entrance. Edges of the roads will be maintained to provide parking along the roadsides.



*Figure 3-29: Proposed Cemetery at Shannon Farm*

The south parcel of Shannon Farm will be split between two uses: cemetery and community agriculture. The cemetery would include 6 acres and is organized according to the same principles. The community agriculture would consist of 3 acres of land devoted to garden plots local individuals would be allowed to rent out for the season for the purpose of farming them.

Located in the rear of the community gardens is a proposed wet meadow. There is currently a seasonal stream running through the parcel. The wet meadow would allow runoff from the community gardens to be cleansed before entering the adjacent stream. It would serve to maintain water quality on the site and for the community.

Parking is provided on the south Shannon Farm parcel. It would be located adjacent to the existing barn and building along Lexington Road and allow for 20 parking spaces. It would serve as parking for the users of the community gardens. All parking would be constructed in the same manner previously stated in the Master Plan A section.

Winning Farm is proposed to be maintained as conservation land in both master plans. The proposal of trails remains nearly identical for both master plans within Winning Farm, but the trails are slightly adjusted to allow for the different land uses.

A proposed conservation buffer is integral with both master plans. The minimum 100' proposed conservation buffer would remain intact. A total of 16 acres of the Shannon Farm parcels would be devoted to conservation land surpassing both the city's mandated conservation buffer (25') as well as the proposed minimum 100' conservation buffer in many areas.



The ideas proposed in Master Plan B would provide an opportunity for the city of Woburn to become one of the first to explore concepts of a natural cemetery in the nation. It would allow the city to become a model of sustainability in cemetery management while providing for their own needs. The city might conduct public workshops to explain the concepts of natural burial and assess community interest. The community gardens provide the opportunity to strengthen the community and allow for individuals to become more self-reliant and sustainable while allowing individuals that otherwise might not have the opportunity to grow a garden that can feed their family.

## CHAPTER 4 - GREENWAY CONNECTIONS

### A. Definition of a Greenway

A greenway is a different way of thinking about how the people move around within a city. It's the idea that a journey is more than the destination: moving between two points can be enjoyable and relaxing. In addition to enhancing the experience of movement throughout the city, greenways often connect recreational and conservation areas, acting as a safe corridor for wildlife as well as for people, and for responsible management of water resources.

Paths and corridors in a greenway can vary according to the transportation opportunities and needs of the surrounding areas. These corridors can be walking paths, biking paths, or multi-modal streets that accommodate different types of transit in one street. There is variation in the types of streets within a greenway: green streets can be good for pedestrians, cyclists, cars, and buses. These streets can be anything from a broad tree-lined multi-modal avenue to a low-traffic residential street with a bioswale (vegetated stormwater basin). One of the benefits to green streets is their adaptable nature: with careful design, they can be appropriate for many different contexts within a city.

Green streets and paths together contribute to *green infrastructure* when they are linked together in a network. Think of a pie lattice: the way each strip of dough connects to the others. If a series of different types of streets and paths lays over the city like a lattice, the intersections of streets and paths can allow people and vehicles to move through the city efficiently in whatever manner they choose: walking, biking, driving, or taking a bus.

Green streets can also include bioswales, sometimes called rain gardens. In addition to being beautiful to look at, bioswales benefit public health and city finances. The job of a bioswale is to slow down and retain water, begin to clean it, and allow it to infiltrate into the ground. (City of Portland, 2008) The plants in a bioswale begin to clean the water: their roots remove pollution including fertilizers and pesticides that stormwater picks up as it flows across the ground. Bioswale plants are often native – an opportunity for additional wildlife benefit, providing food to some of New England's native species. And because native plants are from this area, they can survive and reproduce with little help from humans. Low maintenance plants mean lower maintenance costs for the city of Woburn.

Not only do planted bioswales begin to clean water, they also allow water to infiltrate the soil, percolate through the ground, and recharge the groundwater aquifers. This is especially important to Woburn since 60% of the city's water supply comes from wells A-F around Horn Pond. (City of Woburn, 2010) These wells draw from groundwater aquifers: if Woburn can get cleaner, larger quantities of water into its aquifers, it won't need to pay the Massachusetts Water Resource Authority to bring in as much water. Other cost benefits to the city include reduced ongoing stormwater maintenance on culverts and pipes that currently carry away the stormwater. (City of Portland, 2008)

## B. Recommended Potential Greenways for Woburn

An evaluation of Western Woburn revealed three major existing and potential nodes of recreation / conservation space: Whispering Hill & Mary Cummings Park, Shannon and Winning Farms, and Horn Pond. (Figure 4-1)

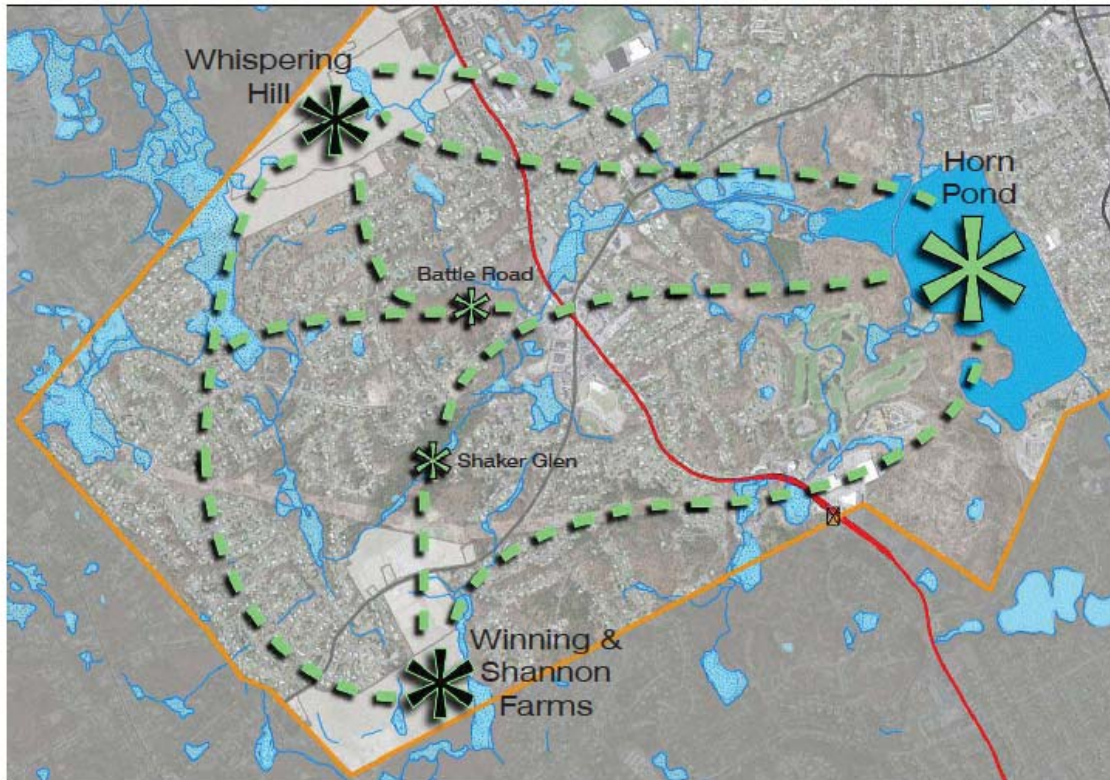


Figure 4-1: A proposed greenway for Woburn, linking Whispering Hill, Winning & Shannon Farms, and Horn Pond

## Recommended Potential Greenways for Woburn

### B-1: Whispering Hill & Mary Cummings Park to Shannon & Winning Farms

Proposed green streets include Sylvanus Wood Lane, Windsor Drive connection to Stevin Drive, Dix Road to Dix Road extension, and Lexington Street to the Farm properties. (Figure 4-2)

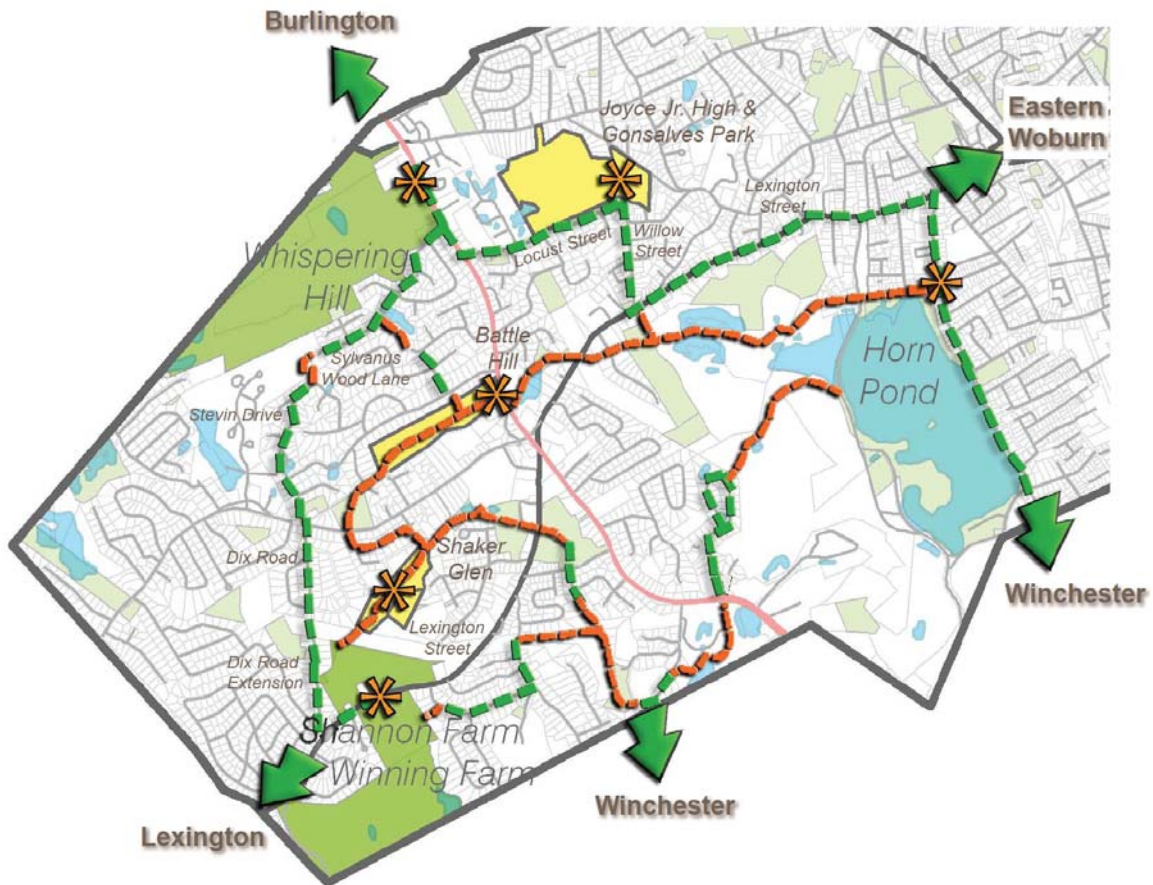


Figure 4-2: Proposed greenway from Whispering Hill to Winning & Shannon Farms

Sylvanus Wood Lane has an existing trailhead into the conservation areas, as well as a cul-de-sac that has space for 6 parking spots, acting as a node within the green network. There is the opportunity for a pedestrian trail running through conservation lands, connecting the end of Sylvanus Wood Lane through a right-of-way onto Windsor Drive. Windsor Drive then connects to Stevin Drive: because Stevin Drive is steep and leads down to a wetland, there is an opportunity to add a bioswale with weirs along the side of the road. (Figures 4-3 and 4-4) These weirs will help to slow the water in a storm event, allowing the water to infiltrate into the nearby wetlands while also providing an aesthetic amenity to the neighborhood.

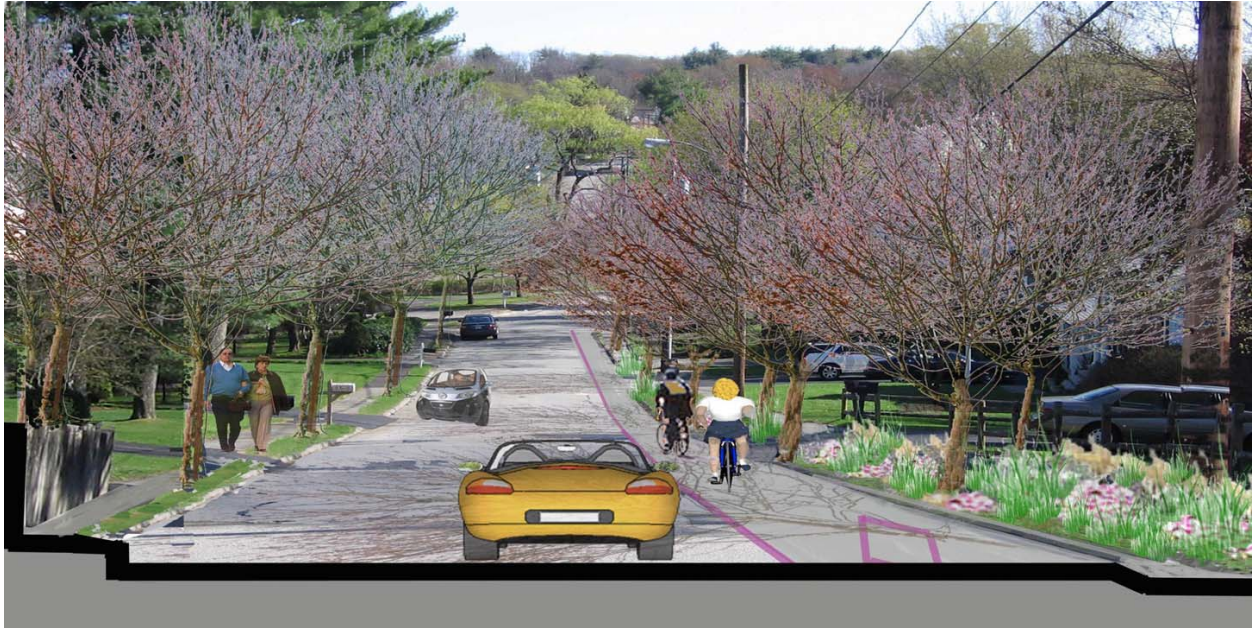


*Figure 4-3: A section of Stevin Drive with a bioswale and additional street tree plantings. Stevin is currently 42' wide; that width would not change with these modifications*



*Figure 4-4: What Stevin Drive might look like with a green street re-arrangement*

Continuing South, Stevin Drive continues to Dix Road (*Figure 4-5*) and Dix Extension - these streets are divided by power lines, providing the opportunity for a pedestrian and bike connection between the two streets. Dix Extension connects to Lexington Street, and there the Farms properties are a node within Woburn's green network.



*Figure 4-5: Dix Road as a green street with cycling lane and bioswale with native plants*

## **Recommended Potential Greenways for Woburn**

### **B-2: Whispering Hill & Mary Cummings Park to Horn Pond**

The route from Whispering Hill & Mary Cummings Park to Horn Pond (*Figure 4-6*) provides an opportunity not only to link two key existing/potential Woburn Conservation areas, but also to gain potential funding and support from the federal *Safe Routes to School* initiative. By including Route 3 (*Figure 4-7*) and Locust Street as part of the city's green network, Woburn can include safe routes for children to walk to Joyce Jr. High and Gonsalves Park. Including Willow Street south of Locust Street as part of this network, Woburn can connect to a pedestrian path into the Horn Pond recreation area. Other options for this route include potential modifications to Lexington Street, though as a state-maintained road, that may be considered a later phase of this project.

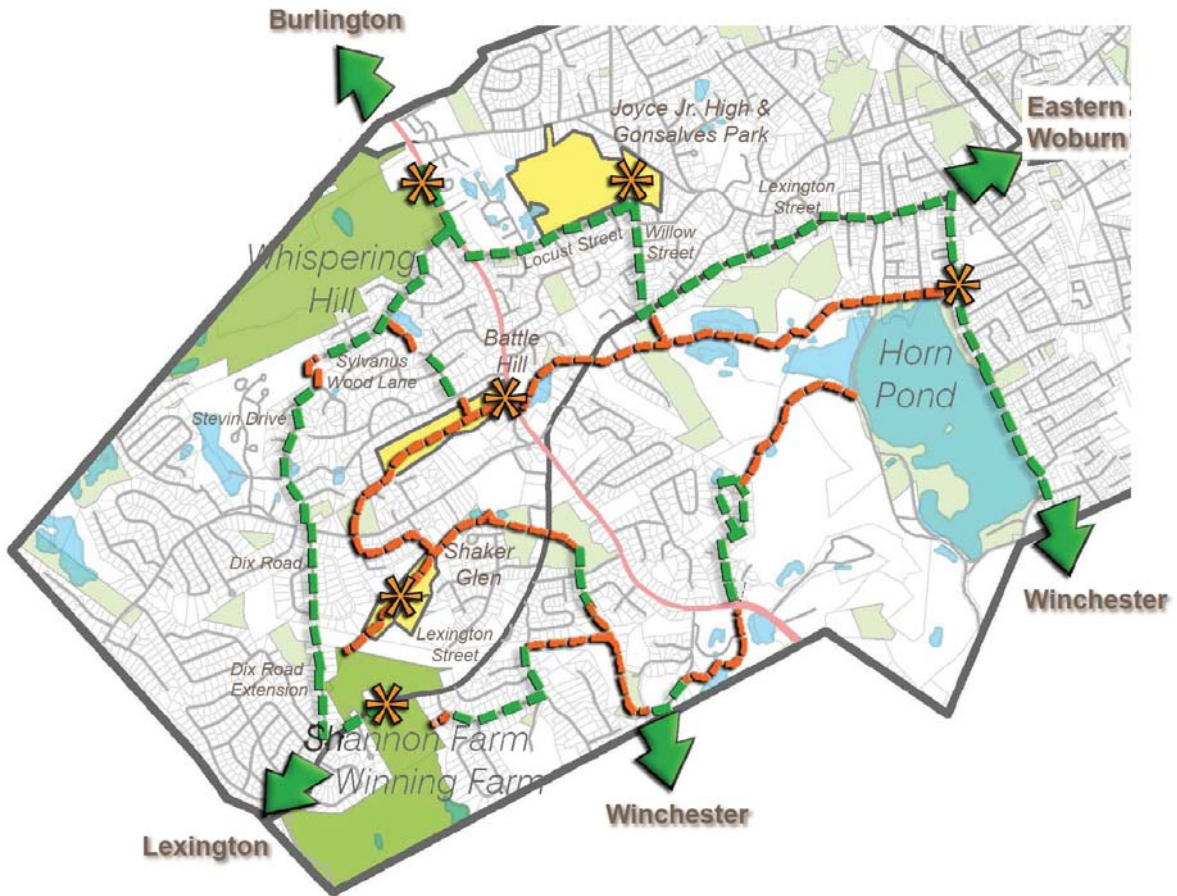
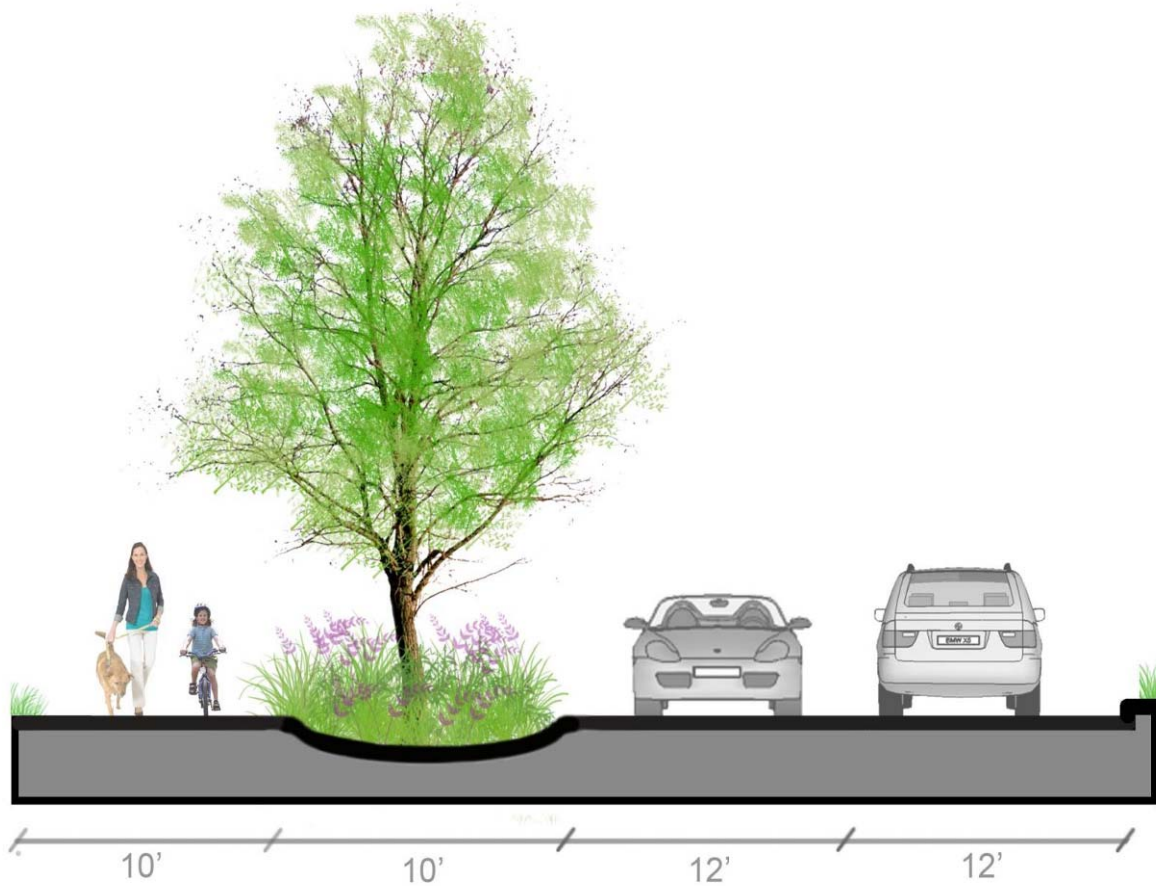


Figure 4-6: Proposed greenway from Whispering Hill to Horn Pond, focusing on Joyce Jr. High, Gonsalves Park, and the Safe Routes to School initiative



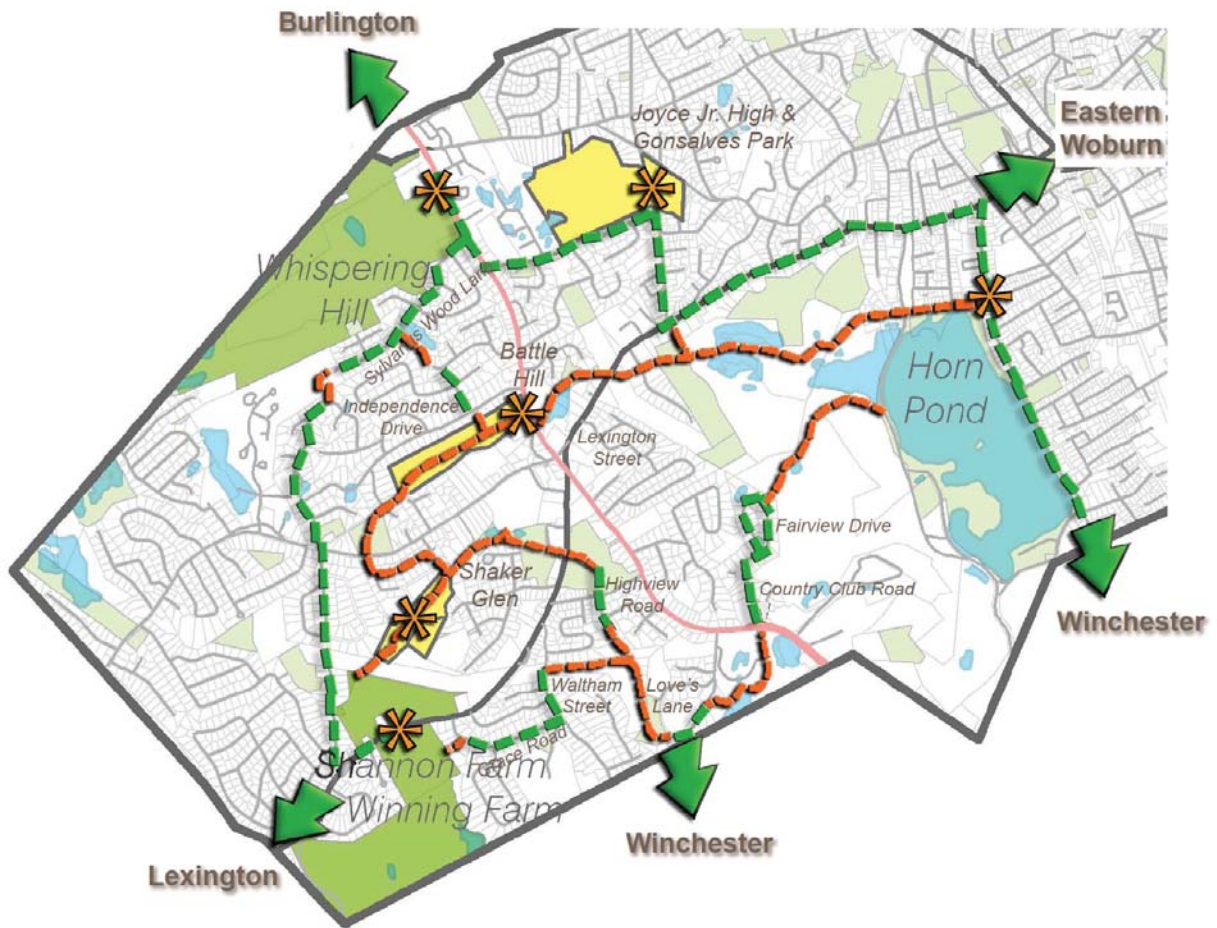
*Figure 4-7: Route 3 with the addition of a bioswale and street tree plantings*

**Recommended Potential Greenways for Woburn**

**B-3: Shannon Farm to Horn Pond**

Hiking trails proposed in the focus areas of Winning and Shannon Farm are designed to connect to the greenway plan at the northeast side of the Shannon property. (Figure 4-8) Here an easement is proposed to connect to a right-of-way to provide access to Grace Road. This proposed path would pass next to a wetland through a small wooded area.



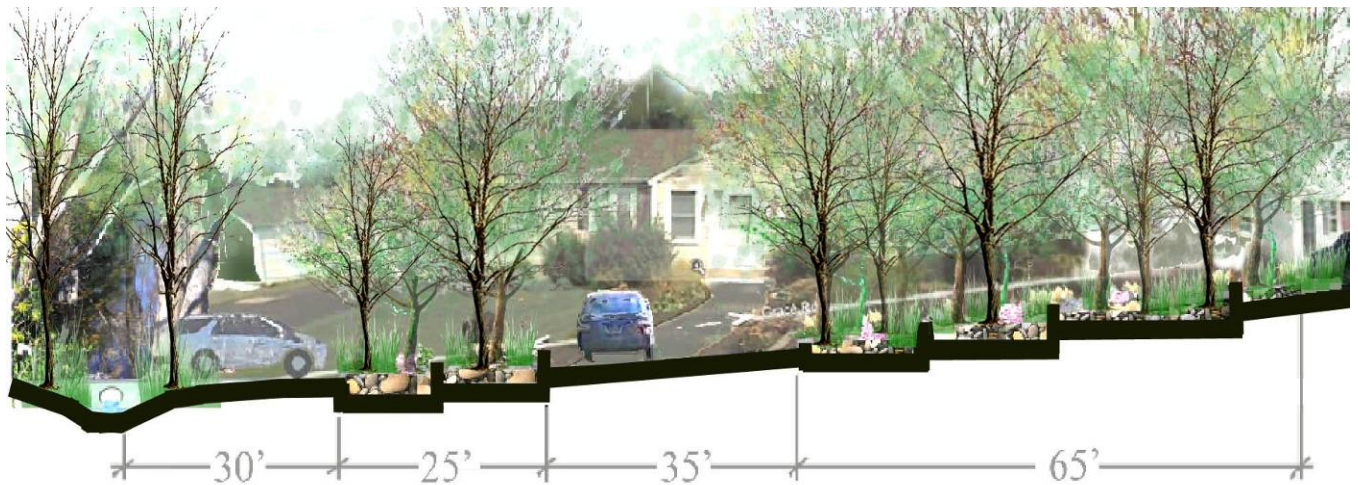


*Figure 4-8: Proposed greenway from Winning & Shannon Farms to Whispering Hill, via Battle Hill conservation area*

Grace Road is proposed to be re-designed as a green street (Figures 4-9 and 4-10), at least in this portion, meeting up with Waltham Street, which is also a proposed green street. Waltham Street extends into neighboring Winchester. At Waltham Street the greenway would meet up with the power line, where we propose parking on Waltham Street under agreement with the power company. It would be a small, street side lot, for 6 cars. There the trail on the power lines would lead up into the area known as Shaker Hill.



*Figure 4-9: A cross section of Grace Road as a green street, including bioswales and tree plantings*



*Figure 4-10: Grace Road with weirs to slow down water and promote infiltration*

At this point the greenway presents a connection north to Reeves Elementary School via a city owned right-of-way. This would give the school opportunities to link both to the conservation area of Winning Farm and the Horn Pond recreation area through a safe path of beautiful

greenway travel. It would also be an opportunity for Woburn to promote Safe Routes to School, which could bring grant money to the town to help support the proposed greenway. The main greenway connection turns south at this point, going through a wooded area via a city right of way and connecting with Love's Lane Conservation area.

The greenway is proposed to link the dead end of Love's Lane which borders the Sucker Brook Conservation Area. A trail off of Love's Lane leads into Sucker Brook. This conservation area has residential development along both sides, both condominiums in Woburn and bordering Winchester. This proximity with the neighboring town presents opportunity for residents of this area, who would live on both sides of this greenway trail to also enjoy the greenway.

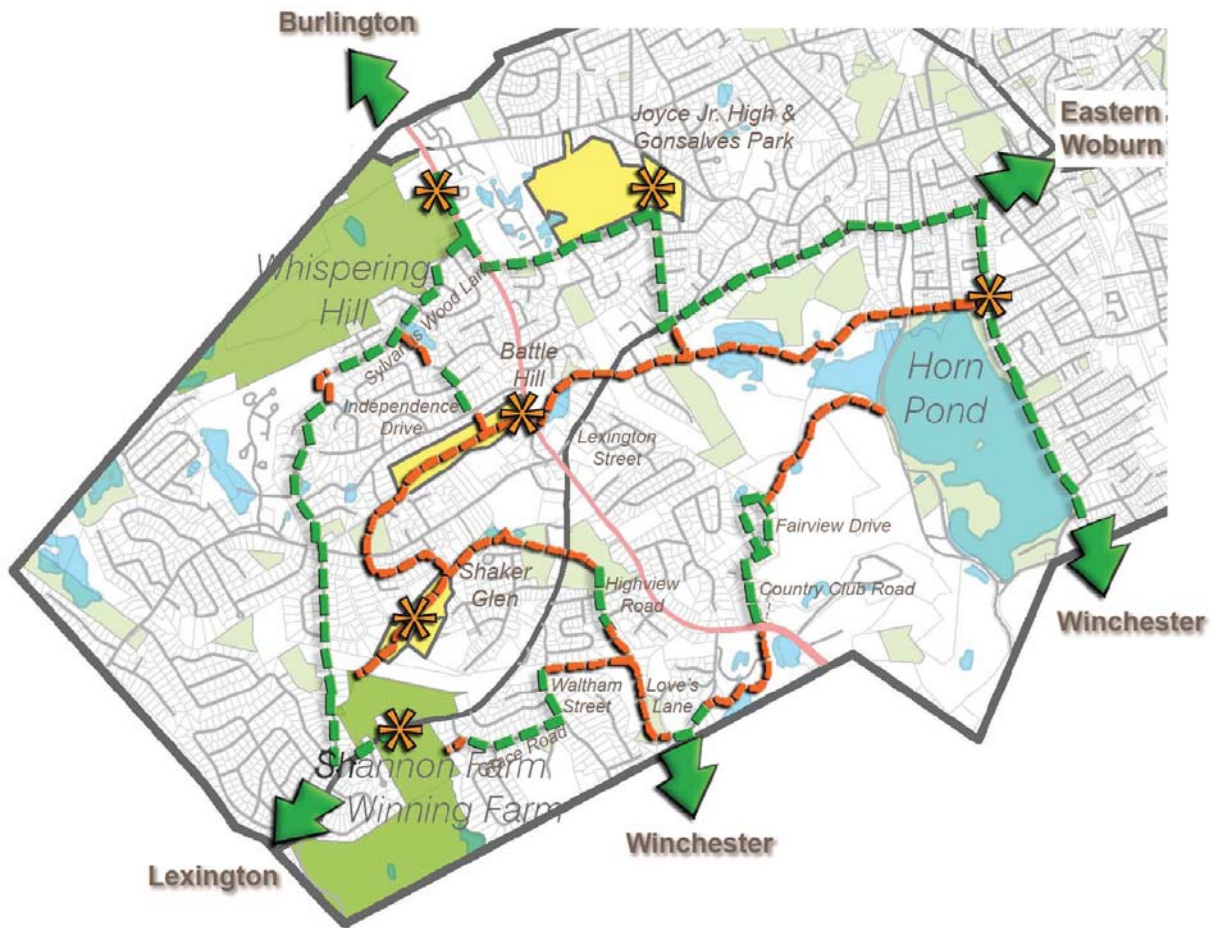
After passing through Sucker Brook and moving around a wetland, the greenway crosses Route 3 at a traffic light with crosswalk. Route 3 is a busy main road through Woburn and this spot was chosen due to the fact that there is a traffic light with cross walk that will ensure a safe crossing for anyone wanting to extend the greenway journey eastward to Horn Pond.

Crossing Route 3 connects the greenway to Country Club Road. The Woburn Country Club, which is part of conservation land, would be presented with a great opportunity to add a green street as part of their already conservation land property. Moving onto Ledgewood Road leads through another green street to Fairway Drive. Fairway Drive is a newer residential development with great potential for incorporating green practices. From Fairway Drive, pedestrians would be able to enter the Horn Pond Conservation Area and meet up with the trails. There is potential with an understanding with lot owners to provide a few parking spaces on this land, or at least a public access point through a beautiful neighborhood.

### **Recommended Potential Greenways for Woburn**

#### **B-4: Shannon Farm to Whispering Hill**

The proposed greenway trail system would extend from Winning Farm into the Shannon Farm property. (*Figure 4-11*) This trail system connects directly with the Shaker Glen Conservation Area. Shaker Glen is a valued part of the Woburn community that is underused due to lack of public access points. It has a loop trail which enters the Glen at a spot with two parking spaces and a kiosk on Summit Street.



*Figure 4-11: Proposed greenway from Winning & Shannon Farms to Horn Pond via the Shaker Glen conservation area*

At the northern border of the Shannon property we propose that the farms' trail system connect with the Shaker Glen trail system, which would need to be expanded at its southernmost end. The trail would continue through the Glen then on a proposed extension of the trail on the northernmost end. We propose the trail come out of the Shaker Glen conservation area near the intersection of Route 3 and Lexington Street. Here lies an abandoned overgrown parking lot and foundation remains of an old building. The space is full of trash debris and invasive species and though hidden by office buildings from the view of the intersection, it needs to be cleaned up. This might be a possible project for a boy scout troop. We propose this parking lot be rejuvenated as primary parking for Shaker Glen. It would provide a few dozen parking spaces for access to the Glen and Battle Road Woodlands Area, which is also in close proximity. This area is adjacent to a wetland area and would be a great opportunity for Woburn to practice some alternative parking strategies that would be more environmentally sensitive than typical parking lots. There are parking lots located adjacent to this abandoned lot, but for private business use.

From the proposed Shaker Glen parking lot, pedestrians can continue onto Russell Street going west to meet up with a pedestrian right-of-way that travels into the Battle Road Woodlands Area. Battle Road is a historic cultural asset of Woburn but is currently under used due to limited public access and parking areas. The pedestrian right-of-way would meet up with the trails in Battle Road, leading to a public entrance to Battle Road on Reeve Road. A short jaunt across the street would bring the pedestrian to Independence Drive, which turns into Patriot Road. At the end of the cul-de-sac of Patriot Road, we propose an easement between two houses to provide a trail around an existing pond and wetland area. On the other side of the pond the greenway would meet up with Sylvanus Wood Lane, a proposed green street, and lead to a proposed parking lot at Whispering Hill completing the greenway connection.

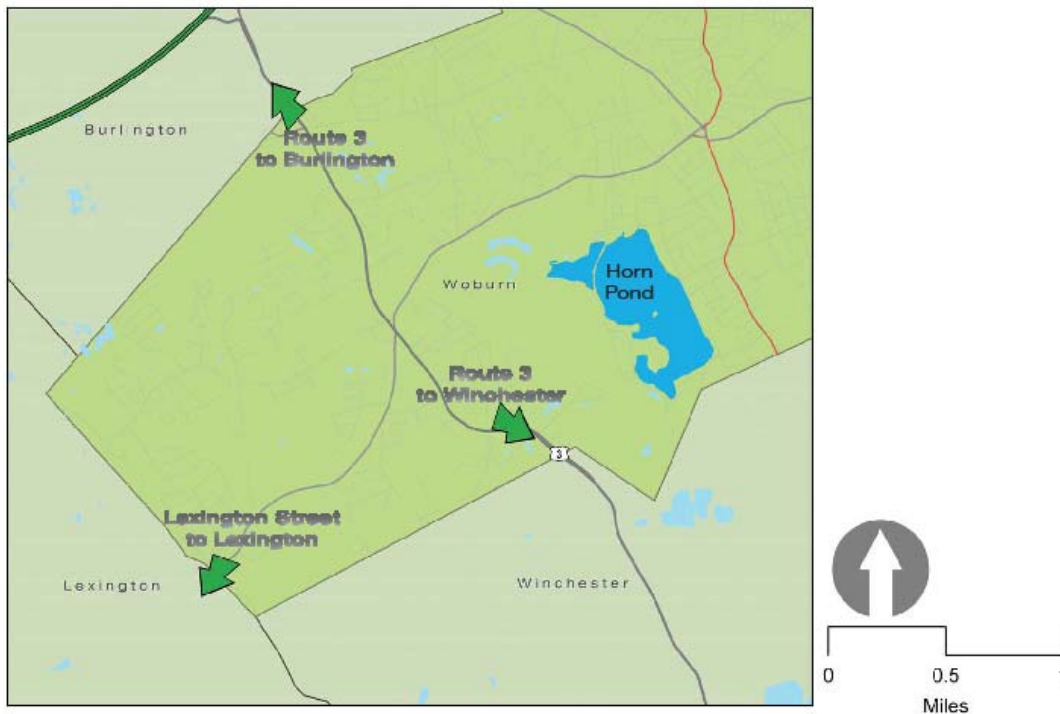
### **B-5 Connections Between Western & Eastern Woburn**

Horn Pond is a well positioned node to connect the Western Woburn greenway system to a network established in the eastern portion of the city. Gonsalves Park and Joyce Jr. High also provide natural nodes of connection for Eastern Woburn using green streets and Safe Routes to School.

### **B-6 Connections Between Woburn & Surrounding Towns**

Green streets in Woburn not only benefit the citizens of Woburn, but can also demonstrate the benefits of a greenway system to people passing through Woburn. Key greenway connections include Route 3 to Burlington, Route 3 to Winchester, and Lexington Street to Lexington.

*(Figure 4-12)*



**Green Connections to the Greater Woburn Area**

*Figure 4-12: Potential green connections between Woburn and neighboring towns*

## **CHAPTER 5: CONCLUSION, RECOMMENDATIONS, AND POTENTIAL FUNDING SOURCES**

### **A. An Opportunity to Lead**

The city of Woburn has an unprecedented opportunity to be a leader in the region by making a positive difference in the quality of life of its residents, adding to important conservation lands and habitat necessary to sustain and support wildlife, and protecting the clean water on which the entire city depends.

Woburn's leadership role will be based on its demonstrated commitment to the following:

- informed land use decisions - investing in the future
- protection of conservation land;
- protection of water resources;
- smart development practices;
- implementation of sustainable green parking solutions; and
- creation of a local greenway system.

The goal of this study is to aid the city in making important decisions about particular land acquisitions (Whispering Hill now, Shannon Farm possibly in the future) and maximizing the benefits presented by this opportunity. Another goal of the study is to identify appropriate uses of the recently acquired portion of Winning farm, as part of an innovative development agreement. It is important to note that the recommendations contained in this report were framed by the 2004 Open Space and Recreation Plan (see Appendix A for the Executive Summary of the Plan):

**The primary goal of this open space and recreation plan is to protect the natural resources of the City and to ensure that sufficient recreational opportunities are available to all of Woburn's citizens.**

It is also our intention that the contents of the study will aid the city in following the primary recommendation of the Open Space Plan:

**To apply carefully considered criteria to future land acquisitions to ensure that all land acquisitions serve one or more of the goals and objectives of the plan.**

Every concept presented in this report supports the above goal and recommendation. We hope that this work can serve a roadmap that could help to guide the city in the immediate and long-term future. We believe that it is possible for Woburn to emerge as a model city for the Boston Metropolitan area in the next 10 years, one that other mid-sized communities can look to for inspiration, as well as practical and realistic strategies to reach the goal of becoming a "Green City."

## **1. The Conceptual Master Plans**

As shown in this report, a combined Whispering Hill/Mary Cummings Park (approximately 300 acres total) would be the 10<sup>th</sup> largest public park space within Boston's Route 128 loop. The concepts in the Master Plan for Whispering Hill were guided by the property's status as a "Priority Habitat of Rare Species," as designated by the Mass. National Heritage and Endangered Species Program (NHESP.) There are statewide restrictions for land use in these areas, and any proposed development must be reviewed by the NHESP to ensure it is compliant with the Massachusetts Endangered Species Act regulations. This important designation mandates a minimum-impact approach to land use, and as such, we proposed a trail system throughout the property, as well as a recreational field and access point on the eastern edge, where the NHESP designation ends.

We also presented an optional concept for a natural cemetery for cremated remains. While we understand that this type of cemetery may not meet all of the needs of the city, and may not be allowed by certain funding sources, our goal was to introduce a new way of thinking about memorializing the deceased that might enhance the creative process the city must undertake to explore alternative means of meeting the city's need for additional cemetery space.

At Winning Farm, the city's management of the approval process for new development could be shared as a model for other city planners, many of whom are facing the challenge of conserving open space while undertaking necessary residential and commercial development projects. Here again, the focus of the concepts presented for the city's 30 acres on the Winning Farm site represents a minimum-impact approach that will greatly enhance the quality of life for residents with a new trail system that respects and protects the natural resources of the site, including the two wetlands.

Should the city have the opportunity in the future to exercise its right of first refusal to acquire the Shannon Farm property, additional opportunities for smart land use could help the city meet multiple goals outlined in its Open Space Plan and voiced by community members – cemetery space, recreational fields, and a variety of agricultural uses. The Shannon Farm parcel could also provide very useful and important linkage with Winning Farm to the south and Shaker Glen to the north, representing a significant node in a future greenway system for western Woburn.

## **2. Greenways**

Finally, the opportunity to create a network of greenways between Winning/Shannon Farms and Whispering Hill/Mary Cummings Park and Horn Pond is a chance for the city to be at the forefront of the greenway movement that is gaining strength internationally. As the functions and benefits of greenways become more understood, accepted, and implemented, more and more cities will undertake to create greenway systems. Some of the functions and benefits are:

- supporting active and passive recreation;
- providing alternative, safe transportation (bicycles and walkways);
- environmental education;
- wildlife habitat and movement corridors;
- stormwater and groundwater management;
- climate modification and carbon storage;
- community gardens; and
- aesthetic value.

Woburn's commitment to providing these benefits to its citizens will no doubt positively influence the actions of individuals at multiple scales – in their homes, in their community, and potentially as advocates in a larger regional system. Educating and exposing people to these principles is a critical component of widespread implementation and needed changes in land use policies.

### **3. A Historical Note**

Finally, it cannot be overemphasized that the city must continue to exercise great care in protecting its water resources. The tragic history of the contamination of the G and H wells by the W. R. Grace Company in the 1970s was a turning point for the city. Few cities have experienced the effects of a company's blatant disregard of its responsibility to citizens and the environment to the extent that Woburn has.

Today, despite the continued closure of those two wells, the city still relies on its own resources (the Horn Pond Reservoir) for a majority of its water supply. The ability of Woburn to meet its water needs locally is admirable but must be reinforced by all future land use decisions. The quality of its water is of primary importance. Woburn has moved beyond this troubled time in its history, but it will not be forgotten, especially by those who personally experienced the worst of this tragedy.

### **B. Recommendations**

As a result of this research process, including first-hand observation, site analysis and assessment using Massachusetts GIS information, synthesis of community input, and other methods, we have presented here a number of new ideas for the city of Woburn to use as it considers the future of its open spaces, including the ongoing acquisition of properties as they become available.

As a next step, we offer recommendations for the city to implement the suggestions contained in this report for this valuable space, as well as to maintain the open spaces for the maximum benefit to residents. Woburn is fortunate to have a number of active community and volunteer groups with a demonstrated dedication to and enthusiasm for protecting the city's natural resources. These groups will form the foundation, along with the continued commitment of city officials, to make Woburn a city in which the recreational needs and conservation of resources are always a priority.



- Engage the help and expertise of the Woburn Residents Environmental Network (WREN) and Friends of Mary Cummings Park in trail design and environmental education.
- Work with other groups to establish a process for ongoing maintenance of the trail systems – boy and girl scouts, school or church community service projects , and local resident stewards with a specific interest in trails (hiking clubs, etc.)
- Create new advocacy and volunteer groups such as the “Friends of Whispering Hill” and “Friends of Winning Farm” to coordinate efforts.
- Prioritize public streets to be converted to “Green Streets.” Consider all three types of streets – arterial, connector, and residential. Seek funding from Mass Highways and US EPA.
- Evaluate the potential for private streets to become part of the greenway by discussion options and regulations with landowners and property abutters.
- Create a citizen committee to research and help the city apply for funding to implement these recommendations.

It is clear that this opportunity may be the last chance Woburn has to acquire and protect some of its valued environmental and historical assets. The benefits would reach far beyond the western portion of the city to include all of the residents of Woburn who would have access to a greenway system that included, complemented and augmented the current “jewel” of the city’s protected open space necklace, Horn Pond. It would also benefit residents of neighboring towns and potentially the entire region. It would give Woburn the opportunity to be a leader in the acquisition and management of open space in ways that would respect and protect its watershed and the wildlife that depend on the habitat within it.

It is our hope and belief that the city will not let this opportunity go unrealized, but that it will galvanize the strength of the entire community to make it happen.

## **C. Potential Funding Sources**

Following is a list of potential funding resources for the City of Woburn. We have also included ideas for creative funding mechanisms such as volunteer efforts and partnerships with local organizations and schools, including vocational schools, colleges, and universities

Implementing the proposed plans will require a combination of many funding sources—general City funds, Community Preservation Act (CPA) funds, grant awards, volunteer efforts, and private donations—and financial strategies yet to be explored.

The Community Preservation Act (CPA) - The City of Woburn may reconsider adopting the CPA. The CPA is a statewide enabling legislation that allows cities and towns to exercise control over local planning decisions. The Community Preservation Act provides funding sources which can be used to address three core community concerns:

- Acquisition and preservation of open space
- Creation and support of affordable housing
- Acquisition and preservation of historic buildings and landscapes

(Source: Massachusetts Community Preservation Act.  
<<http://www.communitypreservation.org/index.cfm>>.)

### **Parks**

#### SCA Mass Parks AmeriCorps

SCA Mass Parks AmeriCorps is a residential community of emerging leaders who devote 5 or 10 months to full time conservation service. This program is a partnership between the Student Conservation Association, the Massachusetts Department of Conservation and Recreation and the Massachusetts Service Alliance/Corporation for National and Community Service. SCA crews tackle a wide variety of projects including trail construction and maintenance, habitat restoration, bridge construction, renovation of historic structures, invasive species removal, and environmental education, with an emphasis on trail projects.

(Source: Massachusetts Department of Conservation and Recreation.  
<http://www.mass.gov/dcr/>)

#### The Trust for Public Land (TPL)

TPL helps transform newly acquired or existing sites into parks, playgrounds, or restored natural areas. (Source: The Trust for Public Land [www.tpl.org](http://www.tpl.org).)

### **Conservation**

#### US Land and Water Conservation Fund

<http://www.nps.gov/lwcf/>

Conservation Restrictions (Source: M.G.L. c. 184.  
<<http://www.mass.gov/legis/laws/mgl/184-31.htm>>.)

### Federal Affairs

The Trust for Public Land's Federal Affairs department promotes federal land conservation policy and funding partnerships with a wide range of interested parties, including congressional and federal agency staff, the White House, state and local conservation organizations and government officials, national conservation groups and private landowners. Federal Affairs staff work with these partners to ensure that federal policies, programs, and funding support land conservation at the federal, state, and local levels. (Source: The Trust for Public Land [www.tpl.org](http://www.tpl.org).)

### Conservation Finance

The Trust for Public Land's Conservation Finance team advises state and local governments on conservation funding and helps to design and adopt measures that dedicate new public funds for parks and land conservation. (Source: The Trust for Public Land [www.tpl.org](http://www.tpl.org).)

## **Agriculture**

### Farm and Ranch Lands Protection Program

The Farm and Ranch Lands Protection Program (FRPP) provides matching grants to states, local, tribal and non-profit entities for the purchase of agricultural conservation easements. The program is administered by the USDA Natural Resources Conservation Service (NRCS). (Source: <http://www.nrcs.usda.gov/>)

The following agricultural funding opportunities were obtained through Massachusetts Department of Agricultural Resources <<http://www.mass.gov/agr/programs/index.htm>>.

- Agriculture Business Training Program (ABTP) – This program develops flexible business plans through training and technical assistance.
- Massachusetts Agricultural Energy Grant Program (Ag-Energy) - is a competitive program that funds agricultural energy projects in an effort to improve energy efficiency and to facilitate adoption of alternative clean energy technologies by Massachusetts farms.
- Massachusetts Agricultural Environmental Enhancement Program (AEEP) - provides funding to agricultural operations in Massachusetts for the mitigation and/or prevention of impacts on natural resources that may result from agricultural practices. While primarily a water quality program, AEEP will also fund practices that promote energy efficiency, water conservation, and reduce greenhouse gas emissions.
- Agricultural Preservation Restriction Program (APR) - This is a voluntary program which is intended to offer a non-development alternative to farmers and other owners of "prime" and "state important" agricultural land who are faced with a decision regarding future use and disposition of their farms.

- APR Improvement Program (AIP) – AIP provides technical assistance and business planning to improve farm productivity with the goal of enhancing the significance of APR farm operations and their contribution to the state’s agricultural industry.
- Farm Viability Enhancement Program - The Program offers farmers environmental, technical and business planning assistance to expand, upgrade and modernize their existing operations.

## **Cemeteries**

### Department of Veterans Affairs

This program helps states to provide gravesites for Veterans in those areas where Veterans Affairs national cemeteries do not fully satisfy their burial needs. (Source: [www.cem.va.gov/scg/scgpinfo.asp](http://www.cem.va.gov/scg/scgpinfo.asp))

## **Habitat**

All information obtained through Massachusetts Division of Fisheries and Wildlife, Habitat Grants <[http://www.mass.gov/dfwele/dfw/habitat/habitat\\_home.htm](http://www.mass.gov/dfwele/dfw/habitat/habitat_home.htm)>.

- Landowner Incentive Program (LIP) - The MassWildlife Landowner Incentive Program is a partnership that provides private landowners interested in developing and maintaining wildlife habitat on their property with financial and technical assistance.
- The Ecological Restoration Program – This Program focuses on habitat restoration at sites of exceptional ecological significance identified from Natural Heritage's database that are on public lands under permanent conservation protection.
- Forest Stewardship - Mass. Dept of Conservation and Recreation -- This educational non-regulatory program is designed to help private and public landowners protect the inherent ecosystem values of their forest.
- Wildlife Habitat Incentive Program—USDA Natural Resources Conservation Service (NRCS) -- The Wildlife Habitat Incentives Program (WHIP) is a voluntary program that provides technical and financial assistance to landowners who want to improve fish and wildlife habitat or restore natural ecosystems on their land. The NRCS will pay up to 75 percent of the cost of establishing and maintaining conservation practices that are necessary for enhancing/improving wildlife habitat and restoring natural ecosystems. Agreements are from 5 to 10 years in duration.

## **Trails**

### Recreational Trails Grants

The Recreational Trails Program provides funding support for a variety of trail protection, construction and stewardship projects throughout Massachusetts. This national program makes funds available to states to develop and maintain recreational trails and trail-related facilities for non-motorized and motorized recreational trail uses. (Source: Massachusetts Department of Conservation and Recreation < <http://www.mass.gov/dcr/stewardship/greenway/regionalGrants.htm>>.)

## **Trees**

All information obtained from the Massachusetts Department of Conservation and Recreation.

- MASS ReLeaf Grant Program  
Mass ReLeaf is a trust fund for public tree planting projects in Massachusetts.
- Urban and Community Forestry Challenge Grants With support from the USDA Forest Service, the Massachusetts Urban and Community Forestry Program offers an Urban and Community Forestry Challenge Grant. (Mass ReLeaf, Planning and Education, and Heritage Grants).
- Forest Stewardship Planning Grants for Private and Town Forestlands This program seeks to encourage landowners to practice long-term guardianship through the development of a management plan for their woodlands.
- Urban Forest Planning and Education Grants: The goal of the Urban Forestry program is to assist communities and nonprofit groups in building support for the long-term protection and management of community trees and forests.
- Heritage Tree Care Grant Program  
This federally funded program offers competitive grants to communities with advanced tree care programs wishing to protect and enhance large or unique "heritage trees" located on public property or easements. In order to be designated a "heritage tree," the tree must have a diameter greater than 32 inches, be designated a champion in size for its species in Massachusetts, or have documented historic significance to the community or state.
- Community Development Block Grants (Source: United States Department of Commerce (USDOC))

## **Waterways**

### Rivers and Harbors Grant Program

A statewide program of matching grants from DCR's Office of Waterways to towns and municipalities for design and construction to address problems on coastal and inland waterways, lakes and great ponds.

(Source: Massachusetts Department of Conservation and Recreation)

## **Children**

### National Center for Safe Routes to School

This program provides funding and assists communities in developing safe routes to enable and encourage more children to safely walk and bicycle to school. (Source: <http://www.saferoutesinfo.org/>)

## **Possible Volunteer Partnerships**

### Area organizations

- Boys and Girls Club
- The Mission of Deeds
- Woburn Council for Social Concern
- Boy Scouts of America

### Area vocational schools, universities, and colleges

- Woburn Electrical School of Code and Theory, Woburn
- ITT Technical, Woburn
- Northeastern University, Suburban Campus, Woburn
- Woburn Public Schools

## **APPENDICES**

- A. Woburn Open Space and Recreation Plan, Summary and Introduction
- B. Green Streets and Complete Streets
- C. Green Infrastructure, Seattle 2100
- D. Urban Greenways, Massachusetts Greenway Plans
- E. Mass BIOMAP and Living Waters
- F. Storm Water Retrofits
- G. Accessibility
- H. Safe Routes to School
- I. Recreational Trails
- J. Community Agriculture
- K. Sustainable Community Charettes
- L. Massachusetts Environmental Laws

## APPENDIX A

# City of Woburn, Massachusetts Open Space and Recreation Plan

June 23, 2004

Funded under Executive Order 418 by the Massachusetts Department of Housing and Community Development, Massachusetts Department of Economic Development, Executive Office of Transportation and Construction, and the Executive Office of Environmental Affairs.



## **SECTION I: PLAN SUMMARY**

This is an update of the 1999 City of Woburn Open Space and Recreation Plan. The major goals and action recommendations from that plan have been reaffirmed and are still valid today.

### ***A. Goals for the Open Space and Recreation Plan***

The primary goal of this open space and recreation plan is to protect the natural resources of the City and to ensure that sufficient recreational opportunities are available to all of Woburn's citizens.

The major goals of the open space and recreation plan are:

- Provide active and passive recreational opportunities for all residents
- Protect Woburn's natural resources
- Acquire new open space lands
- Consider regional connections in open space planning efforts
- Protect cultural and historic resources
- Manage existing recreation and conservation lands for maximum benefits

### ***B. Major Recommendations***

The three key recommendations of the plan are:

- To apply carefully considered criteria to future land acquisitions to ensure that all land acquisitions serve one or more of the goals and objectives of the plan.
- To undertake management actions that will ensure a more balanced use of conservation areas to avoid overcrowding and impacts on sensitive environmental areas.
- To continue to upgrade existing parks to meet the recreational needs of all residents.

## SECTION II: INTRODUCTION

### *A. Statement of Purpose*

The purpose of this open space and recreation plan is to protect the natural resources of the City of Woburn, and to ensure that sufficient recreational opportunities are available to all of Woburn's citizens.

The protection of natural resources is critical to ensuring that sufficient water is available for the continued residential and economic growth of the community, and to providing an environment that balances development with natural areas. The provision of recreational opportunities is critical to creating a community that is a desirable place to live and work. Because there is limited land remaining and limited financial resources, this plan will ensure that wise, cost-effective decisions are made in the future.

### *B. Planning Process and Public Participation*

In 1998, the Woburn Redevelopment Authority funded the completion of a new open space and recreation plan. The City contracted with the Metropolitan Area Planning Council (MAPC) to prepare the plan. The plan was completed in 1999 and covered the time period 1999 - 2004. Because the state requires that communities update their open space and recreation plans every five years, the City decided to utilize funds available under Executive Order 418 to update the plan. The City again contracted with MAPC to update the plan.

Public participation activities began with a visioning session on October 9, 2002 which included a breakout session devoted to open space and natural resources. This was followed by an open space/natural resources forum on May 21, 2003. At this forum, the participants discussed goals and identified priority parcels for protection.

## APPENDIX B

### Green Streets & Complete Streets

“**Green Streets**” is a sustainable stormwater management strategy that meets regulatory compliance and resource protection goals by using a natural systems approach to manage stormwater, reduce flows, improve water quality and enhance watershed health.

There are four types of Green Streets: Simple Green Street, Rain Garden, Stormwater Curb Extension and Stormwater Street Planter.

1. **Simple Green Street:** The street is excavated to create a vegetated area behind a reinforced curb, with curb cuts for inflow and outflow. The vegetation is a simple approach to capture and treat street runoff. (Figure 1)
2. **Rain Gardens:** A rain garden is a shallow, constructed depression that is planted with deep-rooted native plants & grasses. It is located in the landscape to receive runoff from hard surfaces such as roads, roofs, sidewalks, or driveways. Rain gardens slow down the rush of water from these hard surfaces and hold the water for a short period of time to allow it to naturally infiltrate into the ground. At a residential scale, a rain garden can be thought of as a personal water quality system because it filters the runoff from your roof and lawn and recharges the groundwater. A rain garden can also transform awkward street intersections into safe pedestrian and bicycle crossings, if there is enough space. (Figure 2)



Figure 1. Simple Green Street



Figure 2. Rain Garden

3. **Stormwater Curb Extension:** Extending into the street, stormwater curb extensions transform the curb lane into a landscape area. Curb Extensions can conveniently integrate a ramp for safe pedestrian crossing. (Figure 3)
4. **Stormwater Street Planter:** A planter between the sidewalk and the curb works well to manage stormwater in areas with limited space. They also they allow for adjacent street parking or travel. (Figure 4)



Figure 3. Stormwater Curb



Figure 4. Stormwater Street Planter

**Complete Streets** are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across a complete street. A complete street includes sidewalks, bike lanes (or side paved shoulders), special bus lanes, comfortable and accessible transit stops, frequent crossing opportunities, median islands, accessible pedestrian signals, curb extensions, and more.



Figure 5.  
Before



Figure 6.  
After

## References

Green Street Types

<http://www.crwa.org/projects/ESUD/GreenStreet.pdf>

LOW-DENSITY RESIDENTIAL STREETS: Stormwater Curb Extensions

<http://www.flowstobay.org/documents/municipalities/sustainable%20streets/Ch%204/pg%2062-73%20Ch4.pdf>

GOOD's 'complete street' interactive graphic

<http://www.cooltownstudios.com/2009/04/09/good-features-a-complete-street-interactive-graphic>

What is Rain Garden?

[www.raingardennetwork.com](http://www.raingardennetwork.com)

Chapter 4: Design Criteria - Right-of-Way Improvements Manual

[http://www.cityofseattle.net/transportation/rowmanual/manual/4\\_2.asp](http://www.cityofseattle.net/transportation/rowmanual/manual/4_2.asp)

Chapter 6: Streetscape Design Guidelines - Right-of-Way

[http://www.seattle.gov/transportation/rowmanual/manual/6\\_2.asp](http://www.seattle.gov/transportation/rowmanual/manual/6_2.asp)

## APPENDIX C

### **Open Space Seattle 2100: Designing Seattle's Green Network for the Next Century**

“In the early days of February 2006, over 300 of Seattle’s citizens participated in the Green Futures Charrette to create a long-range vision for Seattle’s open space network. Over the course of two full days, twenty-three charrette teams composed of planners, designers, environmentalists, city officials developers, artists, and open space advocates envisioned livable, ecologically-healthy and socially-robust urban watersheds and neighborhoods for the city’s sustainable future.” (Envisioning Seattle’s Green Future, 2006, <http://www.open2100.org/>)

The ideas, observations, and recommendations of these twenty-three teams were reviewed by students and landscape architects at the University of Washington. Certain threads ran throughout many of the twenty-three reports, and those identified themes summarized in four strategies for creating a robust green infrastructure for the city. This vision begins with a scenario for 2025, but also envisions further progress and growth of this green infrastructure into the future, with scenarios for 2100 as well.

The four recommendations follow:

#### **Aggregate Open Space**

Create connections and greenways forming loops, connecting uplands to shorelines, linking backyards, and connecting to regional trails.

By *connecting* larger patches of open space with corridors, a network is created and built up throughout the city over time: a living lattice. (Figure 1 & Figure 2) This will encourage metapopulations of wildlife as well as allowing people to circulate through the network either with a destination in mind or as a loop through the city.

#### **Create Multi-functional Open Space**

Maximize the uses and benefits of every parcel. Multiple use of streets including transit, water purification, stream corridors, and recreation.

By using streets to transport and provide benefits to the community, instead of just as avenues for vehicles, quality of life for the increasing number of city residents will be improved. (Figure 3) Not only in terms of fitness and physical activity walking and biking, but also through treatment of stormwater and a reduction of the heat island effect.

#### **Redefine Transportation Corridors**

Encourage people to re-think what transportation is, how it can look, and the affect it can have on public health and recreational activities.

Part of redefining transportation corridors includes creating more green spaces and ecosystem functions in the rights of way. Other opportunities include lidding freeways, or building a structural cover over them, to create new urban spaces and weave neighborhoods back together.

### Recreate Natural Drainage to Restore Waters

Through the use of pervious surfaces, rain gardens, restored wetlands, and bioswales that clean and detain water before it enters streams, lakes, and the Puget Sound.

By slowing water, cleaning it using bio processes, and allowing it to infiltrate, groundwater aquifers will recharge. Swales improve water quality and address public health concerns by removing nonpoint pollution like nitrogen and road runoff, including heavy metals and oil.

Department of Landscape Architecture, College of Architecture and Urban Planning. "Envisioning Seattle's Green Future." University of Washington. , July 2006. Print.

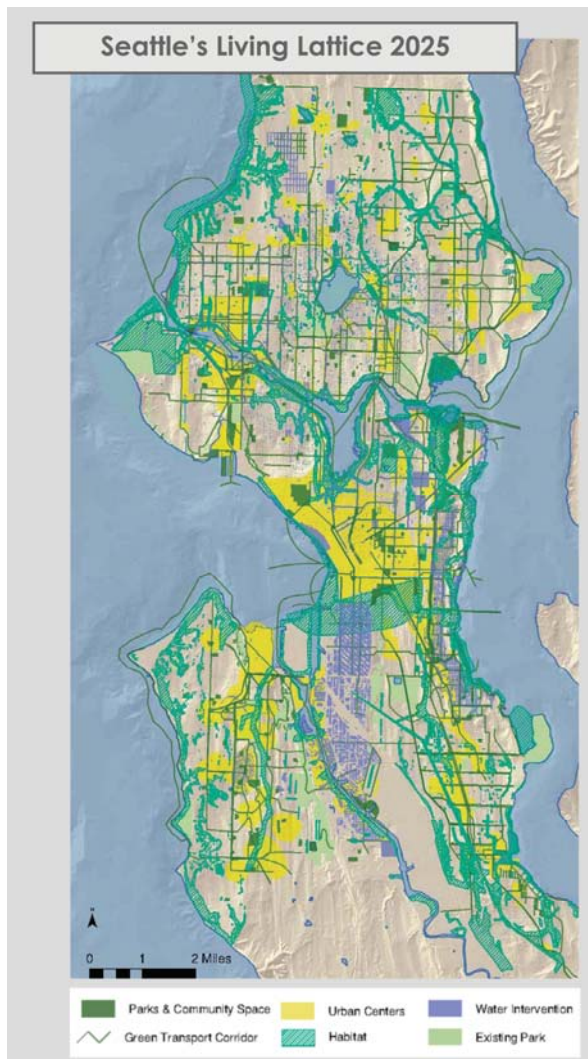


Figure 1: Seattle's green infrastructure, 2025

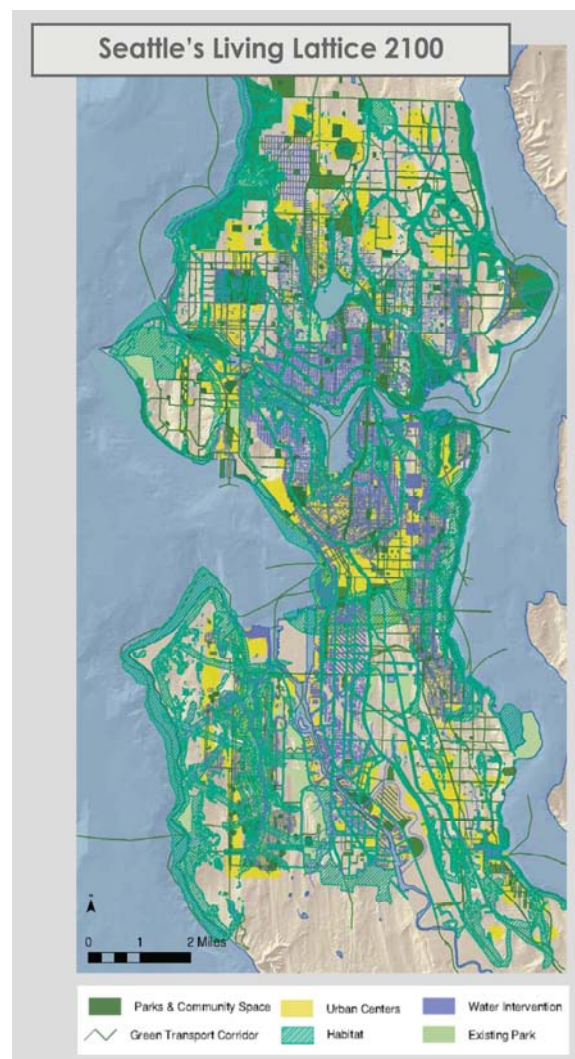


Figure 2: Seattle's green infrastructure, 2100

### Street Typology Examples

Different types of streets found within the network of transportation corridors, addressing the needs of particular city areas while providing opportunities for pedestrians, cyclists, cars, mass transit, as well as hydrologic health and heat island reduction.

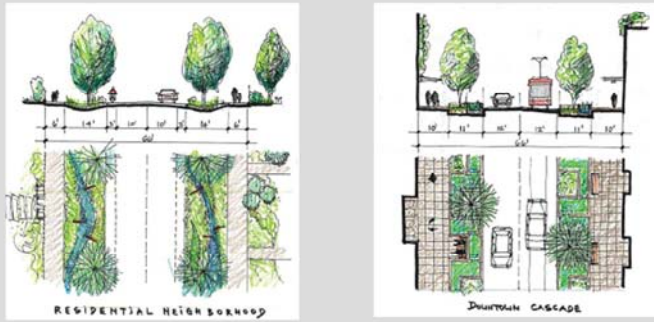


Figure 3: Re-envisioning what a street can look like, and the functions it can support



# APPENDIX D

## Urban Greenways, Massachusetts Greenway Plans

### Commonwealth Connections: A Greenway Vision for Massachusetts

#### A CALL TO ACTION

##### 7 recommendations for securing the MA Greenway Vision

- 

**1. Protect and promote long-distance trail corridors as primary spines of open space.**  
*All long distance trails are in danger of being fragmented due to unprotected segments being developed or closed to public use.*  
**Strategy:** Permanently protect these trails by outright acquisition, easements, formal agreements and thus make more accessible to the public.
- 

**2. Protect critical river corridors and their tributaries statewide.**  
*Rediscover unique sites used for recreation, environmental education and for critical habitat they provide.*  
**Strategy:** Protect land along river corridors and identify key public access sites to rivers.
- 

**3. Strategically link important natural and human activities.**  
*Greenways connect natural areas to each other and places that people live. Together these networks have far greater ecological value than the individual resource areas, and are more interesting and accessible for public recreation.*  
**Strategy:** Integrate and link ecologically significant areas.
- 

**4. Create a cross-state multi-use trail reaching from Boston to the Berkshires.**  
*Most long-distance trails in MA run north to south with only a few running east to west.*  
**Strategy:** Design trails as statewide initiative.
- 

**5. "Trail Bank" unused rail corridors and work to gain public access to utility corridors.**  
*Rail and utility corridors represent a significant opportunity for greenway and trail protection in MA.*  
**Strategy:** Conduct comprehensive inventory to identify and prioritize potential corridors, and urge no-cost transfer from MBTA.
- 

**6. Assist the greenways and trails community with technical support and funding needed to establish a coordinated greenway systems.**  
*There are hundreds of committed individuals and groups working to create and maintain greenways and trails in MA.*  
**Strategy:** Support and build on existing greenway programs, develop and utilize a full range of community tools including websites and training.
- 

**7. Increase funding for greenways and trails.**  
*This is critical for leveraging these assets and making the plan a reality.*  
**Strategy:** Establish greenway and trail bonds, work with MA Legislature, dedicate funds to complete all projects with a defined goal and designated timeline.

#### Benefits of Greenways and Trails

- Provide vital links between the built environment, natural areas, and native habitats
- Provide unique opportunity for people to learn about and enjoy the outdoors
- Link people within a community and link communities to each other
- Create a common ground for civic identity and pride



Regional Greenways and Trail Potential, from Commonwealth Connection Plan

#### Important Goals throughout Massachusetts Greenways:

The Berkshires, CT River Valley, Central MA, Southeastern MA, Metro Boston, Northeastern MA

- Create greenways linking unique natural features to protect biodiversity and to create recreational opportunities.
- Take advantage of dwindling open space and the impact on natural resources, community character and quality of life.
- Permanently protect current trails and reservation areas.
- Provide pedestrian access to areas of interest such as waterfronts and historic districts.
- Create a network of bike paths and trails throughout the region.
- Create a system of river greenways to protect natural and cultural resources, water quality and to provide recreational and education opportunities.
- Connect to the land, to the history, and to the neighbors.



Greenway Hedge



Greenway Cross Country



Greenway Bike Paths



Greenway Children Activities



Greenway Equestrian Riding

Poster by Rebekah DeCoursey  
 A greenway vision for Massachusetts  
 Department of Environmental Management

## APPENDIX E

### MASS BIOMAP AND LIVING WATER, AND (SUB) URBAN BIODIVERSITY

The Natural Heritage + Endangered Species Program (NHESP)  
Massachusetts Division of Fisheries and Wildlife

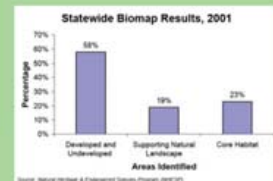
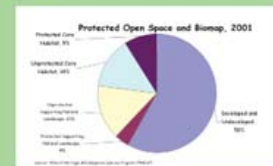
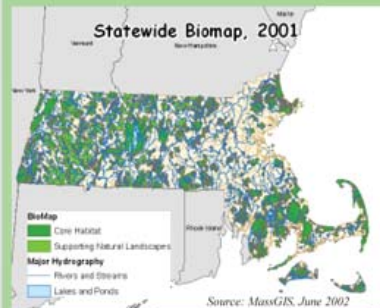
“Diversity has always characterized the biosphere to which man belonged. In living systems, complexity brings stability, and ability to withstand change. The future survival of man may well depend on the continued complexity of the biosphere.”  
- Raymond Dasmann

#### Biomap + Living Waters Projects Share a Common Goal: Protect Biodiversity

BioMap and Living Waters were created in part to help cities and towns prioritize their land protection efforts. While there are many reasons to conserve land – drinking water protection, recreation, agriculture, aesthetics, and others – BioMap and Living Waters Core Habitats are especially helpful to municipalities seeking to protect the rare species, natural communities, and overall biodiversity within their boundaries.

#### Biomap

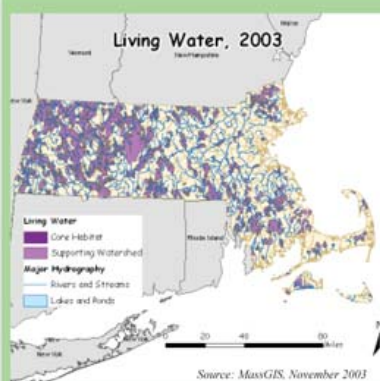
NHESP developed Biomap with the intent of identifying the areas most in need of protection of biodiversity throughout Massachusetts. Biomap focuses primarily on state-listed rare species and exemplary natural communities but also includes the full span of the State’s biodiversity. The goal of the Biomap is to promote strategic habitat over the long term for the maximum number Massachusetts’ terrestrial, wetland plants, animal species, and natural communities.



#### Living Water

NHESP’s goal of the Living Waters Project is to promote the strategic protection of freshwater biodiversity in Massachusetts.

Because changes in water flow and degradations in water quality threaten these and other freshwater species, NHESP developed the Living Waters conservation plan to identify the most critical sites for freshwater biodiversity in Massachusetts. These sites, referred to as Core Habitats, represent the rivers, streams, lakes, and ponds where we should focus proactive conservation activities in order to protect freshwater habitats.



#### Critical Supporting Watershed



The Critical Supporting Watershed identifies the more immediate portion of a Core Habitat’s watershed where conservation efforts should be targeted.

For information, please visit Natural Heritage & Endangered Species Program Website:  
<http://www.mass.gov/dfwel/dfw/nhosp/nhosp.htm>

Maureen Pollock  
Landscape Sustainability Studio, LA 554  
Professor Jack Ahern, Ph.D. FASLA, Spring 2010

## APPENDIX F

### Urban Storm Water Retrofits

Storm water is an ongoing issue with urban development, one that dictates many aspects of design. This is just as important when retrofitting a site, as it was when originally building it. The Center for Watershed Protection has published a number of recommendations with respect to retrofitting storm water systems (Hirschman 2007) . In addition, they have created a number of technical instruction manuals for specific applications. They emphasize a number of goals for storm water retrofits:

- Minimize accelerated channel erosion
- Reduce pollutant loads
- Correct past mistakes
- Protect other watershed areas
- Reduce flood peaks to normal levels
- Encourage groundwater discharge

A successful retrofit will address all of these goals in its design. In addition to normal drainage issues, these goals are particularly relevant to the Whispering Hill and Winning/Shannon Farm sites because both sites have wetlands. Although those goals may cover any number of specific actions, the Center highly recommends these five:

- Stabilize Stream Channel
- Improve aquatic habitat within urban streams
- Replacing or enhancing riparian cover
- Protect the larger resource with pollutant prevention
- Re-populate streams with native fish

Urban systems require care that is different from other systems. This populated environment creates large amounts of pollutants that run quickly through the local watersheds due to the increased amount of impervious surface. One difficulty that retrofits often encounter lies with the permitting system. Permits tend to be hard to get because Town Planners and the local environmental commission want to ensure that the new design will cause fewer problems and impacts than the old design. As a result, the permits are often more stringent and limiting. For more detailed information visit the Center for Watershed Protection's website at [www.cwb.org](http://www.cwb.org).

### References

Hirschman, D et. al. "Urban Subwatershed Restoration Manual No.3: Stormwater Retrofit Practices." Center for Watershed Protection, 2007 [www.cwb.org](http://www.cwb.org)

## Appendix G

### Land Acquisition and Accessibility for Public Open Space: Success Begins with Access

Access to conservation areas, whether park or open space, by the public, is pivotal to the success and endurance of these ecologically and socially valuable environments. Without accessibility, the purpose of a park becomes moot. Access is a rather simple process if the open space or park has road frontage, as that land is already public land that provides public access. Often, however, this is not the case. If the public property is isolated from all access routes, there are several tools that the planner or designer can use to obtain land that would provide an access point to the property.



Techniques for Land Acquisition to be used for Public Access to Parks or Open Space:

- Public Right-of-Ways
- 'Stub' or public roads
- Conservation Easements
- Partnerships with Land Owners
- Charitable Donation



Public access point, Whispering Hill



Public access point

# APPENDIX H

## SafeRoutes



The Safe Routes to School initiative is...

**A program to encourage safe, healthy trip options for students and parents to and from school**

The Goals are...

- Less traffic
- Less congestion
- Less air pollution
- Healthier lifestyles

### Safety is Primary Component

- Sidewalks and bike paths that connect homes and schools
- Child-friendly ways to cross streets (raised medians, traffic/ pedestrian signals, crossing guards)
- Slower vehicle speeds through narrowing of streets and other planning and enforcement strategies

## Why do we need it...

- Roughly 42% of students walked or bicycled to school in 1969. Today, less than 16% do.
- Travel to school can account for up to 25% of morning traffic.
- Childhood obesity rates have tripled in the last three decades.
- Asthma rates in children have doubled in the past 15 years.
- Parents report traffic danger as one of the major barriers to walking to school.
- Urban and suburban sprawl have increased the distance children must travel to school.

(Figures compiled by the CDC)

### What are the benefits?

#### For Children

- Increased independence
- Increased physical activity
- Better health
- More time in natural environment
- Improved pedestrian skills
- Increased cognitive and motor functioning

#### For the Environment

- Less carbon emissions –

*if half the students at average-sized school walked, could save over 39 tons of greenhouse gas emissions – same as abilities of 900 trees over a 10-year period*

- Measurably better air quality

#### For the Community

- Less traffic/congestion
- Improved community design
- Reduced fear of crime
- More social interaction
- Sense of ownership/common goals

### How does it work?

#### Funding

Federally-funded program at \$612 million over five years (2005-2009). Continuing Resolution passed for FY 2010.

#### Management

Each state DOT administers its own program with annual federal funding allotment.

#### Participating Schools

Schools create customized program based on needs. Nearly 6,500 schools participating.

#### Program Elements

Programs are structured around the "Five Es" – education, encouragement, engineering, enforcement, and evaluation.

#### Events

Many established SRTS programs participate in International Walk to School Day and Month with schools in 50+ countries.



## Resources

- [www.saferoutesinfo.org](http://www.saferoutesinfo.org)
- [www.walktoschool.org](http://www.walktoschool.org)
- [www.iwalktoschool.org](http://www.iwalktoschool.org)
- [www.cdc.gov/kidwalk](http://www.cdc.gov/kidwalk)
- [www.pedbikeinfo.org](http://www.pedbikeinfo.org)
- [www.commute.com/schools.shtml](http://www.commute.com/schools.shtml) (MassDOT site)

## MA Safe Routes to School Program

In Massachusetts, the program is managed by Mass DOT, MassRIDES, the Commonwealth's travel options program. Total funding from FHA was \$2.95 million (2005-2009).



Collaboration with superintendents, public officials, principals, teachers, school organizations, students, parents, community stakeholders, and neighbors

There are 271 partner schools, including Clapp-Goodyear in Woburn.

### Resources available for Massachusetts partner schools include

- Assessment of walking and bicycling routes within one mile of the school
- Educational materials and programs for students, parents, and school/community leaders
- Student giveaways
- Customized program design and implementation
- Infrastructure improvements including:
  - sidewalk improvements
  - traffic calming and speed reduction improvements
  - traffic diversion projects near schools
  - pedestrian and bicycle crossing improvements
  - secure bicycle parking

### Safe Routes in Western Woburn – Reeves Elementary

Reeves Elementary School is one of nine elementary schools in Woburn, serving 461 students. The Reeves district covers the entire western portion of the city. The school is located on Lexington St., west of Route 3.

A connection can be made to Reeves along a greenway that connects the Winning Farm site with Horn Pond. Students and parents in the Reeves district would then have access to the larger greenway system throughout the western portion of the city.



#### Massachusetts Coordinator:

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## APPENDIX I

### Recreational Trails

The ideal trail takes advantage of natural features, meets diverse users needs and expectations, requires minimal maintenance, and minimizes environmental impact to soils, wetlands, and other sensitive areas. Preventing erosion caused by water is key: keep water off the trail and follow existing contours to naturally shed water.

#### Trail Design

When planning and designing trails, consult soil survey maps (NRCS), hydrologic data, and topographic maps (USGS). Be familiar with the character of the land and its vegetative cover. Identify all prime wetlands and avoid them. Be sure to survey your potential trail site during the wettest months.

The design should strive to keep trail users on the trail in order to minimize potential damage. Users will leave the trail when it is wet, eroded or does not meet their needs and expectations.

Consider safety: keep walking trails and vehicle routes separate and design for visibility and crime prevention. Design for maximum connectivity with other trails and surrounding bicycle and pedestrian networks. Loops provide options. The majority of the system can be shared use, with a few areas designed for single use. Keep core loops near trailheads open and flowing to accommodate the widest variety of users. Outer loops can become progressively more technical and strenuous for people who want challenge.

TRAIL TYPE	SLOPE					
	0-3%	4-5%	6-8%	10-12%	12-15%	>15%
ADA	best	better	good	not suitable	not suitable	not suitable
walking/ interpretive	best	best	better	good	not suitable	not suitable
high challenge hiking	better	better	best	best	better	good
par course	good	better	best	better	good	not suitable
mountain biking	better	best	best	better	good	not suitable
cross-country skiing	good	good	good	good	good	not suitable
equestrian	good	better	best	better	good	not suitable

#### Trail Types and Recommended Grades

Identify early on the type of trail intended, potential uses and the volume of expected use. Multiple-use trails should be designed to the most limiting standard.

The maximum sustainable grade, the steepest grade the trail will attain, should be determined early on in the planning and design process. Typically this should fall between 15% and 25%, but will depend on your site's soils, rainfall, the half rule, frequency of grade reversals, user type and volume and desired challenge.

The half rule states that the trail's grade should be no greater than half the grade of the hillside that it contours along. For example, the trail grade should not exceed 8%, if traversing a hill with 16% slope. This allows water to flow across the trail and not down it.

The American with Disabilities Act (ADA) prohibits discrimination on the basis of disability, and requires that newly constructed "places of public accommodation" be readily accessible and usable by individuals with disabilities. This does not require unreasonable efforts to provide an accessible route on hiking trails in steep terrain without added surface. Where terrain allows accessible slopes, a range of surfacing choices from pavement to fine stone dust to engineered wood fiber can create levels of accessibility that consider the nature of the trail.

Accessible trail grades: 5% for any distance, 8.33% (max. of 50'); 10% (max. 30'); 12.5% (max. 10'). Maximum cross slope: 5%. Minimum clear tread width: 36"

<b>Hiking/interpretive:</b>	0-12%
<b>High challenge hiking:</b>	15%, with short steeper segments.
<b>Mountain biking:</b>	4% sustained, average of 3%. pitched grades of 8%, 5% for long runs, grades of 12% possible
<b>Cross country skiing:</b>	17% sustained, 20% maximum
<b>Equestrian:</b>	8% sustained, 15% for a maximum of 200 feet with a 4% easing-off section of at least 500 feet; avoid steeper than 15%
<b>Snowmobiling:</b>	avoid grades of greater than 25%
<b>ATV/ Motorcycle:</b>	avoid grades of greater than 30%
<b>Bicycling:</b>	0-3%, 5% as needed, 8% max.
<b>Accessible trail grades:</b>	5% for any distance, 8.33% (max. of 50'); 10% (max. 30'); 12.5% (max. 10'). Maximum cross slope: 5%. Closed to dogs and bicycles. exercise/fitness on resilient track: 0-1%

Other potential uses include overnight backpacking, competitive trail events, in-line skating, jogging or running, and 4WD vehicles.

## Surfaces

Trail surfaces to choose from are earth, stone, wood, asphalt, concrete, gravel, crusher fines, porous asphalt, pervious concrete and permeable pavers, agricultural by-products such as filbert shells, organic surfaces such as bark mulch or wood planer shavings, limestone treated surfaces, recycled plastic lumber boardwalk, engineered wood fiber, rubberized surfaces and geosynthetics.

Dual tread trails provide for multiple use with multiple pathways. These can be adjacent or parallel tread ways with different surfaces. ie: pedestrian and significant bicycle traffic can be paved to 10-12' wide, or narrower with an adjacent tread of crushed rock for walkers and runners. Runners and horses often make their own trail—but this is only advisable where steep banks and erosion are not present. Mountain bikers will create trails taking advantage of the existing topography, if the trail is not challenging enough.

## Context

Adjacent landowners can benefit from proximity to trails, or they can be annoyed by them. The narrower the trail corridor, the closer the trail to the residence and the likelihood that fencing will be required. In most cases, proximity to a recreational trail that passes through conserved land is a selling point for a property and will raise property values.

## Signage

Wildlife, habitat, botanical, or geological interpretive signs and displays on trails provide an opportunity to teach the public about the environment, natural and cultural history, help build support for preserving open space, and teach about critical habitat and biodiversity issues.

## Construction techniques

Many of the construction techniques illustrated below are designed to minimize erosion, particularly where water is present.

### Erosion and sedimentation control

**sediment barriers:** hay, straw bales or geotextile materials for silt fencing installed across the toe of a slope

**retaining walls/cribbing:** structures made of logs or rocks which provide stability and strength to the edge of the trail

**filter strip:** an area of undisturbed soil, vegetation, and leaf litter between a trail and a body of water or wetland

**stabilization:** establishing vegetation on disturbed or erodible areas by sowing seed, planting, and/or mulching

appropriate temporary spring seeding species mixtures for Massachusetts: Creeping Red Fescue, Annual Ryegrass, Winter Rye

## Drainage

outsloping: trail surface is sloped in same direction as hill slope

insloping: trail surface sloped into the direction of the rise.

**swales/dips/berms:** depressions constructed across a slope with earthen berms

**water bars:** rock, earthen or log barrier or excavated channel angled across a trail to divert runoff. Some consider water bars to be unsustainable and recommend grade reversals and grade dips instead.

**grade reversals (or rolling grade):** reverse grade often (every 20-50 feet) to reduce the watershed, and prevent water from collecting and flowing down the trail.



**deflectors:** rubber belting fastened to treated timbers which are placed in the ground to deflect water off a trail (suitable for heavily traveled trails with motorized use or roadways or trail corridors where water runoff could cause serious erosion)

**culverts:** metal, plastic, cement or wood pipe placed under a trail to permit crossing a stream. (conventional, open top culverts, box culverts)

## Water Crossings

**stepping stones:** in low wet these minimize destruction by users attempting to avoid them; for crossing shallow streams with light to moderate flow

**fords:** low water stream crossing on stream bed at same grade as trail. Designed to allow normal flow, and to be covered by seasonal floods. Should be employed where streambed is hard, unless constructed of concrete bars, or as last resort due to water quality impact.

## Bridges

**wet soil crossings:** avoid whenever possible!

**stepping stones:** any material laid on trail which minimizes compaction of soil, prevents erosion, and provides dry surface for users

**corduroy:** logs or other material placed perpendicular to trail to provide dry crossing

**puncheon:** walkway constructed of logs to provide dry crossing on fragile, wet terrain

**boardwalks:** a fixed planked structure usually built on pilings, piers or footings. Often used for interpretive facilities in habitat areas such wetlands. Can widen for seating and observation areas

**crowns and ditches:** raised section of trail with side trenches to improve drainage in wet areas

**paved surfaces** may require infiltration trenches or bioswales to the side

**Porous asphalt**, if properly maintained, minimizes puddles and potential hydroplaning and infiltrates stormwater. Porous asphalt results in a rougher surface (not preferred by rollerbladers or skateboarders). Porous asphalt is not recommended for sites that flood or are likely to receive large amounts of seed.

**Removeable bollards** prevent unauthorized vehicular access to off-street trails, warn trail users of vehicle crossings and slow them down, and identify the trail or its cross-streets. They are placed in the center of the trail and locked in place.

References:

[www.americantrails.org](http://www.americantrails.org)

[www.appalachiantrail.org](http://www.appalachiantrail.org)

[www.nhtrails.org](http://www.nhtrails.org)

[www.PortlandParks.org](http://www.PortlandParks.org)

[www.outdoors.org](http://www.outdoors.org)

## APPENDIX J

### Community Agriculture: Viet Village Urban Farm, New Orleans, LA

Viet Village Urban Farm is located in New Orleans East, one of the most damaged areas of the city during hurricane Katrina. It is an effort to reestablish the tradition of local farming in this community. It was designed by Mossop + Michaels in collaboration with the Tulane City Center and won the 2008 ASLA Analysis and Planning Award of Excellence. It provides a great demonstration of the integration of community agriculture, sustainable design, and cultural ideas. It was created as a community resource and economic catalyst for the community.

One of the first activities of the early Vietnamese immigrants in New Orleans was to establish gardens to grow the traditional fruits and vegetables that were not available locally. Prior to hurricane Katrina, over 30 acres of fragmented portions of land were being farmed within the community. There was a well-established tradition of informal markets used to sell produce.

Engaging the community was an important aspect of the project. The community sees this project as the main component for the rebuilding efforts in the local area. Through a series of community meetings, a set of goals for how the project is developed were established. (ASLA, 2008) These goals were:

- Establish a Certified Organic farming practice that includes integrated pest management, composting, crop rotation, and cover cropping among other organic practices
- Become a model for low-tech sustainable site development in the New Orleans area through the use of bio-filtration of water resources and alternative energy sources such as wind, and passive and active solar power
- Establish relationships with area restaurants and grocery stores to price locally grown produce as part of the localvore food movement
- Create an economic and cultural resource for the community
- Create a cultural resource for Vietnamese-Americans along the Gulf Coast

The 28-acre farm will be a combination of community garden plots, larger commercial plots (providing food for local restaurants and grocery stores), and a livestock area (for raising chickens and goats in the traditional Vietnamese way). A proposed market will provide a location for the farmers to sell their crops while also providing a community space for the Vietnamese community regionally.

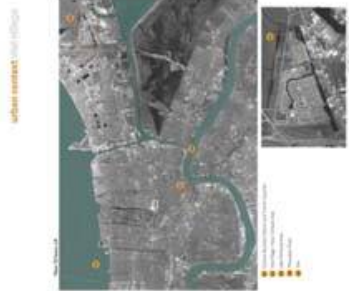
In the design of the farm, sustainability is applied both culturally and environmentally. The agricultural production is strictly organic. The hydrology is managed on site. The site is designed as a series of sub-watersheds. Water is collected in a series of bioswales and ultimately into a central reservoir that is distributed to the farm for irrigation.



site plan viet village

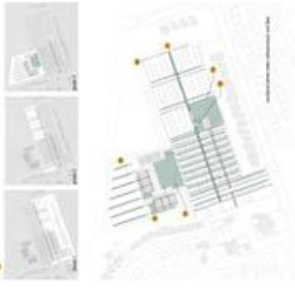
- 1. Community Center
- 2. Community Garden
- 3. Community Market
- 4. Community Workshop
- 5. Community Office
- 6. Community Library
- 7. Community Hall
- 8. Community Plaza
- 9. Community Park
- 10. Community Street
- 11. Community Alley
- 12. Community Courtyard
- 13. Community Terrace
- 14. Community Fountain

The site plan shows the layout of the Viet Village community center, which is a new center of the community. The plan includes a community center, community garden, community market, community workshop, community office, community library, community hall, community plaza, community park, community street, community alley, community courtyard, community terrace, and community fountain.



urban context viet village

- 1. Community Center
- 2. Community Garden
- 3. Community Market
- 4. Community Workshop
- 5. Community Office
- 6. Community Library
- 7. Community Hall
- 8. Community Plaza
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urban context viet village

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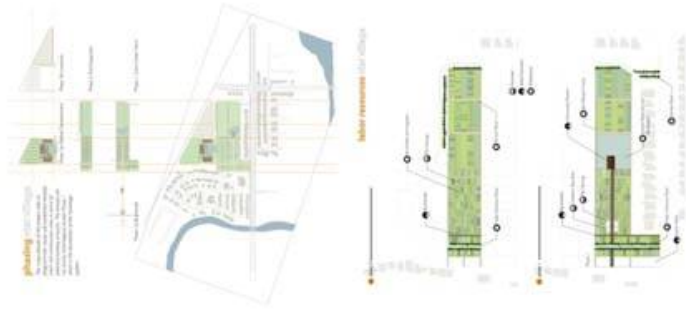
Program Description

- 1. Community Center
- 2. Community Garden
- 3. Community Market
- 4. Community Workshop
- 5. Community Office
- 6. Community Library
- 7. Community Hall
- 8. Community Plaza
- 9. Community Park
- 10. Community Street
- 11. Community Alley
- 12. Community Courtyard
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- 14. Community Fountain



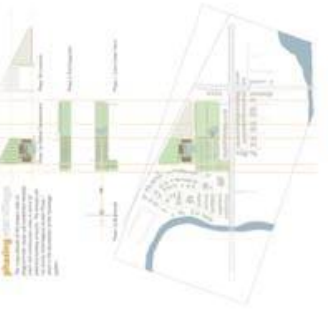
program layout viet village

Community Center  
Community Garden  
Community Market  
Community Workshop  
Community Office  
Community Library  
Community Hall  
Community Plaza  
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Community Street  
Community Alley  
Community Courtyard  
Community Terrace  
Community Fountain



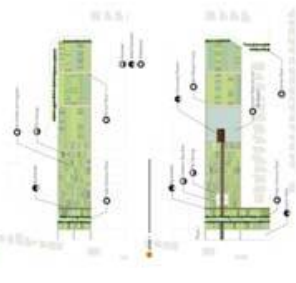
urban context viet village

- 1. Community Center
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urban context viet village

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urban farm viet village

New Orleans

Ryan Bell | LA 664 Landscape Sustainability Studio | Professor Dr. Jack Ahern | March 22, 2019

## Works Cited

"ASLA 2008 Professional Awards." *American Society of Landscape Architects - Home*. 2008. Web. 5 Apr. 2010. <<http://www.asla.org/awards/2008/08winners/411.html>>.

"Tulane City Center › Viet Village Urban Farm." *Tulane City Center › The Tulane City Center*. Web. 5 Apr. 2010. <<http://www.tulanecitycenter.org/programs/projects/viet-village-urban-farm>>.

"Spackman, Mossop+Michaels - Viet Village Urban Farm." *Spackman, Mossop+Michaels: New Orleans Landscape Architecture and Urban Design*. Web. 5 Apr. 2010. <[http://www.mossopmichaels.com/projects\\_viet.html](http://www.mossopmichaels.com/projects_viet.html)>.

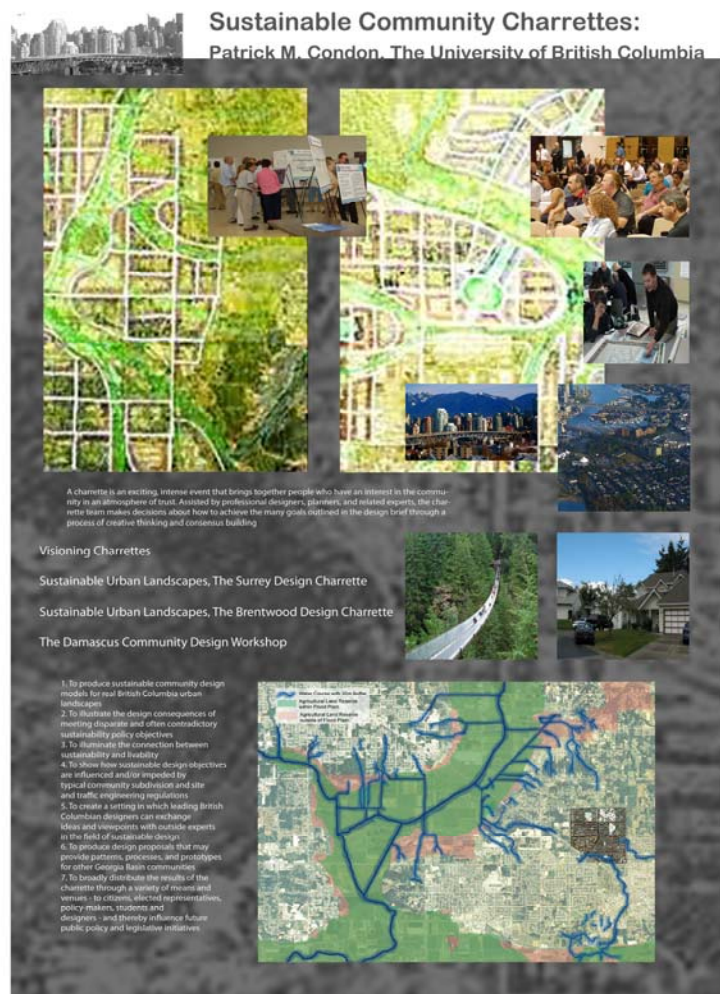
## APPENDIX K

### Sustainable Community Charrettes

According to "Design Charrettes for Sustainable Communities": a design charrette is an exciting, fast-moving event that brings people together, who have a vested interest in their community. The term charrette was actually coined at the Ecole des Beaux-Arts in Paris late in the nineteenth century. They usually consist of a series of interactive community meetings assisted by professional designers, designers, planners and related experts. The charrette team can make decisions about how to achieve the many goals outlined in the design brief through a process of creative thinking and consensus building (Condon '07). The importance of building sustainable cities is the underlying objective of these charrettes.

Condon emphasizes the importance of generating and using drawings from these charrettes and applying those findings to potential designs. Communication through illustration and design images are critical for use during the charrette process and for final products. Through a series of "Visioning Charrettes" Condon has come up with a checklist of objectives that other designers should try to accomplish during the course of their design charrettes:

1. Produce sustainable community design models for real urban landscapes.
2. Illustrate the design consequences of meeting disparate and often contradictory sustainability policy objectives.
3. Illuminate the connection between sustainability and livability.
4. Show sustainable design objectives are influenced and/or impeded by typical community subdivision and site and traffic engineering regulations.
5. Create a setting in which leading designers can exchange ideas and viewpoints with outside experts in the field of sustainable design.
6. Produce design proposals that may provide patterns, processes and prototypes for other urban communities.
7. Broadly distribute the results of the Charrette through a variety of means and venues - to citizens, elected officials, policy-makers, students and designers – and thereby influence future public policy and legislative initiatives.



Source: Condon, Patrick M. "Design Charities for Sustainable Communities", Island Press, 2008.

## APPENDIX L

### Massachusetts Environmental Law

Massachusetts Endangered Species Act (M.G.L c.131A and regulations 321 CMR 10.00) -The Massachusetts Endangered Species Act (MESA) prohibits the "taking" of any rare plant or animal species listed as Endangered, Threatened, or of Special Concern by the MA Division of Fisheries & Wildlife. "Taking" is defined under the act as to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity of an animal or to collect, pick, kill, transplant, cut or process a plant. Permits for taking rare species for scientific, educational, conservation, or management purposes can be granted through the Division of Fisheries & Wildlife.

Massachusetts Wetlands Protection Act (M.G.L. c.131, s.40 and regulations 310 CMR 10.00) - The Wetlands Protection Act Regulations require that proposed alterations to the wetland habitats of rare wildlife be reviewed by the Natural Heritage & Endangered Species Program. Alterations that would have short or long term adverse effects to the wetland habitats of rare wildlife species are prohibited

The Natural Heritage & Endangered Species Massachusetts Forest Cutting Practices Regulations (304 CMR 11.00) - require reviews of forest cutting plans and potential impacts on rare species.

The Massachusetts Environmental Policy Act (MEPA) (M.G.L. c.30, secs. 61-62H) also provides for the review of potential impacts to rare species populations by proposed development projects that occur on a site of two or more acres within Priority Habitats delineated by the NHESP.

Certification of Vernal Pools - The Natural Heritage & Endangered Species Program "certifies" the occurrence of vernal pools based on documentation of the pool's use by one or more groups of species that rely on vernal pools. Official certification provides a vernal pool, and up to 100 feet beyond its boundary in some cases, certain protections under several state and federal laws. Originally defined and protected under the Massachusetts Wetlands Protection Act regulations, Certified Vernal Pools now also receive protection under Title 5 of the Massachusetts Environmental Code, Section 401 of the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards which relate to Section 401, and the Massachusetts Forest Cutting Practices Act. These regulations help to eliminate direct impacts to certified vernal pools and to minimize indirect impacts.

## REFERENCES

- Ahern, J., LeDuc, E, and M.L. York. Biodiversity Planning and Design : Sustainable Practices. Island Press, Washington, 2007
- Baltimore Metropolitan Council. "Bicycle Level of Service Evaluation Update & Pedestrian Level of Service Evaluation: Task Report June 2004.
- Bennet "Linkages in the Landscape: The Role of Corridors and Connectivity in Wildlife Conservation" LUCN, Gland, 1999.
- Blaustein, Project Manager, MAPC, Joan. *Open Space and Recreation Plant.* Rep. Boston: Metropolitan Area Planning Council, 2004.
- Breunig, K. *Losing Ground: At What Cost? Changes in Land Use and Their Impact on Habitat, Biodiversity, and Ecosystem Services in Massachusetts.* 3rd Edition. Massachusetts Audubon Society, Lincoln, Massachusetts.2003
- Chronological History of Woburn, Massachusetts. Woburn Public Library. Web. 09 Apr. 2010. <<http://users.rcn.com/woblib/chnrlgy.htm>>.
- City of Woburn, Conservation Commission. 2004 Open Space Plan.
- City of Woburn. "Public Works: Water." City of Woburn, 2010. Web. 16 May 2010 <http://cityofwoburn.com/index.aspx?NID=384>.
- Clapp-Goodyear School. *Woburn Public Schools.* Web. 17 Apr. 2010. <<http://woburn.sharepointsite.net/schools/clapp-goodyear/default.aspx>>.
- Clyde Reeves School. *Woburn Public Schools.* Web. 17 Apr. 2010. <<http://woburn.sharepointsite.net/schools/reeves/default.aspx>>.
- Coady, Marie. "Shannon's Farm: A Family Legacy." *Daily Times Chronicle* [Woburn] 9 Sept. 2005.
- Daniel L. Joyce Middle School. *Woburn Public Schools.* Web. 17 Apr. 2010. <<http://woburn.sharepointsite.net/schools/joyce/default.aspx>>.
- DeGraaf, Richard M. and Yamasaki, Mariko. "Schematic depiction of historical changes in representative wildlife species and successional habitat in New England"
- Environmental Services City of Portland. "What is a Green Street?" City of Portland, 2008. Web. 16 May 2010 <http://www.portlandonline.com/bes/index.cfm?c=44407>.
- Foster, Motzkin, Bernardos, Cardoza, "Wildlife dynamics in the changing New England Landscape, *Journal of Biogeography*, 29, 1337-1357
- Hopper, Leonard J. *Landscape Architectural Graphic Standards.* Hoboken, N.J.: John Wiley & Sons, 2007. Print.
- Kuo, F.E., Bacaicoa, M., & Sullivan, W.C. (1998). Transforming inner-city neighborhoods: Trees, sense of safety, and preference. *Environment & Behavior*, 30(1), 28-59.
- Lucero, Kathy. "Woburn Site Historical Information." 1 Apr. 2010. E-mail.
- Massachusetts Division of Fisheries and Wildlife, Department of Fish and Game, Executive Office of Environmental Affairs, "2005 Massachusetts Comprehensive Wildlife Conservation Strategy." Revised September 2006.
- Massachusetts Division of Fisheries and Wildlife, Natural Heritage & Endangered Species Program: <http://www.mass.gov/dfwele/dfw/nhesp/nhesp.htm>

MassGIS 'DEP Wetlands (1:12,000)' April 2007. <  
<http://www.mass.gov/mgis/wetdep.htm>>.

MassGIS 'NHESP Certified Vernal Pools' January 2010. <  
<http://www.mass.gov/mgis/cvp.htm>>.

MassGIS 'Soils' October 2008. <<http://www.mass.gov/mgis/soi.htm>>.

Melissa Cryan, Division of Conservation Services and Janet Curtis, EOEEA, (Revision March 2008) *Open Space and Recreation Planner's Workbook*, Retrieved from Massachusetts Land Trust Coalition <<http://www.massland.org>>.

*National Center for Safe Routes to School*. Web. 29 Mar. 2010.  
 <<http://www.saferoutesinfo.org/>>.

*NEsoils.com, last updated January 1, 2009, accessed April 6, 2010.*

*New England Wildlife: Habitat, Natural History, and Distribution*, University Press of New England, 2001. 15.

Open Space and Recreation Plan. City of Woburn. June 23, 2004.

OpenStreetMap. Creative Commons Attribution-Share Alike 2.0 Generic License.  
 <<http://www.openstreetmap.org/>>

Paul The Knight. "Winning Farm –Wicked Weird." *Organic Trails*. 12 March 2007. Blogger.com. Web: <http://organictrails.blogspot.com/>. 17 May 2010.

*Soil Survey of Middlesex County, Massachusetts*, By Thomas A. Peragallo, Natural Resources Conservation Service, United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the Massachusetts Agricultural Experiment Station, *Issued 2009, Accessed April 6, 2010*

Sorvig, Kim and William Thompson. *Sustainable Landscape Construction: A guide to Green Building Outdoors*. Island Press, 2008.

Tarallo, Edmund. Email May 3, 2010.

*U.S. Department of Agriculture, Natural Resources Conservation Service. National Soil Survey Handbook*, title 430-VI. Available online at:  
<http://soils.usda.gov/technical/handbook/> accessed April 6, 2010.

Ucisik, Ahmet S. & Rushbrook, Philip. *The Impact of Cemeteries on the Environment and Public Health*. World Health Organization, Regional Office for Europe, 1998. Print.

United States. Massachusetts Department of Housing and Community Development. Executive Office of Environmental Affairs. *Woburn Vision 2020: Community Development Plan*. Woburn, 2005.

Wicked Local, Gatehouse News Service. "Bikeway Would Connect Woburn, Stoneham, Winchester ". Available at:  
<http://www.wickedlocal.com/winchester/features/x228088167/Bikeway-would-connect-Woburn-Stoneham-Winchester>. Date Accessed: April 12, 2010.

Wilson, E.O., *The Current State of Biodiversity*, National Academy Press, 1988

Winning Farm, Inc. ©2008. Accessed May 11, 2010.  
 <<http://www.winninghome.org/index.html>>.

Winning History - Winning Home, Inc. *Winning Home, Inc.* Web. 18 Apr. 2010.  
 <[http://www.winninghome.org/winning\\_future.html](http://www.winninghome.org/winning_future.html)>.

Woburn History. *Woburn Historical Commission*. Web. 29 Mar. 2010.  
 <<http://www.woburnhistoricalcommission.com/woburnhistory.html>>.



Woburn Municipal Code (last updated 2/24/10), under Title 7 “Wetlands Protection and Conservation,” Article I. Wetlands Protection Section 7-2 Jurisdiction there is a required 150’ Wetland Buffer. The Conservation Commission can give a special permit.

Woburn Municipal Code 1989 Municipal Code, as amended. With Amendments Through March 1, 2010.

Woburn Public Schools. *Woburn Public Schools*. Web. 29 Mar. 2010.  
<<http://woburnps.com/home/>>.

Woburn Zoning 5.7: Buffers from Residential Development, Buffer Requirement for useable open space is 20 feet.

Woburn, Massachusetts. *Wikipedia, the Free Encyclopedia*. Web. 17 Apr. 2010.  
<<http://en.wikipedia.org/wiki/Woburn,Massachusetts>>.

World Wildlife Fund: <<http://www.worldwildlife.org/>>.

Wren, “Tri-Community Bikeway.” Available at:  
<http://www.waldenfont.com/wren/content.asap?id=111#1056>. Accessed: April 19, 2010.

## Census Sources (2000 Data):

### Total Population of Woburn, MA

<[http://factfinder.census.gov/servlet/DTable?\\_bm=y&-context=dt&-ds\\_name=DEC\\_2000\\_SF1\\_U&-mt\\_name=DEC\\_2000\\_SF1\\_U\\_P001&-CONTEXT=dt&-tree\\_id=4001&-all\\_geo\\_types=N&-geo\\_id=06000US2501781035&-search\\_results=01000US&-format=&-\\_lang=en](http://factfinder.census.gov/servlet/DTable?_bm=y&-context=dt&-ds_name=DEC_2000_SF1_U&-mt_name=DEC_2000_SF1_U_P001&-CONTEXT=dt&-tree_id=4001&-all_geo_types=N&-geo_id=06000US2501781035&-search_results=01000US&-format=&-_lang=en)>

### Sex by Age of Total Population of Woburn, MA

<[http://factfinder.census.gov/servlet/DTable?\\_bm=y&-context=dt&-ds\\_name=DEC\\_2000\\_SF1\\_U&-CONTEXT=dt&-mt\\_name=DEC\\_2000\\_SF1\\_U\\_P012&-tree\\_id=4001&-redoLog=false&-all\\_geo\\_types=N&-geo\\_id=06000US2501781035&-search\\_results=01000US&-format=&-\\_lang=en](http://factfinder.census.gov/servlet/DTable?_bm=y&-context=dt&-ds_name=DEC_2000_SF1_U&-CONTEXT=dt&-mt_name=DEC_2000_SF1_U_P012&-tree_id=4001&-redoLog=false&-all_geo_types=N&-geo_id=06000US2501781035&-search_results=01000US&-format=&-_lang=en)>

### Sex by Age of Total Population of the United States

<[http://factfinder.census.gov/servlet/DTable?\\_bm=y&-context=dt&-ds\\_name=DEC\\_2000\\_SF1\\_U&-mt\\_name=DEC\\_2000\\_SF1\\_U\\_P012&-CONTEXT=dt&-tree\\_id=4001&-redoLog=true&-all\\_geo\\_types=N&-geo\\_id=01000US&-search\\_results=01000US&-format=&-\\_lang=en](http://factfinder.census.gov/servlet/DTable?_bm=y&-context=dt&-ds_name=DEC_2000_SF1_U&-mt_name=DEC_2000_SF1_U_P012&-CONTEXT=dt&-tree_id=4001&-redoLog=true&-all_geo_types=N&-geo_id=01000US&-search_results=01000US&-format=&-_lang=en)>

### Total Households in Woburn, MA

<[http://factfinder.census.gov/servlet/DTable?\\_bm=y&-context=dt&-ds\\_name=DEC\\_2000\\_SF1\\_U&-CONTEXT=dt&-mt\\_name=DEC\\_2000\\_SF1\\_U\\_P015&-tree\\_id=4001&-redoLog=false&-all\\_geo\\_types=N&-geo\\_id=06000US2501781035&-search\\_results=01000US&-format=&-\\_lang=en](http://factfinder.census.gov/servlet/DTable?_bm=y&-context=dt&-ds_name=DEC_2000_SF1_U&-CONTEXT=dt&-mt_name=DEC_2000_SF1_U_P015&-tree_id=4001&-redoLog=false&-all_geo_types=N&-geo_id=06000US2501781035&-search_results=01000US&-format=&-_lang=en)>

### Median Household Income of Woburn, MA

<[http://factfinder.census.gov/servlet/DTable?\\_bm=y&-context=dt&-ds\\_name=DEC\\_2000\\_SF3\\_U&-mt\\_name=DEC\\_2000\\_SF3\\_U\\_P053&-CONTEXT=dt&-tree\\_id=403&-redoLog=true&-all\\_geo\\_types=N&-geo\\_id=06000US2501781035&-search\\_results=01000US&-format=&-\\_lang=en](http://factfinder.census.gov/servlet/DTable?_bm=y&-context=dt&-ds_name=DEC_2000_SF3_U&-mt_name=DEC_2000_SF3_U_P053&-CONTEXT=dt&-tree_id=403&-redoLog=true&-all_geo_types=N&-geo_id=06000US2501781035&-search_results=01000US&-format=&-_lang=en)>

### Percent of Persons Under the Age of 5 in Woburn, MA

<[http://factfinder.census.gov/servlet/ThematicMapFramesetServlet?\\_bm=y&-context=tm&-tm\\_name=DEC\\_2000\\_SF1\\_U\\_M00155&-ds\\_name=DEC\\_2000\\_SF1\\_U&-CONTEXT=tm&-tree\\_id=4001&-all\\_geo\\_types=N&-geo\\_id=06000US2501781035&-format=&-\\_lang=en](http://factfinder.census.gov/servlet/ThematicMapFramesetServlet?_bm=y&-context=tm&-tm_name=DEC_2000_SF1_U_M00155&-ds_name=DEC_2000_SF1_U&-CONTEXT=tm&-tree_id=4001&-all_geo_types=N&-geo_id=06000US2501781035&-format=&-_lang=en)>

### Percent of Persons Aged 65 and Over in Woburn, MA

<[http://factfinder.census.gov/servlet/ThematicMapFramesetServlet?\\_bm=y&-context=tm&-tm\\_name=DEC\\_2000\\_SF1\\_U\\_M00073&-ds\\_name=DEC\\_2000\\_SF1\\_U&-tm\\_config=|b=50|l=en|t=4001|zf=0.0|ms=thm\\_def|dw=0.4059938129615691|dh=0.22713288188657324|dt=gov.census.aff.domain.map.EnglishMapExtent|if=gif|c](http://factfinder.census.gov/servlet/ThematicMapFramesetServlet?_bm=y&-context=tm&-tm_name=DEC_2000_SF1_U_M00073&-ds_name=DEC_2000_SF1_U&-tm_config=|b=50|l=en|t=4001|zf=0.0|ms=thm_def|dw=0.4059938129615691|dh=0.22713288188657324|dt=gov.census.aff.domain.map.EnglishMapExtent|if=gif|c)>

x=-  
71.15949850000001|cy=42.489745|zl=5|pz=5|bo=|bl=|ft=350:349:335:389:388:332:331|fl=403:381:204:380:369:379:368|g=06000US2501781035|ds=DEC\_2000\_SF1\_U|sb=50|tud=false|db=140|mn=4.9|mx=6.5|cc=1|cm=1|cn=5|cb=|um=Percent|pr=1|th=DEC\_2000\_SF1\_U\_M00155|sf=N|sg=&-CONTEXT=tm&-tree\_id=4001&-redoLog=false&-all\_geo\_types=N&-geo\_id=06000US2501781035&-format=&-\_lang=en>

#### Total Population by State of the United States

<[http://factfinder.census.gov/servlet/ThematicMapFramesetServlet?\\_bm=y&-context=tm&-tm\\_name=DEC\\_2000\\_SF1\\_U\\_M00092&-ds\\_name=DEC\\_2000\\_SF1\\_U&-tm\\_config=|b=50|l=en|t=4001|zf=0.0|ms=thm\\_def|dw=1.9557697048764706E7|dh=1.4455689123E7|dt=gov.census.aff.domain.map.LSRMapExtent|if=gif|cx=-1159354.4733499996|cy=7122022.5|zl=10|pz=10|bo=|bl=|ft=350:349:335:389:388:332:331|fl=403:381:204:380:369:379:368|g=01000US|ds=DEC\\_2000\\_SF1\\_U|sb=50|tud=false|db=040|mn=5.7|mx=17.6|cc=1|cm=1|cn=5|cb=|um=Percent|pr=1|th=DEC\\_2000\\_SF1\\_U\\_M00073|sf=N|sg=&-CONTEXT=tm&-tree\\_id=4001&-redoLog=false&-all\\_geo\\_types=N&-geo\\_id=01000US&-format=&-\\_lang=en](http://factfinder.census.gov/servlet/ThematicMapFramesetServlet?_bm=y&-context=tm&-tm_name=DEC_2000_SF1_U_M00092&-ds_name=DEC_2000_SF1_U&-tm_config=|b=50|l=en|t=4001|zf=0.0|ms=thm_def|dw=1.9557697048764706E7|dh=1.4455689123E7|dt=gov.census.aff.domain.map.LSRMapExtent|if=gif|cx=-1159354.4733499996|cy=7122022.5|zl=10|pz=10|bo=|bl=|ft=350:349:335:389:388:332:331|fl=403:381:204:380:369:379:368|g=01000US|ds=DEC_2000_SF1_U|sb=50|tud=false|db=040|mn=5.7|mx=17.6|cc=1|cm=1|cn=5|cb=|um=Percent|pr=1|th=DEC_2000_SF1_U_M00073|sf=N|sg=&-CONTEXT=tm&-tree_id=4001&-redoLog=false&-all_geo_types=N&-geo_id=01000US&-format=&-_lang=en)>