NATURAL RESOURCE INVENTORY & STEWARDSHIP PLAN of ARLINGTON'S GREAT MEADOWS in Lexington, Massachusetts

Produced for the
Conservation Commission
Town of Arlington
730 Massachusetts Avenue
Arlington, MA 02476

by
Frances Clark
Carex Associates
Lincoln, MA
July 2001

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TOWN OF ARLINGTON

MASSACHUSETTS

CONSERVATION COMMISSION

6 July 2001

Dear Arlingtonians and Lexingtonians:

We are pleased to present this report by Frances Clark of Carex Associates identifying the natural and historical resources of Arlington's Great Meadows in Lexington. This 183-acre open space is valued greatly by residents of both towns as well as by users of the Minuteman Bikeway.

This report was commissioned in 1997 and public involvement has been instrumental in its creation. In December of 1999, Ms. Clark held a public meeting in Arlington to present preliminary findings and to obtain citizen input. In February of 2001, a draft document was distributed to various town officials, boards, commissions, and interested parties in Arlington and Lexington for comment. Subsequently, a joint working group of Arlington Conservation Commission and Arlington Open Space Committee members provided additional feedback.

We hope that this report will serve as a source of useful information in ongoing considerations of the future of Arlington's Great Meadows. We welcome your comments.

Sincerely,

Arlington Conservation Commission
Chair: Nathaniel Stevens
Members: Judy Hodges, Timothy Sullivan, Geraldine Tremblay, John Roche, Christine Wallace, David White

TOWN HALL, 730 MASSACHUSETTS AVENUE, ARLINGTON, MA 02476
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Scope of Work for the Natural Resource Inventory and Stewardship Plan of Arlington's Great Meadows in Lexington, Mass

Objective

Natural Resource Inventory and Stewardship Plan of Great Meadows will provide both Arlington and Lexington with specific guidance as to how to protect the natural resources of the 200-acre conservation land and provide for compatible public uses. This document will be useful for developing management policies, volunteer projects, public programs, and restoration projects.

Process and Contents

Review of existing information including commission open space goals and concerns, past reports, cultural values, wildlife inventories, and legal status. Botanical survey of plant communities with focus on marsh, bog, red maple swamp, vernal pool, and open upland. Report will include community descriptions including dominant plant species by layer and preliminary plant list including relative abundance. Grasses and sedge species covered. Status of invasive exotics and any rare plant species will be provided.

Compilation of animal inventories, including birds, mammals, reptiles, and amphibians using existing data and conversations with local experts to determine sensitive species and habitats at current time. Priority protection areas will be delineated.

Assessment of current public uses and their impact on natural, cultural, and recreational resources.

Management concerns and recommendations including stewardship chart of action items, priorities, responsibility, schedule, and estimated hours.

Deliverables

Report of approximately 100 pages, including color photographs of habitats, plant lists, and maps of area. Original and 3 color copies (one for Arlington, one for Lexington, one for author). Any photographs not included in the report will be the property of the commission.

ACKNOWLEDGEMENTS

I wish to express my sincerest thanks to Geri Tremblay, Susan Brent, and Marilyn Nordby, who provided the impetus and much information for this report, and David White, who brought this project to conclusion. Also, I give thanks to John Andrews, Ruth Ladd, and their many compatriots for not only investigating the natural history of Arlington's Great Meadows over the years, but also documenting their findings so that these vital observations could be used in this report. I am indebted to many employees at Lexington Town Hall for their assistance in providing details on land ownership, zoning, leash laws, fire history, aerial photographs, and the like. Finally, I extend my appreciation to the dozens of citizens of both Arlington and Lexington who have participated in previous reports, joint committees, public meetings, and most recently the review of this plan.

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- Macroinvertebrates Observed in Infinity – Ruth Ladd 1991
- Bird List of Arlington Great Meadows – John W. Andrews
- The Great Meadow Hydrology and Land Use Study June 14, 1971.
- Preliminary Summary Great Meadows Biodiversity Days 2001 – Karsten Hartel
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SECTION ONE
EXECUTIVE SUMMARY

I. Purpose

The purpose of this report is to provide both Arlington and Lexington with specific guidance as to how to protect the natural resources of Arlington's Great Meadows and to provide for compatible public uses. It gathers in one place the relevant information concerning the ecological values and stewardship needs of this 183-acre open space. It inventories the many ecological, cultural, recreational, and education assets of the property and proposes specific, practical recommendations for their protection and enhancement. It will be useful for developing management policies, volunteer projects, public programs and restoration projects. It is hoped that this report will stimulate and guide the Towns of Arlington and Lexington, not only to permanently protect its unique resources, but equally important to support the ongoing stewardship of this remarkable regional asset.

II. Summary of Findings

Arlington's Great Meadows, located entirely in the town of Lexington, is a 183-acre natural area surrounded by densely populated suburbs of Boston. While not protected as conservation land, Great Meadows has served as public open space since 1872, when the large wetland was purchased by the Town of Arlington as part of its water supply system. Today Arlington's Great Meadows is a significant green space surrounded by two schools, a nursing center, condominiums, and single-family homes. It is bordered by the highly popular Minuteman Commuter Bikeway. Great Meadows lies in close proximity to conservation land owned by Lexington, and serves as de facto conservation land for the immediate neighborhood and the region as a whole.

The basis of any stewardship plan is an inventory of the natural resources of a site. The varied topography, created by the glaciers, includes kame terraces, outwash plains, and the extensive kettlehole that forms the Meadows. Due in part to the unusual juxtaposition of geological features, Arlington's Great Meadows supports regionally unusual natural plant communities: marsh, vernal pool, oak woodland, and successional grassland. Eight community types in all provide habitat for an identified 56 species of breeding birds, 12 species of amphibians and reptiles, and 251 species of plants. Several of these species are unusual, if not rare, and many more are common "watchable" wildlife species that people enjoy seeing and learning about. In addition, over the last thirty years, several reports highlight the Great Meadows' natural resource services, including water supply protection, flood control, and wildlife habitat. Lying within the Mystic River Watershed, Arlington's Great Meadows buffers portions of Sickle Brook and Munroe Brook and reduces flooding of the Arlington Reservoir and Mill Brook downstream.

In addition, Arlington's Great Meadows features a variety of cultural, recreational, and educational assets. Stonewalls, cart paths, open fields, and extensive vistas are reminiscent of the historic Massachusetts landscape. An undeveloped trail network extends throughout most of the property except the wetlands. Visitors enjoy hiking, cross-country skiing, bird watching, dog-walking, and berry picking. Two nearby schools often use Great Meadows as an outdoor classroom. The scenic values are readily accessible for those traveling the Minuteman Commuter Bikeway.

III. Values

Great Meadows is an ecological and scenic treasure amidst suburban Boston. Not only is the extensive marsh one of the largest in the region, but also it is surrounded by open grasslands and woodlands on undulating hills that are reminiscent of naturalistic landscapes designed by Frederick Law Olmsted, the famous landscape architect of the late 19th and early 20th century. It offers a destination point for those using the Minuteman Bikeway and for birders, nature watchers, and artists. Many urbanites seek out Great Meadows because of its expansive landscape, its tranquility, and bird life. It is the largest fully undeveloped area owned by the Town of Arlington. Equally important, the proximity of the wetlands to the fast draining uplands serves to regulate flooding and protect water quality of the Arlington Reservoir and adjacent streams and lowlands.

IV. Concerns

Despite a long history of citizen interest in Arlington's Great Meadows as conservation land, it is not yet permanently protected and continues to be threatened by development proposals. Stewardship activity has been limited in part by its location in Lexington and also by the uncertainty over the future of the Great Meadows. Consequently, the full potential of this 183-acre green space has yet to be achieved.

Several threats could affect the existence of Great Meadows and its ecological, cultural, recreational, and educational resources. The overarching threat is the conversion of land-use from a natural open space to a more developed status. As long as Great Meadows is unprotected open space, development remains a possibility and will likely continue to divert citizen support from the task of managing the property.

The loss of Great Meadows to development would eliminate or seriously degrade many of its functions and values:

- Unusual natural habitats would be lost or compromised
- Flooding could increase downstream, particularly around Arlington Reservoir
- Scenic and historic landscapes would be severely compromised
- Citizens would lose access to 183 acres of open space within a densely developed suburb of Boston and along the popular Minuteman Bikeway

Stewardship of the property is essential to sustain the functions and values of the open space. Of prime concern is maintaining the unique natural communities that rely on periodic natural disturbance, such as fire, to keep them in early successional stages. Another is protecting the site from being overwhelmed by invasive exotic species, such

as buckthorn, phragmites, honeysuckle, and swallowwort. Promoting increased public use while maintaining the natural qualities of the site is a third major challenge. While public access is essential for long-term public support of Arlington's Great Meadows, turning Great Meadows into another suburban park would greatly diminish its special qualities.

V. Recommendations

Part of the purpose of the report is to make practical recommendations to the Conservation Commission, understanding that the Board of Selectmen has authority over the property. The overarching recommendations are as follows:

- Determine the long-term status for Arlington Great Meadows. As long as the future use of the property remains unsettled, it is unlikely that either town will be willing to commit significant resources to its stewardship over the longterm. The property will remain at risk and under utilized.
- Protect and manage existing plant communities and wildlife values, thereby also preserving unique scenic qualities.
- Encourage compatible public use and enjoyment by developing access points and designing an environmentally sensitive trail network, along with public-use policies.
- Work with the Town of Lexington, surrounding neighborhoods, and other interests to accomplish these recommendations. It is an unusual situation to have such a significant public resource owned by one town but wholly contained within another town's borders. Cooperation and creativity by both towns is essential.

VI. Conclusion

Arlington's Great Meadows in Lexington is a major asset to the region for its ecological, scenic, recreational, and educational values. As the region continues to develop the last open spaces, these remaining parcels only increase in value. Whatever decisions are made in the near future will affect the quality of life of citizens throughout the region for years to come.

SECTION TWO
INVENTORY

I. Introduction

The purpose of Section II is to bring together in one place detailed information on Arlington's Great Meadows. This section describes the setting for the property, including its exact location and regional context. It elaborates upon the physical features, such as geology, topography, hydrology, and soils which together determine the natural resource functions and values. It also includes the biological features and plant and animal lists. The plant communities are described in some detail along with special features and specific recommendations for management. Section II also highlights the cultural aspects of the property, including legal considerations as well as public access and use. Section III analyzes these findings. It summarizes the overall ecological, cultural, recreational, and educational values. It reviews major concerns, and outlines recommendations to further protect and enhance the outstanding values of Great Meadows.

II. Methodology

This report is a compilation of many previous studies on Great Meadows as well as de-novo field work and recent public input. Much of the report is based on existing information derived from many formal and informal studies of the site over the last thirty years. These studies attest to the high degree of public appreciation of the site's natural resources and concern over the Great Meadows' long-term protection. References include hydrology reports emphasizing water quality protection and flood control, Lexington' and Arlington's open space and recreation plans, a master's project on a vernal pool, and carefully documented species lists of birds, reptiles, and amphibians by local naturalists. Other sources of information include U.S. Geographical Service topographical and bedrock geology maps, Natural Resource Conservation Service soil maps and descriptions, and Massachusetts Geographic Information Service (MassGIS), as well as town records and historic aerial photographs.

A botanical survey based on different community types was conducted periodically over the growing seasons of 1997-2000. Over 50 hours of field time was spent walking through the wetlands, around the perimeter uplands, and viewing adjacent areas.

A public meeting was held in December 1999 to review the values of the property and the management issues. This meeting, which was publicized in the local paper as well as by sending letters to local neighborhood associations, town boards, and other groups, was attended by 35 citizens from both Lexington and Arlington, who represented several different community interests.

Maps were created using MassGIS data, aerial photographs, and town assessor's maps.

III. Background

Location

The Arlington Great Meadows is in East Lexington, about one-half miles west of the Arlington border (see Map 1 – Locus). It is bounded by the Minuteman Commuter Bikeway (former Boston & Maine Railroad), which runs more or less parallel to Massachusetts Avenue along the west/southwest property line. The Waldorf School and the East Lexington Library are landmarks in this area. The Town of Lexington owns 9.3 acres designated as conservation land, including D'Angustus Conservation Land, in the southwest corner which directly abuts Arlington's Great Meadows. An Exxon gas pipeline easement runs between the open space and the developed community called Pierces Bridge. Maple Street borders along the northwest property line. Emerson Gardens and Nursing Center abuts it to the north. Lexington Christian Academy, on Bartlett Avenue, which is accessed of Lowell Street, is a major abutter to the northeast. Mt. Ephraim, a high point in the area, and the Arlington Reservoir, lie to the east, along with numerous neighborhood roads. The channel for Sickle Brook wraps along the southern border in the neighborhood formed by Brandon and Norton Streets. Thus, Great Meadows is surrounded by residential streets, the Bikeway, public and private institutions, neighborhood homes, and some adjacent open space.

Regional context

It is important to look at Great Meadows in a regional context to help assess its values. Arlington and Lexington are located in the eastern plateau of Middlesex County – 42.26N latitude, 71.13W Longitude. They lie in the Boston Basin Ecoregion within the Northeastern Coastal Zone (Barbour et al, 21). Arlington's Great Meadows is in the Mystic River Watershed while most of the rest of Lexington is within the Shawsheen River Watershed.

Great Meadows is one of several valuable natural areas in the region (see Map 2 – Surrounding Open Space). It is one of the largest natural sites in Lexington and in the surrounding towns. Its regional conservation value is enhanced by its more or less round shape with relatively little edge compared to the interior. It is also in relatively close association with other conservation lands including Whipple Hill to the north, Arlington Reservoir to the east, Dunback Meadow to the south, and Lower Vine Brook to the west. It is connected, albeit tenuously, to other conservation lands by wetland corridors. Munroe Brook runs east from under Maple Street, through the Lexington Christian Academy, just north of Great Meadows, into Arlington Reservoir. Sickle Brook runs from Great Meadows through the Cataldo Reservation to the vicinity of Arlington Reservoir and is cited as an important wildlife corridor in the Lexington Open Space Plan. The Minuteman Bikeway serves as a corridor not only for people during the day, but also possibly for mobile mammals during the night. The Bikeway links several conservation properties including Tophet Swamp and Parker Meadow. The Bikeway is probably one of the key wildlife links to conservation lands to the west of Route 128.

Great Meadows can be evaluated in the context of the characteristics valued by conservation biologists. Ideally, conservation lands should be large, arranged in close proximity to each other, more or less round in shape with minimum edge, and linked to other natural open space so that combined these lands provide sufficient resources for a

variety of interconnected species which form natural communities that persist over time. This connection is important because all too often individual conservation lands gradually become fragments or islands of natural habitat within a sea or matrix of urban development. Biologists recognize that isolated natural areas lose much of their natural diversity over generations for a variety of reasons. For instance, a population of a given animal species may increase and then not have sufficient resources, including new mates, to support itself; the population may become reduced due to lack of genetic diversity and inbreeding depression. Animals cannot move out to new areas and other animals cannot move in because the fragments are too far apart, small, and surrounded by inhospitable habitat. Major highways or other busy roads are particular barricades. Consequently, the species that survive tend to be generalists, highly adapted to urban situations.

Great Meadows lies within such a fragmented, urban/suburban landscape. As mentioned above, it is one of several natural areas in Lexington that form a complex of conservation lands in the towns of Arlington, Lexington, and Woburn within the Routes 2 ,128, and 3 triangle. While bound by inhospitable habitat, there are a few undeveloped properties and narrow linkages to other significant open spaces/conservation lands to the northwest and northeast and to the east. While wildlife linkages between these properties are tenuous and hazardous for slow moving, small species such as reptiles and amphibians, it is possible for at least some creatures, such as raccoons, fox, opossum, and rarely deer, to move from one site to another, often using wetland corridors. Birds, the most mobile of all wildlife species, benefit from having a variety of habitats in close association. For instance, wetland birds probably benefit by having the extensive marshes of Dunback Meadow, Tophet Swamp, the former Metropolitan State Hospital in Waltham, and Rocky Meadow in Belmont, within short flying distances. Together, all these natural open spaces are vital to the health of remaining wildlife inside Route 128. Great Meadows, while not formally designated conservation land, is a vital part of this conservation network.

While Great Meadows may not have many rare or unusual plants and animals, it is still regionally significant. It serves as a vital oasis for many more common species. The variety of community types, both wetland and upland, as well as edge and successional habitat, add to local diversity. Many of the bird species, in particular, are relatively easy to watch and enjoy.

Great Meadows is a regionally significant open space for public use. Lexington's population is approximately 27,000 people and Arlington's population is approximately 42,300 people. Combined with adjacent communities of Belmont, Winchester, Waltham, and Woburn, the total population is almost 200,000 people. Connecting Arlington, Lexington, Bedford, and other communities, the Minuteman Bikeway is used by thousands of bicyclists, in-line skaters, skiers, and walkers a year. Arlington's Great Meadows is an aesthetic, recreational, and environmental asset to these users.

IV. Physical Factors

Bedrock Geology

According to the *Bedrock Geology Map of Massachusetts* (1983), the Great Meadows lies within the subdivision of the Milford Dedham Zone of the Proterozoic era. The brief description is derived from the map legend: "*Zdigb – Diorite and gabbro – (ProterozoicZ) Complex of Diorite and grabbo - subordinate metavolcanic rocks and intrusive granite and granodiorite."

Surficial Geology

The great majority of the Great Meadows is covered by peat, an organic substrate composed of decayed plants. Areas of glacial till are found on the slightly higher slopes along the east boundary near Circle Road and Hillcrest Avenue and on the highest knoll to the north/northeast. Kame and crevasse fillings are found on the west border near the D'Angusta Conservation Land. The remainder of the area consists of kame terrace deposits. A few rock outcrops are found near the primary entrance from the Bikeway and on the highest point to the north.

The glacial features are explained in detail by a paper prepared for Neil Jorgensen, author of *New England Landscape*, by students Donald Bocker and Marzina Morin (1976.) The paper describes a large ice block being left by a receding glacier in the current location of the marsh. This is a glacial kettle hole, which eventually filled with over 24 feet of peat. Meltwater streams deposited stratified layers of sand and gravel around the edge of the shrinking ice block. The outwash deposits found around the marsh edge are called kame terraces. Crevasse fillings consist of coarse material that flowed into cracks and holes in the ice. When the ice melted, these features stood slightly higher than the surrounding area. Glacial till is found on the slightly higher slopes at the base of Mt. Ephraim and in the north boundary near the Christian Academy. Glacial till is a mix of variable sized stones and rocks, which was essentially smeared over harder bedrock by the weight of the retreating glaciers.

Topography

Great Meadows presents an undulating topography around the level center of the wetland. The wetland averages less than 170 feet in elevation. Within this wetland are three islands of similar elevation but which consist of mineral versus muck soils. From this flat plain the land rises to the north to form a knoll 220 feet high consisting primarily of glacial till. To the west is an island knoll made from kame terrace deposits, which rises to 180 feet in elevation. To the south, just across from the Waldorf School by the primary bikeway entrance, is a slightly higher knoll of 185 feet. Elevations around the rest of the perimeter range between 170 and 180 feet. These gentle rolling hills, which often include depressions, provide a varied and aesthetically interesting topography. The higher hills to the east, including Mt. Ephraim, are easily visible and add to the sense of place.

Soils

Soils are particularly helpful in understanding ecology and past, current, and potential land-use of a site. For instance, one of the reasons why there is a mostly oak and pitch

pine community growing in the uplands is because these plants are particularly adapted to well-drained soils.

Great Meadows is unusual in having very well drained, droughty soils, which formed from glacial till and outwash, immediately adjacent to very deep, poorly drained, organic soils. The depth of peat is particularly notable, with accumulations up to 24 feet, and an average depth of 8 to16 feet, underlying the marsh vegetation of the Great Meadows itself (Camp, Dresser & McKee, 10).

The following information is derived from the Middlesex County Draft Report and Map compiled by the Natural Resources Conservation Service. The numbers refer to the numbers on the draft soil map for Arlington.

Hinkley (35c) soils are excessively drained substrates derived from glacial outwash plain, terraces, kames and eskers. They formed in gravelly and cobbly, coarse textured glacial outwash. They have rapid to very rapid permeability and, therefore, are very droughty soils. They are found on knolls to the northeast around the vernal pool and on the knoll to the west in the wetland and in the southwest corner.

Canton (114) soils are well drained substrates on uplands which formed in glacial till, ground moraine, and ice-contact stratified drift and have moderately rapid permeability to rapid permeability. They are very stony or extremely stony on the surface. They are found on the high knoll by the north border and along the eastern boundary.

Udorthents (555) are highly disturbed soils with a wet substratum. They are found along the Minuteman Bikeway just east of the small wetland. This area may have been altered during the construction of the railroad or during the channeling of Sickle Brook.

Freetown muck (46) is a very poorly drained organic soil formed in depressions and on flat areas of uplands and glacial outwash plains. They are very deep, consisting of 51 inches to many feet of black, highly decomposed organic material over sandy or loamy mineral material. The watertable is at or near the surface most of the year. The majority of the Great Meadows consists of Freetown muck

Swansea muck (45) is another organic soil type similar in origin and location to Freetown mucks but is usually only 16-51 inches deep. This underlies the shallower fresh water marsh in the southwest corner by the Minuteman Bikeway.

Hydrology

The great majority of the property lies within the Sickle Brook watershed which is part of the larger Mill Brook watershed. These waters eventually drain into the Mystic River. A very small portion of the property drains into Munroe Brook, which is to the north off the property. Munroe Brook also includes drainage from Fessenden and Reeds Brook to form the Munroe Brook watershed. Munroe Brook drains into the Arlington Reservoir. From the Arlington Reservoir, Munroe Brook joins Sickle Brook to form Mill Brook which flows to the southeast, eventually to the Mystic River. In summary, these two sub-basins – Sickle Brook and Munroe Brook -- drain into Mill Brook and are part of the

Mystic River Watershed. (Arlington-Lexington Great Meadows Study Committee, December 1970, Fig 1).

The hydrology of this area has been greatly altered over the years. Early on, it was dammed for a mill. The railroad, constructed in the mid 1800s, undoubtedly altered the runoff patterns. The Great Meadows was set aside as part of Arlington's water supply in 1873 and flooded for this purpose until 1902. In 1926 the state legislature passed Ch. 263 of the Acts of 1926, which sanctioned draining and filling of wetlands. The extensive ditching throughout the Great Meadows indicates efforts to drain the wetlands at least in part for mosquito control, until the passage of the Wetlands Protection Act in 1963 restricted such activities. (Lexington Open Space Plan, 35). During the effort to enhance Arlington's water supply, the course of two streams was permanently altered: Sickle Brook was diverted past the Arlington Reservoir and Munroe Brook was diverted into the reservoir (Ladd, 1991, 1-2.). Both Sickle and Munroe Brooks are deeply channeled. Furthermore, the surrounding area has become heavily developed with extensive impervious surface and culverts. All of these cumulative changes have no doubt affected the hydrology of the Great Meadows.

In 1965 and again 1973 a joint committee of both Lexington and Arlington was established to study the hydrology and land use of Great Meadows. A report compiled by Camp, Dresser, & McKee in 1970 for this joint committee analyzed the hydrology of the area with particular emphasis on flood problems and surrounding land use. In summary, the report emphasizes the need to protect the surrounding Munroe Brook watershed from "intensive developments...that have flood retardation value" and "to keep the Great Meadows area as an open space use and plan on using the area for flood retardation purposes for short periods of time." The report also says, "It should be kept in mind that dense vegetation on the slopes of the Great Meadows introduces a time-lag effect that increases the retardation capacity." (Camp, Dresser, and McKee, 5)

A study by IEP for the Arlington Department of Planning and Community Development and Recreation Facilities Committee reports that the portion of Sickle Brook Watershed within the Great Meadows offers the best groundwater recharge possibility due to high bedrock areas between Munroe Brook and the Arlington Reservoir. (Lexington Open Space Plan, 38.)

The FIRM map dated September 30, 1983, confirms the susceptibility of Great Meadows to flooding. The map shows that the lower third of Great Meadows marsh and Mill Brook lie within the 100-year flood zone. The base-flood elevation is 172 feet. The rest of the Great Meadows wetland is in Zone B or the 500-year floodplain. Munroe Brook, east of Bryant Road and Arlington Reservoir, is within the 100-year flood zone.

Land-use History

The following excerpt from "A Self-guided Tour of the Arlington's Great Meadows in Lexington" by Norma Floyd and John Andrews succinctly reviews the history of Great Meadows:

> The area's colonial name of "Alewife Meadows" indicates that at one time the small alewife herring found its way from the Atlantic Ocean to spawn in the water here. Seventeenth century European settlers of "Cambridge Farms" (which became Lexington) came here to harvest oak, pine and maple for Medford shipyards. Because the soft peat soil does not support the weight of buildings, the colonists left the marsh open and used the "Great Meadows" mostly for grazing livestock. The Winship family operated a dairy farm here until the 1860s. The Winships also built a mill on Munroe Brook near Fottler Avenue. Glacial boulders mixed with gravel provided foundations for such buildings. Oxcart roads, which still exist today, carried milk, hay, and peat to market. From 1865-67, the American Peat Company cut peat from the meadows. [The peat was used for fuel.]
>
> In 1871, Arlington purchased the Great Meadows and flooded it as a water supply storage area…. The famous American naturalist William Brewster frequented the Great Meadows Reservoir during this era. Brewster recorded numbers of shorebirds and waterfowl such as Snipe, Sandpipers, Rails, Herons, Bittern, Coots, Gallinules, Grebes, and various ducks, such as Mergansers, Wigeon, Shovelers, Ruddy Ducks, and others. In 1899 the Great Meadows was no longer needed as a water supply. The reservoir was drained in 1902.

This description is interesting in that it highlights several changes in the perceived and actual functions and value of the wetlands and uplands over the years. First, the oaks and pines indicate that the surrounding lands supported a pine/oak forest community typical of xeric, acidic uplands. The forests were cleared and the land used for grazing cows and other livestock. The large wet meadows were particularly valuable to settlers in the early years as they did not have to clear trees, and they provided easy, lush grazing for livestock, especially in late summer when the soils supported the weight of cows. The wetlands underwent further use. The area was dammed for a mill near Fottler Avenue and the wetlands were mined for peat. Later in the 19th century, Great Meadows was dammed and pumped as a water supply. The presence of the variety of waterfowl indicate there were once areas of deep water marsh to attract rails, bitterns, and herons, and areas of relatively open and deep water for migrating waterfowl. Later, the areas of open water returned to wetland and an extensive system of ditches was dug to help with mosquito control and perhaps for agricultural purposes. Thus, Great Meadows has been disturbed in a variety of ways; however, it is important to note that despite these manipulations, most of the natural topography, soils, and hydrology have remained essentially the same. For over a hundred years Great Meadows has been used by people and wildlife as an oasis of natural open space within an increasingly populated landscape.

V. Biological Factors

Plant Communities

Method: The property was divided into eight different community types. Plant communities are defined by their setting, including topography, hydrology, soils, land-use history, and disturbance regimes, as well as the dominant plant species. To help determine the community types, the author of this report and botanist researched the underlying physical factors, looked at aerial photographs, and conducted field surveys periodically over the course of three years. She also attempted to identify the different plant species within each community type. To do so, she traversed the property several times including crossing the marsh in the dry summer of 1997 when the sphagnum moss was crisp under foot and again on snowshoes in February 2001. Shorter forays were attempted into the wetlands; however, walking in some areas was impossible or unsafe due to ditches and pits. The author also walked the tangle of trails, surveying the different corners of the property. Even so, some plants were inevitably overlooked, were not identifiable at the particular time of year, or were inaccessible. The plant list that accompanies this report, therefore, is a good representation of the diverse flora of the Great Meadows, but is not complete.

References for plants include *Newcomb's Wildflower Guide* and Gleason and Cronquist's *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*, 2nd edition. The former reference was used primarily for common names and the latter reference was used for botanical names.

Each community description includes the environmental setting, such as the topography, soils, and any disturbances; dominant plants by layer (canopy, subcanopy, shrub, herbaceous, if applicable); and the total cover of the dominant species by layer. Total cover can be envisioned as the area that is shadowed by the plant in full leaf. For example, in a red maple swamp, red maple often dominates the canopy layer and may provide approximately 80% total cover. American elm may be a minor component providing only 10% total cover. The total canopy cover is the shadow cast by all the plants combined. In this example, total canopy cover may be only 85% because some of the branches of elm and maple overlap. The average height and total cover of each layer help indicate the structure of the community. Structure helps determine the value of a community for wildlife. For instance, scientists have determined that there are more bird species in a forest with multiple layers, (e.g. canopy, subcanopy, shrub, and herbaceous layers), than in a forest with only a canopy and an herbaceous layer. This makes sense because there are more niches for both small and large animals to use.

A plant species list with each species' relative abundance is also provided, along with any relevant comments. The five-point scale of relative abundance consists of rare, uncommon, frequent, common, dominant or abundant. In the example of the swamp, red maple would be dominant and elm uncommon. The purpose of the plant community descriptions is to provide enough information to determine what is present now, the locations of particularly sensitive areas or species, and how the landscape changes over time. For reasons explained below, the plant list is organized primarily by wetland and

upland plants, with only a few specific habitats. The plant lists have been supplemented by work done by Ruth Ladd, Nancy Childs, and J. Volpe. These lists found are in the appendix.

There are eight community types represented in the 183 acres, some of which are distinct, and others, which blend into one another. These are arranged and described mostly in accordance with the *Natural Community Classification of Massachusetts* published by the Natural Heritage and Endangered Species Program (Swain and Searcy 2000) (See Table 1). Some communities do not fit as clearly into the categories and are described independently. Map 3 depicts the estimated areas for each community type.

Several of the communities blend without distinct boundaries to form a mosaic. For example, the upland mosaic is the result of different successional states that form a continuum from grassland to scrub-shrub to woodland to forest. This continuum is due, in large part, to periodic and patchy fires, which are in turn affected by the irregular topography and vegetation types. These fires set back the successional stage of growth so that, for instance, shrub land goes back into grassland. In general the areas around the perimeter of the property support older, even-age growth of mature oak forest because these areas have had few if any fires in recent history. The open grassland and pitch pine/scrub oak communities on the uplands around the meadow are most frequently burned. This is probably in part because the people who start the fires seek isolated sites, away from the sight of houses. Also, these fires are harder to detect and reach by the fire department. Another reason is that the fires may be encouraged by winds sweeping across the marsh. These periodic fires, whatever their origin, have for years affected the local ecology. None have encroached on the surrounding neighborhoods.

In the wetlands, the mosaic is due to minor hydrological variations. The primarily herbaceous community of the shallow emergent marsh is found in the wetter regimes in the center and southeast of the meadow, while the woody shrub swamp and red maple swamps are in the slightly drier gradients, respectively. The community types are roughly outlined on Map 4 – Plant Communities.

UPLAND

Grasslands

Environmental setting: Grasslands are found on the well drained to very well drained, low nutrient soils formed over kame terraces and glacial till. Fires are a frequent occurrence and maintain this open community. Examples of these communities are found on the northwest side of the marsh, the knoll to the west, the southwest corner by the D'Angustus Conservation Land, and south by the primary bikeway entry. This community type often intergrades with or is surrounded by successional scrubland or pitch pine/scrub oak community.

Table 1. Natural Plant Communities Observed at Arlington's Great Meadows

Terrestrial:

Herbaceous (dominated by herbaceous vegetation with less than about 25% tree and shrub cover):

Sandplain Grassland

Shrub communities (less than about 25% tree canopy)

Pitch pine Scrub Oak, inland variant

Forest/Woodland (greater than about 25% tree cover)

Oak Forest

Palustrine:

Forested Wetland

Red Maple Swamp

Shrub Swamp

Shrub Swamp

Non-forested Wetland

Shallow emergent marsh

Peatland:

Acidic peatlands

Level Bog

Kettlehole level bog

Vernal Pool

Woodland Vernal Pool

Vegetation description: This community has several, but certainly not all, the elements of the sandplain grasslands described by NEHSP. The main difference is that this community is found on uneven terrain, instead of broad sandplains, and does not include the full complement of species, particularly the unusual species typically found in Southeastern Massachusetts and Martha's Vineyard and Nantucket. In short, this is a more depauperate variant which has similar elements to what is found along regularly mowed powerlines and other rights-of-way.

The Great Meadows grassland is an herbaceous community with less than 25% tree and shrub cover. Little bluestem (*Schizachryium scoparium*) and Pennsylvania sedge (*Carex penyslvanica*) are often co-dominant species. Poverty grass (*Danthonia spicata*) and a mix of non-native bent grass (*Agrostis gigantea*) and fescues (*Festuca capillaris, F.*

rubra) can form a greater or smaller component. Green's rush (*Juncus greenei*), velvet-fruited sedge (*Carex vestita),* and three-awned grass (*Aristida dichotoma*) mix in. Wild indigo (*Baptisia tinctoria*) and pinweed (*Lechea intermedia*) are scattered. This grassland is particularly colorful in the late summer and fall. Frequent flowering plants include several members of the aster family, including stiff-leaf aster (*Aster liniariifolius*), which has blue flowers with yellow centers on stiff stems with needle-like leaves; several
goldenrods, including downy goldenrod (*Solidago puberula*), rough-stem goldenrod (*S. rugosa*), and gray goldenrod (*S. nemoralis*) with yellow wands of flowers, and many-flowered aster (*Aster ericoides*), with sprays of delicate white blossoms. Spreading dogbane (*Apocynum androsaemifolium*) is frequent and common milkweed (*Asclepias syrica*) attracts various butterflies. Orange grass (*Hypericum gentianoides*), with grass-like stems, is most easily found when its small orange flowers open in mid summer. Blue-curls (*Trichostema dichotomum*) is apparent in late summer amidst short grasses. These species are occasional components of the grassland. There are often large patches of open ground and lichens and moss which have not been inventoried.

Around the edges and integrated into this grassland community are colonies of short woody plants punctuated by slightly taller shrubs and trees. Low-bush blueberry (*Vaccinium angustifolium*) and black huckleberry (*Gaylusaccia baccata*) are common. The black huckleberry has oils in the leaves and stems that make them good fuel for fires. Low-bush blueberry produces more fruit after fires and are popular for berry pickers. The white plumes of meadow-sweet (*Spirea alba*) with its white flower sprays, sweet fern (*Comptonia peregrina*), with its aromatic evergreen leaves, and bristly dewberry (*Rubus flagellaris*), with its white flowers and red berries, are frequent, while bayberry (*Myrica pensylvanica*), another fragrant species, is occasional. Many of these plants are specially adapted to growing on soils low in nutrients. For instance, bacteria live in nodules formed by the roots of bayberry and sweet fern and fix nitrogen from the air, thereby nurturing their host plants. Widely scattered small trees include gray birch (*Betula populifolia*), quaking aspen (*Populus tremuloides*), scrub oak (*Quercus ilicifolia*), oak seedlings, and black cherry (*Prunus serotina*) growing to variable heights. Usually they reach only 5 to15 feet tall before the fires kill them back.

Special values: This is an unusual community type since few places in suburban Boston have the same combination of droughty soils and an on-going history of burning. The stonewalls that run through some of these habitats add an aesthetic element that is reminiscent of historical agricultural lands. The grasslands provide a sense of spaciousness as well as security for those walking through them. In addition, the area on the north end of the property supports American Woodcock, which performs its mating ritual of peent-peent calls, upward, fluttering spirals, and precipitous decents in open fields. Observing this display is a spring ritual for many birdwatchers. Finally, the views from the high knolls overlooking the extensive marsh add to the aesthetic values of this natural landscape.

Management issues:

Fires: It is important, if possible, to sustain the ongoing pattern of cultural burning that this ecosystem depends upon. Fires caused by partying teenagers or other individuals are

naturally considered a hazard by neighbors. However, to date, most of the fires at Great Meadows are of limited size and are far removed from residences or other built features. Fires are essential to the long-term viability of the grassland community and, therefore, also to maintain the highly scenic landscape. This open vegetative community provides an essential element for presence of the American Woodcock – a mating ground. The openness also provides a sense of security to visitors. Without periodic fires, or a management alternative, the grassland community will grow up into thick brush and eventually into forest, this unique community will be lost, and visitors may be less attracted to the property.

Erosion: The uneven terrain, shallow soils, and sparse vegetation are subject to erosion. Several areas, particularly on the steeper hillsides, are becoming severely eroded by mountain bikes, which apparently enter mostly from the bikeway. Not only is vegetation and topsoil perhaps irreparably lost, but also it is difficult for people to walk over the exposed stony ground. The gullies are unsightly scars, which create a sense of neglect and therefore help to perpetrate irresponsible use.

Invasive exotic plants: Some areas are becoming dominated by invasive plants, such as glossy buckthorn. Although low-nutrient, acidic soils tend to deter these adaptable species, buckthorn could become dominant, particularly if the grasslands are allowed to grow up into woody scrub.

Management recommendations:

Grassland management: A grassland management plan is needed to sustain the unique grassland habitat and its associated aesthetics. Controlled prescribed burns should replace the unpredictable brush fires. Although there are important concerns about air quality and fire hazards to address, prescribed burning has been used at Hanscom Airforce Base to keep open a significant area for grassland birds. Rigorously supervised prescribed burns reduce the risk of uncontrolled fires. A side benefit is that prescribed burns provide training opportunities for local fire fighters.

An alternative to prescribed burning is mowing. As long as little blue stem is the dominant grass and invasive species are low in number, mowing should be necessary only every 2-3 years to keep down woody growth. Little blue stem is a warm season grass which requires infrequent mowing, is adaptable to poor soils, and has great aesthetic value particularly in the autumn. Mowing in late fall or spring will allow summer and fall flowers to flourish. The colonies of low-growing woody growth should be brush-hogged every 3-4 years to keep them in check and larger woody plants periodically cut to the ground from where they will resprout. If non-native cool season grasses become more dominant, mowing in the spring two to three times will reduce their cover along with woody species and will enhance the spread of native little blue stem. A careful plan with a monitoring program is necessary to carry out this alternative.

In some areas buckthorn and Morrow's honeysuckle are frequent to common. Mowing or burning regimes could encourage these plants, in particular glossy buckthorn. Carefully assess the status of invasives in the area and develop a management plan that includes this consideration.

Another possibility, to be tried in Concord and Lexington in summer 2001, is grazing sheep. Sheep eat many herbaceous and woody exotic plants, along with native plants, and seem to help promote grasses. This conservation tool is in the very early stages of experiment.

Exotic control: If necessary control invasive plants, particularly the glossy buckthorn, with herbicide treatment of cut stems. The soil should be disturbed as little as possible.

Trails: Trails should be carefully developed and monitored throughout the site to minimize erosion and habitat fragmentation.

Black Oak/PitchPine/Scrub Oak Mosaic

Environmental setting: This community type is a later successional stage than the grassland community of the dry acidic community continuum. As with the grassland community, the black oak-pitch pine-scrub oak community is found on the well drained to very well drained, low nutrient soils formed over kame terraces and glacial till. Fires are less frequent occurrences, but have been an historical disturbance and are still essential to maintaining this community type. The best developed example of this community is found on the knoll north of the marsh. The area with the most pitch pine is just to the east between the vernal pool and Sheila Road.

Vegetation description: This community type blends elements of pitch pine-scrub oak community and black oak savannah types described by NHESP. It is characterized by widely spaced, broad spreading black oaks (*Quercus velutina*), black cherry (*Prunus serotina*), and in some areas pitch pine (*Pinus rigida*). The tree canopy is often only 10 to 20% total cover with black oaks typically 50 feet apart or more, growing to 16 inches dbh. Black oaks comprise up to 80% of the relative cover. These old trees are wide spreading indicating that they have grown out in the open. Black oaks are a fire adapted tree. Some of them have double trunks indicating that at one time they were cut or burned and have subsequently resprouted. Black cherry is an occasional canopy component and is equally broad spreading. In the driest areas, such as the north knoll, scarlet oak (*Q. coccinea*) is occasional to frequent. White oaks (*Q. alba*), which are thinner barked and not adaptable to fires, are rare. These latter tree species make up about 20% relative cover of the canopy which ranges in height from 30 to 50 feet.

In one area, near the Sheila Road entry, pitch pine comprises 20 to 40% of the total canopy cover. Most of these trees are 15 to 25 feet high, although some range up to 30-35 feet. Scrub oak (*Quercus ilicifolia*) forms dense thickets. Pitch pine often requires fire to open its serotinous cones and release the seeds. The seeds germinate best on open mineral ground that has a coating of nutritious ash. Thus pitch pine is another indicator of a fire-adapted community. Where fires have been suppressed, oaks begin to dominate and the pitch pines are eventually shaded out.

Growing around and below these larger trees is a mix of scattered islands of typical old field successional species. Multi-stemmed clumps of gray birch (*Betula populifolia*) are common. Oak saplings, black cherry, and occasionally glossy buckthorn (*Rhamnus*

frangula) grow 10-20 feet tall. Aspen (*Populus tremuloides*) can be dominant in some areas, forming extensive clones. Occasional to frequent stands of smooth sumac (*Rhus glabra*) grow along edges. The lower growing scrub oak can form dense thickets or grow as isolated clumps. Total cover of this mixed sapling and tall-shrub layer varies considerably from only 20-30% to up to 40-60%. In the more open sites, a low-shrub layer forms providing up to 20% total cover. Low-bush blueberry (*Vaccinium angustifolium*), black huckleberry (*Gaylussacia baccata*), dew berry (*Rubus flagellaris*), and meadowsweet (*Spirea alba*) occasionally form large colonies. Bayberry (*Myrica pensylvanica*) and chokeberry (*Aronia melanocarpa*) are rarer components.

In some areas, broad spreading black oaks are scattered amidst a dense shrub layer dominated by the invasive exotic glossy buckthorn. An example is found between the west shrub swamp and the red maple swamp. Unfortunately, the natural integrity and successional dynamic of this area is probably severely compromised by these invasive plants.

Special features: This woodland mosaic, with its broad-spreading, majestic oaks, is an unusual community type in suburban Boston. The combination of well-drained, acidic soils and a history of fire has created the structure, in some areas, of an oak savannah. In one area, pitch pines dominate, and form a community type suggestive of the pitch pine habitats typical in the sandy outwash soils of Cape Cod. The north knoll is particularly scenic not only as one climbs up through the groves of trees and openings but also for the views across the marsh. Large black oaks throughout the Great Meadows are notable landmarks.

Management issues:

Fire: The oak savannah-pitch pine-scrub oak community depends on fire. However, because it includes substantially more woody material and, therefore, greater fuel load than the grasslands, burning is a more difficult operation.

Trail erosion: As with other parts of the site, overuse by visitors, particularly mountain bikes, has created many trails on rocky steep trails which are becoming seriously eroded.

Invasive exotic plants: Some areas are dominated by invasive plants such as glossy buckthorn. Although low-nutrient, acidic soils tend to deter these adaptable species, buckthorn has become dominant in some areas. It may dominate the more open woodlands if it is not controlled.

Recommendations:

Woodland management plan: A carefully prescribed management plan for both the black oak/pitch pine/scrub oak and grassland communities would sustain these unusual and scenic community types. The plan could include controlled burns and/or intermittent cutting of shrubs and larger successional trees, such as the gray birch and cherry, while leaving the larger black oak trees and their saplings.

Trail system and regulations: A defined, well-thought-out trail system along with regulations prohibiting mountain bikes would help protect the steep hillsides from erosion.

Exotic control: If necessary, control the invasive plants with herbicide treatment of cut stems. The soil should be disturbed as little as possible to prevent establishment of new propagules. Priority sites would be those where glossy buckthorn is just invading, not areas that have become dominated by this pernicious species. Invasions by new exotic species, such as swallowwort and garlic mustard, should be controlled immediately.

Successional Mixed Deciduous Forest

Environmental setting: This young even-aged forest, found on well-drained soils of glacial kames and till, has grown up without disturbance of recent fires. This community type is frequent around the perimeter of the property, the islands in the marsh, and in the ecotone between dry upland and wetlands.

Vegetation description: The canopy consists of a mix of black cherry, red maple, aspen, and gray birch in various distributions. Total cover is about 80%, although in some areas there are openings. Average height is 25 to 30 feet with average dbh about 4 inches. Trees are more or less similar in size and height within each stand, unlike the community types described above. Glossy buckthorn (*Rhamnus frangula*) is often dominant in the shrub layer with scattered silky dogwood (*Cornus amoemum*) in lower areas and oak saplings in slightly drier areas. In other areas dominated by oak in the canopy, scrub oak (*Quercus ilicifolia*) is dominant in the shrub layer. Low-growing sheep laurel (*Kalmia angustifolia*) and blueberry (*Vaccinium angustifolium*) may be frequent. The herbaceous layer is often dominated by a grass-like groundcover of Pennsylvania sedge (*Carex pensylvanica*), which provides up to 90% total cover.

Aspen groves: Trembling aspen forms groves along the Minuteman Bikeway and around some of the grasslands. Trees average 20 feet tall and 3-4 inches dbh. Total cover is 80-90%. The overstory is dominated by aspen with a sparse shrub layer of dewberry (*Rubus flagellaris*) and a dense groundcover of Pennsylvania sedge (*Carex pensylvanica*). Other areas are invaded by dense buckthorn growing 6-10 feet tall. Overall plant diversity is very low.

Management issues/Recommendations: At this time, no recommendations are suggested.

Oak Forest

Environmental setting: Just south of the north boundary and surrounding a vernal pool is a mature oak forest that is approximately 50 to 75 years old, if not older. As such it is the oldest forest at Arlington's Great Meadows . The soils are primarily well-drained Hinkley loamy sand and Canton extremely stony, fine sandy loam and the topography is gently rolling with 8-15% slopes. It blends into the oak savannah and pitch pine community to the south and west but differs in that this area has not burned regularly and the trees do not have the broad spreading crowns of the trees that grew out in the open.

Vegetation description: This mature deciduous forest is dominated by oaks with an understory of low-bush blueberry. Red, white, and black oaks (*Quercus rubra*, *Q. alba*, and *Q. velutina*), along with occasional red maple (*Acer rubrum*) and black cherry (*Prunus serotina*), and rarely pitch pine (*Pinus rigida*), provide a canopy of 80% total cover. Unlike the black oak savannah community type, in the oak forest, red and white oaks are common. Smaller understory trees include oak, black cherry, gray birch (*Betula populifolia*), and sassafras (*Sassafras albidum*). The shrub layer is often dense and is dominated by low-bush blueberry (*Vaccinium angustifolium*) and black huckleberry (*Gaylussacia baccata*). Patches of scrub oak (*Quercus ilicifolia*) are frequent in the sunnier areas, and highbush blueberry (*Vaccinium corymbosum*), American hazelnut (*Corylus americana*), glossy buckthorn (*Rhamnus frangula*), and red chokeberry (Aronia spp.) are occasional throughout. The herbaceous layer includes bracken fern (*Pteridium aquilinum*), Canada mayflower (*Maianthemum canadense*), wild sarsaparilla (*Aralia nudicaulis*), and whorled-loosestrife (*Lysimachia quadrifolia*) which are typical of dry oak forests in the region. More rare to find, but indicative of acid woodlands, are pink lady's-slippers (*Cypripedium acaule*), bastard toadflax (*Comandra umbellata*), and the delicate spring ephemeral wild oats (*Uvularia sessilifolia*).

Special features: This site has the oldest forest community with a relatively well developed canopy and shrub layer and a variety of plant species typical of oak forests. The oak forest buffers the vernal pool (see below). Two cart paths 75 years or older provide walking access through the forest.

Management issues/Recommendations: This forest, along with the oak savannah and grasslands, covers much of the upland area of Arlington's Great Meadows. Although currently there is no direct access from any roads, this upland area could be the most vulnerable to any development plans. Permanent protection of the entire property is the prevention to such use.

WETLAND

The Great Meadow - Shallow Emergent Marsh Community

Environmental setting: Great Meadows was named for the extensive shallow emergent marsh which covers much of the property. The marsh has formed within a large kettlehole created by glaciers thousands of years ago. Over the years, plants have gradually decayed forming a very deep organic substrate called Freetown muck, which overlies the sands and gravels of the glacial outwash deposits. The watertable is at or near the surface most of the year. Lower portions of the meadow flood in the spring. However, many areas are only slightly moist to dry underfoot in the fall. There are three different islands within the marsh which are drier and support woody successional growth.

The elevation of the marsh varies only a few feet from 164 to 169 feet. However, even a half a foot can alter the conditions for plant growth. Aerial photographs indicate that the marsh has been extensively ditched and that the vegetation is very irregular. Historical reports mention that area was mined for peat, although the exact location was not researched by this author. The hydrology has been furthered altered over the years by periodic damming and the construction of a railroad line to the south (now the bikeway).

In the 1946 aerial photograph of the area a small building is situated a few hundred feet north of the upland across from the current Waldorf School. The ground does not appear flooded, indicating that the marsh can be relatively dry at times. The ditches and diversion of Sickle and Munroe Brooks were very clear in the 1930 photographs.

Vegetation description: Marshes are dominated by herbaceous plant species that can tolerate the high watertable thoughout the year. This shallow emergent marsh is dominated by Canada bluejoint grass (*Calamagrostis canadensis var. canadensis*) with colonies of broad-leaved cattail (*Typha latifolia*) in deeper areas and tussock sedge (*Carex stricta*), often with marsh fern (*Thelypteris palustris*) in somewhat shallower water. Purple-loosestrife (*Lythrum salicaria*) is dominant in some areas, but infrequent in other areas of the large marsh. The aggressive reed grass (*Phragmites australis*) has formed at least three colonies over 100 to 200 feet wide and long. Wool-grass (*Scirpus cyperinus*) and lakeside sedge (*C. lacustris*) are frequent but usually form only small stands, while slender woolly-fruited sedge (*C. lasciocarpa*) forms large but often sparse colonies. Occasional showy flowering plants include flat-topped aster (*Aster umbellatus*), New York aster (*Aster novi-belgii*), purple-leaved willow herb (*Epilobium coloratum*), and great water dock (*Rumex orbiculatus*). Woody plants include frequent bristly blackberry (*Rubus setosus*), meadowsweet (*Spirea alba*), steeplebush (*S. tomentosa*), occasional buttonbush (*Cephalanthos occidentalis*), and infrequently elderberry (*Sambucus canadensis*).

Around the perimeter of the shallow emergent marsh, gray birch (*Betula populifolia*), silky dogwood (*Cornus amoemum*), gray dogwood (*C. racemosa*), and willows (*Salix discolor, S. petiolaris*) extend into the marsh. A few large black willows (*S. nigra*) to 30 to 40 feet tall grow in the southwest corner, but are not found elsewhere.

Wildlife: A variety of wetland birds visit the marsh. In the bird survey conducted in 1991, the surveyors noted routine occurrences of Northern Harrier and Willow Flycathers, along with breeding Swamp Sparrows, Common Yellow-throats, and Marsh Wrens.

Finger Marsh

A wetland lobe by the Minuteman Commuter Bikeway, called Finger Marsh, has shallower, Swansea muck soils and a different composition of wetland species. Canada bluejoint, purple loosestrife, broad-leaved cattail, and reed canary grass (Phalaris arundinacea) are co-dominant. Interspersed are jewelweed (Impatiens capensis) and beggar's ticks (Bidens sp.). Where the trail crosses over the wet swale, Jerusalem artichoke (Helianthus tuberosus), Joe-pye weed (Eupatorium dubium), goldenrods (Solidago spp.), and fowl-meadow grass (Poa palustris) add to the diversity, along with several other grasses and sedges. Shrubs in the area include silky dogwood and elderberry. Total vegetation cover is 80 to 90% or greater.

North Lobe

In the corner of the property by Emerson Gardens and the East Lexington Nursing Center is a wetland with remarkably little purple loosestrife or glossy buckthorn (*Rhamnus frangula*) that supports a good diversity of wetland species, both shrub and herbaceous. The dominant plants include marsh fern, lakeside sedge, meadowsweet, and steeplebush, with 2 to 3 foot high hummocks of tussock sedge with sphagnum moss growing in between. The average height of the vegetation is 3 to 4 feet with 80-90% total cover. Wetter pockets support marsh St. Johnswort (*Triadenum virginicum*), dwarf St. Johnswort (*Hypericum mutilum*), and wool-grass. Buttonbush is patchy, growing from 2 to 4 feet high. Ten to fifteen foot red maple (*Acer rubrum*) is scattered in slightly drier areas along with occasional gray birch. Canada bluejoint is only occasional throughout the marsh in contrast to the central marsh where it is a dominant species. Patches of shrubs found along the west side include leatherleaf (*Chamnaedaphne calyculata*), sweet gale (*Myrica gale*), and maleberry (*Lyonia ligustrina*).

Special features: The marsh, with its lobes, is an extraordinary natural resource within suburban Boston. It is unique in its geological formation: a deep kettlehole filled with up to 26 feet of peat surrounded by kame terraces. The juxtaposition of extremely well drained soils to the poorly drained organic substrates provides an unusual contrast accentuated by the history of burning. The open land around the Great Meadows allows for views across it. The marsh itself serves as habitat for a variety of birds, mammals, amphibians, reptiles, and insects. Its size, shape, and inaccessibility by people provide seclusion for wildlife.

Management issues for the Great Meadow (including Finger Marsh and North Lobe):

Invasive exotic species: Purple loosestrife and phragmites dominate parts of the central marsh and lobes. Purple loosestrife overwhelms the native plants and reduces habitat for birds. For instance, Marsh Wrens construct their nest between the supple stalks and leaves of cattails. Purple loosestrife stems are too stiff.

The colonies of phragmites have expanded over the last few years. The character of the marsh, both ecological and aesthetic, would be greatly diminished by a dominance of phragmites. Examples of such dominance are found around Spy Pond in Arlington and along the Fenway in Boston. Dominance of phragmites also poses a fire hazard in these areas, not to mention the loss of views and wildlife habitat.

Public use and trails: Several trails around the marsh go through wetland areas. These tracks are becoming sloughs due to destruction of the plant root systems by mountain bikes. These mud holes become impassable to pedestrians.

Public use and wildlife: While each animal species responds differently to the presence of human motion, sound, and smell, in general wetland wildlife managers recommend a 300 foot buffer to prevent disturbance to nesting and resting wildlife, particularly waterfowl. As visitation increases around the perimeter, the safe haven of the interior of the marsh is reduced.

Cutting of vegetation: During a survey in February 2001, the botanist noticed significant cutting in the northeast corner of the marsh, presumably by neighbors to open the view. Not only is this a violation of the Wetlands Protection Act, but also the work was conducted on town land and, therefore, is destruction of public property. Removing these protective buffers reduces vital screening of wildlife habitat.

Management recommendations:

Control invasive exotics: Controlling invasive exotics is not an easy task under any circumstances, and is particularly difficult in the Great Meadows marsh due to the species types and the locations. The priority should be given to controlling the expansion of phragmites by using the most up-to-date methods possible. Cutting and dabbing each stem with a drop of herbicide is proving effective; however, is extremely labor intensive. Such an effort would require careful planning and a contingent of volunteers. Such activities have been coordinated by the New England Wild Flower Society in sensitive habitats.

At this time, scientists are researching the use of biological controls for purple loosestrife. Great Meadows National Wildlife Refuge is a release site for two organisms, a beetle and a weevil. Depending on the results of this experiment, managers should consider using biological control for purple loosestrife at the Arlington's Great Meadows.

Red Maple Swamp

Environmental setting: This large forested wetland is found in the western edge of the property between the borders along Maple Street and Emerson Gardens. It is an extensively ditched area of Freetown muck surrounded by excessively drained Hinckly soils. The overall microtopography is flat, with no discernable hummocks or hollows. The swamp drains gradually to the east. It is on the drier end of the wetland continuum.

Viewing historical aerial photographs, it appears that some areas were used as a nursery or for other agricultural use and that it has relatively recently grown up into woody

vegetation. This recent disturbance may be responsible for colonization of glossy buckthorn.

Vegetation descripton: This swamp is dominated by young red maple (*Acer rubrum*) which grows to 15 to 20 feet. The trees often have several stems, each only a couple of inches in diameter, indicating that the trees have been cut several times in the recent past. Diversity is very low in this young forest. Occasionally there is a clump of gray birch (*Betula populifolia*), also indicating a successional habitat. Glossy buckthorn (*Rhamnus frangula*) dominates the shrub layer growing to 6 to 10 feet and providing 40 to 60% total cover. Swamp azalea (*Rhododendron viscosum*) and highbush blueberry (*Vaccinium corymbosum*) are occasional to rare in most parts of this swamp. A few royal (*Osmunda regalis*) and sensitve ferns (*Onoclea sensibilis*) are scattered about.

Management Issues/Recommendations: This swamp has been greatly disturbed in the recent past and glossy buckthorn has pervaded the understory. No control action is recommended at this time except to protect the area around the Peat Pond (see below) by removing invasive species.

Vernal Pool

Infinity Pond, the vernal pool, set within the oak forest, on the north side of the Great Meadows has been extensively studied by Ruth Ladd as part of a master's degree project in 1991. The information below is liberally excerpted from her report. Ms. Ladd kept a complete list of the flora and fauna. Her flora list has been incorporated into the plant lists by Frances Clark, which are found in the appendix. See also Tables 2 and 3.

Environmental setting: Infinity Pool is a one-half acre vernal pool at elevation 174.6 feet. It is contained within a watershed of 3.5 acres, draining from the high point of Infinity Hill, the kame to the west. This small kettle hole is immediately surrounded by excessively drained Hinkley loamy sand of 8 to 15% slopes. The Infinity basin is higher than the areas beyond the basin to the north, east, and south. The elevation of the pond is also higher than these areas. Therefore, it is likely that the pond not only loses water through evaporation and transpiration, but also via the groundwater. This would explain why the pond does not overflow from the excess of precipitation and why the level of the pond dropped precipitously as the area went into drought condition with the resulting drop in groundwater elevation (Ladd, 1991, 4). Measurements taken in the year 1991 showed a maximum depth of water of 30 inches in early May and no water by mid-July. The length of the persistence of water is important as it affects the ability of different organisms to complete their breeding cycles.

This report's author reviewed aerial photographs at the Lexington Town Hall from 1930, 1946 and 1971, all of which distinctly show this pool. Originally it was part of a complex of ponds that extended to the northeast. Many of these were filled in by 1971. The 1946 photographs show shrubby growth in the pool. Although it is hard to interpret, there may have been shrubby growth in 1930; however by 1946 the vegetation appears to be trees. The margins of the forest extended over time until it was cleared to the north for development. Thus, the pool has been set within a wooded setting for at least 75 years, and possibly many more.

Vegetation description: This description treats the vernal pool itself and the wetland vegetation immediately surrounding the depression and is based on a site visit in August 1997. Vegetation composition can change radically in vernal pools from year to year both in percent cover and in species.

In August 1997, vegetation covered approximately 50% to 75% of the basin area. Overall, the vegetation was patchy with colonies of some species providing almost total cover in some areas, and in other areas vegetation was sparse. Three-way sedge (*Dulichium arundinaceum*) was dominant, forming several colonies providing 50% total cover. A robust spikerush (*Eleocharis palustris*) was interwoven through the three-way sedge stands and also formed isolated patches totaling 15% total cover. A much smaller spikerush (*Eleocharis acicularis*) was occasionally scattered along with sphagnum moss near the pond's north end. There were also small patches of cranberry (*Vaccinium macrocarpon*), fowl meadow grass (*Glyceria canadensis*), swamp candles (*Lysimachia terrestris*), and swamp beggar's ticks (*Bidens connata*). A few shrubs of buttonbush (*Cephalanthos occidentalis*), leatherleaf (*Chamnaedaphne calyculata*), and meadowsweet (*Spirea alba*) were occasionally scattered throughout and most likely persist from year to year.

Around the perimeter is a combination of trees and shrubs. Large trees of swamp white oak (*Quercus bicolor*) are common to the north and northeast, rising directly out of the water in springtime. These trees grow to 50 to 60 feet tall and 16 inches dbh. Red maple (*Acer rubrum*) provides about 20% total cover around the perimeter. Highbush blueberry (*Vaccinium corymbosum*) is common mostly in the southeastern part of the pond along with winterberry (*Ilex verticillata*). Overall the southern part of the pond is more shaded with more shrubs. Swamp azalea (*Rhododendron viscosum*) and withe-rod (*Viburnum cassinoides*) and are also present.

Special features: This is the only vernal pool on the property (with the possible exception of the Peat Pond). It includes many features common to woodland vernal pools in eastern Massachusetts, including resting within a small kettlehole depression which contains water in the spring of the year and then dries up by mid-summer. The vegetation in the center is primarily herbaceous, including many annual plant species. Trees and shrubs ring the perimeter. This pool was certified by the Natural Heritage and Endangered Species Program (Number 184) in June 1991. This is one of six vernal pools certified in Lexington.

Infinity Pool is an unusual feature for Great Meadows and for the town and region. Many of these temporary wetlands have been filled in over the years, as were the possible vernal pools to the north/northeast of the property. Every effort should be made to protect the pool, including protecting the surrounding forest from cutting for fires or and any other alterations. This pool is a scenic attraction, with the round pool of water reflecting the tall trees and skies above, nestled in the surrounding dry oak forest. It also is an important educational resource for science classes. In some years it is used for ice skating.

Management issues/Recommendations:

Vegetation Cutting: In August 1991, the trees and shrubs growing around and in the pond were cut to enhance skating conditions. The shrubs also appeared cut back in 1997. Cutting of vegetation should be terminated or at least carefully considered, as the buttonbush and other shrubs are particularly important habitat for macro-invertebrates and amphibians and reptiles.

Peat Pond

Environmental setting: This small wetland, 150 by 100 feet in size, lies within the red maple successional swamp near the western part of the property. It is easily accessible by a trail that leads from Emerson Gardens to the central meadow. Soils are Swansea muck, a deep organic substrate which has a watertable at or near the surface for much of the year. A shallow pool of a few inches of water is present during the spring of most years. This pool differs from Infinity Pool by having organic instead of mineral soil and being saturated, if not flooded, for much of the year. It has not been certified as a vernal pool.

Vegetation description: This small area is rich in plant diversity. It contains a combination of perennial floating and emergent aquatic plants, along with fragile small annuals and robust colonies of shrubs. White water-lily (*Nymphaea odorata*) has colonized the open sunny center with its shiny round leaves providing 15-20% of the vegetation cover. A delicate spikerush (*Eleocharis sp.*), only one to two inches tall, forms a grass-like mat in this same area. A few creeping cranberry plants (*Vaccinium macrocarpon*) and glistening sundews (*Drosera intermedia*) grow in the sunlight as well. Around the colony of water-lily grows a combination of spikerush, yellow swamp candles (*Lysimachia terrestris*), and pink-flowered marsh St. Johnswort (*Triadenum virginicum*). The unusual Virginia chain fern (*Woodwardia virginica*) is rare, while the more robust spikerush (*Eleocharis palustris*) and marsh fern (*Thelypteris palustris*) form occasional patches. Purple loosestife is rare. Small shrubs, only 1 to 1.5 feet tal,l of buttonbush (*Cephalanthus occidentalis*) are scattered in the central area as well. Ringing the pool are colonies of shrubs including buttonbush and sweet gale (*Myrica gale*) along with mounds of tussock sedge (*Carex stricta*). Swamp azalea (*Rhododendron viscosum*) and highbush blueberry (*V. corymbosum*) are occasional and extend into the surrounding red maple swamp which is dominated by red maples mostly 20 to 30 feet tall and glossy buckthorn 6 feet tall.

Special features: For its size, the peat pond community has the greatest plant diversity found in Great Meadows. Furthermore, several of the plants here are unusual or rare to Great Meadows. Many, such as the sundews, spikerushes, beak-rush (*Rhynchospora alba*) and cranberry, are very small and delicate and thrive in the moist, acidic peat. The lack of purple loosestrife is unusual for wetlands in Great Meadows. The pool in spring reflects the plants around it and is a particularly popular site to visit for picnics.

Management issues:

Inappropriate public use: This appealing spot is easily accessible from Emerson Gardens by a trail. It is used as a party spot at night, as well as a picnic place in the daytime. It is also occasionally overrun by mountain bikes. Unfortunately, the combined activities are

degrading this sensitive wetland with its fragile plants and animals. Lawn care operators and possibly neighbors dump their garden waste along the edge of the parking lot and sometimes down the nearby trail. The trash of bottles and other refuse give a sense of neglect which stimulates further irresponsible behavior.

Invasive exotic plants: Along the bank behind the parking lot of Emerson Gardens is a large colony of garlic mustard (*Alliaria petiolata*), as well as thickets of Morrow's honeysuckle (*Lonicera morrowii*) and large trees-of-heaven (*Ailanthus altissima).* The garlic mustard in particular poses a threat to the surrounding forest, wetland, and peat pond.

Management recommendations:

Public education and stewardship: Work to increase public stewardship of this sensitive area by talking to neighbors at Emerson Gardens to see if a couple of residents might "adopt" the area and take on the responsibility of cleaning up after parties and if necessary, calling the police if parties get out of hand. Such vigilance is the best deterrent
to unwanted activity. Holding an occasional nature walk for the neighborhood would increase public concern as well.

Control invasive exotics: Removing garlic mustard should be a priority as this is one of the few concentrations in Great Meadows and the invasive could easily spread around the sensitive peat pond. The plants should be cut or pulled before flowering for a period of six years. Purple loosestrife should also be monitored and removed before it becomes dominant. This would be a good volunteer project.

Animals

Mammals

No comprehensive inventory of the mammals has been conducted; however, several species are probably found in this suburban conservation land. Common species are listed in Table 2.

Birds

Over 100 species have been recorded and 56 species are known to nest in Great Meadows (see bird list in appendix). During the peak of the breeding season (in June and July) as many as 40 species of birds can be seen in a single visit. (Andrews 1991, 1) Notable species are found at several birding hot spots: Migrant land birds such as warblers and vireos are found in the successional areas of the oak savannah/grassland at the north end of the property. Field Sparrows and Prairie Warblers also nest in these community types. Common Snipe and American Woodcock are found in the northeast part of the Great Meadows marsh. In the open marsh itself, Marsh Wren, Willow Flycatcher, and Swamp Sparrow breed. In the southwest successional areas. Brown Thrasher, Blue-winged Warbler, Rose-breasted Grosbeak, and Northern Orioles are features. In fall, Sharp-shinned and Cooper's Hawks often perch in the trees on the edge of the marsh. Other hawks such as Red-tailed Hawk, American Kestrel, and Northern Harrier hunt the extensive marsh. Sparrows are often evident in the fall around the western edges of the

marsh. (Andrews, Publication P-10) These are some of the over 200 species of birds seen in Lexington as a whole over the preceding 20 years. These species attest to the value of extensive upland edge with successional habitat and large area of marsh.

Reptiles and Amphibians

A total of 12 species of amphibians and reptiles have been inventoried at Arlington's Great Meadows. In a study sponsored by the Mystic River Watershed Association, John Andrews confirmed eight species in the study area:

Red-backed Salamander
Bullfrog
Green Frog
Spring Peeper
American Toad
Wood Frog
Eastern Garter Snake
Painted Turtle

The vernal pool survey by Ruth Ladd adds three other species:

Snapping Turtle
Northern Water Snake
Pickerel Frog

A Spotted Turtle was observed at Great Meadows in June 2001 as part of "Biodiversity Days," a community-wide inventory of different species in Arlington, sponsored by the Executive Office of Environmental Affairs.

The majority of the species were found in the northern wetland areas, particularly near Peat Pond. The vernal pool, Infinity Pond, included Wood Frogs. Peeper Pond by the Waldorf School was also important habitat, including Bullfrogs and Green Frogs not recorded elsewhere, but probably using the Great Meadows. Other "herp" species found in Lexington which might be found here with further exploration include Leopard Frogs.

Invertebrates

Ladd's vernal pool study included several invertebrates; however, no systematic study has been done for dragonflies, butterflies, moths or Elderberry Long-horn Beetles (*Democerus palliatus*) (state listed as "special concern"). The elderberries growing at Great Meadows should be inventoried for Elderberry Long-horn Beetles.

Several other invertebrate species were documented in the June 2001 Biodiversity Day (see appendix). Ladd's list of invertebrates is also in the appendix.

Table 2. Observed and Possible Mammals of Arlington Great Meadows*			
Order	**Common Name**	**Scientific Name**	**Likely presence**
Marsupials - *Marsupialia*			
Deldephidae	Virginia opossum	**Didelphis virginiana**	Likely
Insectivores - *Insectivora*			
Soricidae	Masked Shrew	*Sorex cinereus*	Likely in forested wetlands
Soricidae	Northern Short-tailed Shrew	*Blarina brevicaudata*	Likely as is common in Mass.
Soricidae	Hairy-tailed Mole	*Parascalops breweri*	Possible as is locally common in New England, open woods and meadows with light sandy loam
Talpidae	Eastern Mole	*Scalopus aquaticus*	Probable as is locally common, lawns, meadows, pastures, prefers soils with earthworms
Talpidae	Star-nosed Mole	*Condylura cristata*	Uncommon, prefers low wet ground, swamps, wet meadows.
Bats - *Chiroptera*			
Vesperitlionidae	Little Brown Bat	Myotis lucifugus	Likely, common, hawks flying insects, especially mosquitoes.
Rabbits/Hares - *Lagomorpha*			
Leporidae	Rabbit	*Sylvilagus sp.*	Observed but species not known.
Rodents - *Rodentia*			
Sciuridae	Eastern Chipmunk	*Tamias striatus*	Observed, common.
Sciuridae	Woodchuck	*Marmota monax*	Holes observed.
Sciuridae	Gray Squirrel	*Sciurus carolinensis*	Observed, common.
Sciuridae	Flying squirrel	*Glaucomys sp.*	Likely
Castoridae	Beaver	*Castor canadensis*	Observed Biodiversity Day 2001
Cricetidae	White-footed Mouse	*Peromyscus leucopus*	Likely in fields.
Cricetidae	Southern Red-backed Vole	*Clethrionomys gapperi*	Likely as is common in New England.
Cricetidae	Meadow vole	*Microtus pennsylvanicus*	Likely as is abundant in New England.
Cricetidae	Muskrat	*Ondatra zibethicus*	Likely due to extensive marsh.
Muridae	Norway Rat	*Rattus norvegicus*	Likely as is abundant in New England and urban areas.
Muridae	House mouse	*Mus musculus*	Likely as is abundant in and around dwellings
Zapodidae	Meadow Jumping Mouse	*Zapus hudsonius*	Possible as is locally common in New England, available habitat
Carnivores - *Carnivora*			
Canidae	Coyote	*Canis latrans*	Possible
Canidae	Red Fox	*Vulpes vulpes*	Observed
Procyonidae	Raccoon	*Procyron lotor*	Observed
Mustelidae	Long-tailed weasel	*Mustela frenata*	Possible
Mustelidae	Mink	*Mustela vison*	Possible
Mustelidae	Striped skunk	*Mephitis mephitis*	Observed

* information derived from DeGraaf and Rudis. 1987. *New England Wildlife: Habitat, Natural History, and Distribution.*

TABLE 3. Amphibians and Reptiles of Arlington Great Meadows				
Type Order	**Common Name**	**Scientific name**	**Location observed**	**Comments**
Salamanders - *Caudata*				
Plethodontidae	Redbacked Salamander	*Plethodon cinereus*	Peat Pond	
Frogs/Toads - *Anura*				
Bufonidae	Eastern American Toad	*Bufo americanus americanus*	Infinity Pond, Red Maple Swamp, North lobe of Great Meadow	
Hylidae	Northern Spring Peeper	*Hyla crucifer crucifer*	Infinity Pond, Waldorf Pond North Lobe of Great Meadow	
Ranidae	Bullfrog	*Rana catesbeiana*	Infinity Pond, Waldorf Pond	
Ranidae	Green Frog	*Rana clamitans melanota*	Infinity Pond, Waldorf Pond	
Ranidae	Wood Frog	*Rana pipiens*	Infinity Pond, Peat Pond	
Ranidae	Pickerel Frog	*Rana palustris*	Infinity Pond	One observed
Turtles - *Testudines*				
Chleydridae	Snapping Turtle	*Chelydra serpentina sperentina*	Infinity Pond	
Emydidae	Eastern Painted Turtle	*Chrysemys picta picta*	Infinity Pond, Waldorf Pond,	
Emydidae	Spotted Turtle	*Clemmys guttata*		
Snakes - *Serpentes*				
Colubridae	Northern Water Snake	*Nerodia sipedon sipedon*	Infinity Pond	
Colubridae	Eastern Garter Snake	*Thamnophis sirtalis sirtalis*	Infinity Pond area, Red Maple Swamp area	

Mystic Valley Amphipod (*Crangonyx aberrans*) has been recorded at Great Meadows and is listed as a species of "special concern" by the Natural Heritage and Endangered Species Program (see below).

Rare and Special Species

Great Meadows is listed on the Priority Habitats of Rare Species and Estimated Habitats of Rare Wildlife. The Mystic Valley Amphipod, a shrimp-like animal, which lives in shallow, slow moving bodies of water, has been recorded on the property. It is a state listed species of special concern. It is an indicator of relatively unpolluted and healthy wetlands. A Spotted Turtle, observed in June 2001, is a species of special concern, as well. Requiring both upland and wetland habitats, Spotted Turtles are particularly vulnerable to fragmentation of habitat. They are run over frequently by cars when moving through developed landscapes.

No state-listed plant species were observed during the inventory. However, there are several plants that are unusual in this region. For instance, the small peat pond supports sundews, cranberry, and Virginia chainfern.

Great Meadows has one of only six certified vernal pools in Lexington.

Wildlife Corridors

Most of the connections to and from Great Meadows are along ditched brooks that run under busy roads, making them difficult to navigate by both large and small mammals, reptiles, and amphibians. The Lexington Open Space Plan lists Sickle Brook, which connects Great Meadows with Arlington Reservoir, as a significant wildlife corridor. The Bikeway serves as a possible travel route for larger mammals. However, it should be noted that at this time scientists know relatively little about the actual use of different types of corridors by different species. Tracking programs could help determine if indeed animals are using these linkages.

VI. Cultural Aspects

Legal Status

Article 97 designation: Great Meadows is owned by the Town of Arlington and serves as open space in Lexington. It is under the control of the Arlington Selectmen and the Town Meeting. It has not been officially dedicated as conservation land since the enactment of Article 97 in 1972 and yet it has served as defacto conservation land for over a hundred years including protection of water supply, passive recreation, and wildlife habitat. Consequently it may or may not be protected under Article 97 of the Commonwealth's Constitution depending on in part on what the deed states (Jennifer Soper, pers. comm., Dawson and Zelinski, 104). Under Article 97, land dedicated for conservation purposes under G.L. Chapter 40 Section 8C, is restricted to passive activities. Essentially, this dedication prohibits athletic facilities, such as soccer fields, tennis courts, swimming pools, or golf courses. Dedication as parkland under Chapter 45

Section 3 would allow these for these facilities. Under either recreational or conservation dedication, land is protected from development, such as school or public works buildings. Formal dedication of Arlington's Great Meadows as conservation land requires a majority vote of the Town Meeting (Jennifer Soper, pers. comm.). Once so dedicated, a change to another use would require a majority vote of the Commission Commission and a two-thirds vote of Town Meeting and each branch of the state Legislature. (Dawson and Zelinski, 102) An Environmental Notification Form would also have to be filed under Massachusetts Environmental Protection Act. The particulars of these processes are complex and require research by legal professionals.

Also, it is unclear whether or not dedication as conservation land would preclude modifying the area for water supply or flood control. There was a proposal to create a dam at Fottler Avenue, which could flood the Great Meadows in order to provide a greater yield in the buried valley beneath Sickle Brook. (Lexington 1997 Open Space Plan, 38). This legal aspect requires research.

Wetlands Protection Act: The wetlands and the 100-foot buffer zone (200 feet for perennial streams, such as Sickle Brook) are under the jurisdiction of the Wetland Protection Act, and therefore under control of the Lexington Conservation Commission. As the majority of Great Meadows is wetland, many activities on the property are subject to review. It is not clear whether the vernal pool would qualify for protection under the Wetlands Protection Act as it is in an isolated depression. It is possible that it meets the criteria for an isolated land subject to flooding; however, this resource type does not have 100-foot buffer zone.

Town Wetlands By-law: Lexington has a town bylaw that strictly limits development within 50 feet of the wetland edge. Also, there can be no extra drainage off the site.

Zoning: The Great Meadows property is in a Wetland Protection District (WPD) overlay zone. This zoning category affects the possible development options for the site. Surrounding zoning includes residential 30,000 square foot lots (RO), residential two family homes per 15,500 square foot lot (RT), single family homes on 15,500 square feet lots (RS), and residential multi unit (RM) or condominiums such as Emerson Gardens.

Leash law: The only relevant law for those walking dogs at Great Meadows is that dogs must be "under leash or voice control." This regulation pertains throughout Lexington.

Public Access/Use

Responsible and safe public use by neighbors, town citizens, and regional visitors, is important for the long-term protection of the Great Meadows. Without a certain level of public support and regular use, Great Meadows could be developed, grow up into successional growth or forest, or become an unsafe no-man's land.

Also it is important to note that Arlington's Great Meadows abuts over six acres of the D'Augustus Conservation Land owned by Lexington. The trail systems are linked and many people travel from one property to the other not knowing the ownership. Both

Lexington and Arlington have a stake in developing a compatible trail system, use regulations, and enforcement and security plans.

Entry points: Public access is extremely limited given the size of the property as it is surrounded mostly by private property. No signs indicate the entrance to Great Meadows and public parking is limited to on-street parking in neighborhoods and private parking lots. The one parking lot on Maple Street designated by the Arlington Conservation Commission for access to Great Meadows has become overgrown. The most accessible point of entry is from the Minuteman Bikeway.

Public access points include:

- Waldorf School/East Lexington Public Library - one hour parking allowed for library.
- Minuteman Bikeway – approached by foot, bicycle, roller blades, etc.
- Maple Street parking lot - overgrown and difficult to find along this busy street.
- Emerson Gardens - parking is available by the Emerson Condominiums for those who know where the path begins.
- East Lexington Rehabilitation and Nursing Center – This is private property
- Lexington Christian Academy/Bartlett Road – the end of Bartlett Road is rough grass leading into Lexington Conservation Land. However, no trails go to Great Meadows directly from this point and the town land is not directly abutting. Trails lead from the ball fields of the Academy over a bridge to the Great Meadows; however, this parking lot is private.
- Sheila Road – A combination of "No parking" signs and the carefully manicured entrance deters visitors. However, on-street parking is available.
- Fottler Avenue – on-street parking is available by the brook; however, the road is narrow.
- Brandon Street – on-street parking is available. A gate blocks vehicular access to the bikeway. (Note, the Town of Lexington owns a three foot strip at the end of this road)

At this time access to Great Meadows is primarily across private institutional land such as Lexington Christian Academy, Waldorf School, and East Lexington Rehabilitation and Nursing Center. On-street parking near entrances at Sheila Road, Fottler Avenue, and Brandon Streets is available but limited and unwelcoming. Although not an issue at this time, there is potential for conflicts in the neighborhood if too many cars are parked on the streets.

The Minuteman Bikeway is the most likely access point for large numbers of visitors. Completed in 1992, the Minuteman Bikeway attracts thousands of bicyclers, roller bladers, and walkers. The Town of Lexington is committed to providing access to conservation and recreation lands from the bikeway. Arlington's Great Meadows is a natural stop due to its easy access and scenic values.

Recommendations:

1. Post the primary entrance points to Great Meadows with ownership information, regulations, and in some areas interpretive signs.
2. Develop selected access points around the Great Meadows so that they are more inviting.
3. Open up the Maple Street parking area if this can be done safely given the traffic.
4. Research the potential for access from Lexington conservation land to the north.
5. Talk to Lexington Christian Academy, Waldorf School, Emerson Gardens, and the Rehabilitation Center as to parking availability.
6. Work with neighborhoods on parking options.

Public Use**:**

Great Meadows has a variety of public uses, many compatible and some not compatible with wildlife and visitor enjoyment. Users include:

Walkers
Dog walkers
Joggers
Mountain bikers
Bird watchers
Photographers
Berry pickers
Nature classes from local schools and groups
Track team
Skating on Infinity Pond
Camping by Boy Scouts once a year.
Cross-country skiing and snowshoeing
Picnickers

Several undesirable uses occur on Great Meadows. One is partying. These nighttime activities can instigate fires and leave piles of trash and broken glass. Another use has been dumping of yard waste, brush, and household trash near entrances by both contractors and private individuals, and littering throughout. Trespass by motorized vehicles is another management issue. (Arlington Conservation Commission memo, October 1995)

To date there are few concerns expressed about crowding or incompatible uses. People come to Great Meadows to enjoy their outdoors experience. However, over time, there is potential for significantly more use, depending on the amount of access and promotion of the area. Responsible management requires clear regulations and enforcement.

Recommendations:

1. Arlington and Lexington should work together to develop public use regulations that are compatible with their abutting and nearby properties. Regulations should be posted along with ownership, and they should be enforced.

2. Consider prohibiting mountain bikes, motorized dirt bikes and all wheeled vehicles (scooters, ATV's etc). Mountain bikes, the most frequent users of this type, have caused considerable soil erosion, particularly in the southwest corner, and they pose safety hazards.

3. Develop dog-walking guidelines or rules. Owners of dogs should keep dogs on trails at all times to keep them from chasing wildlife and disturbing wetlands and plants. Unleashed dogs, particularly in any number, can deter other users such as walkers, nature watchers, and school groups. Not everyone likes dogs and some people fear them.

Trails:

The Floyd/Andrews trail guide outlines an informative and scenic route along the west side of Great Meadows from the Waldorf School walking clockwise to Sheila Road. To complete the loop, one walks back along Circle Road, Hillcrest Avenue, and Fottler Avenue to the Bikeway. This route is not marked. (See trail map)

Myriad smaller routes lead into and across the edges of wetlands and through the uplands. These create a maze to those not familiar with the property, thus fostering uneasiness in at least some visitors. To others, this tangle of trails provides opportunity for enjoyable exploration. The extensive network of trails fragments wildlife habitat.

In wet seasons, particularly in spring, the longer trail is flooded, thereby, greatly reducing recreational opportunities. However, from a wildlife perspective, the lack of people allows sanctuary for feeding and resting birds, reptiles, and small mammals during critical periods of migration and breeding. In some places animals, such as birds, may set up nests next to trails, which later become vulnerable to visitors when the paths dry out.

Great Meadows has been considered an important link in a greenbelt that connects with the Mystic Lakes. In 1997 it was suggested that trails should be developed from the Mystic Lakes "around the lakes and along the greenbelt connection to the east of Middlesex Fells and the west to Great Meadows in Lexington."

Recommendations:

The main goal is to design and maintain a trail system in keeping with the resources and sensitivities of the site as well as public safety and enjoyment. A secondary goal is to link the trails to other conservation lands including the Mystic Lakes.

1. Sensitive wildlife areas should be determined and areas closed off during certain seasons. Such areas include Peat Pond, the vernal pool, and the north lobe of the Great Meadow marsh. Some of these areas should be off bounds throughout the year and trails rerouted.
2. At least some of the smaller trails should be eliminated to reduce fragmentation and maintenance by judiciously placing brush to obscure the trails.

3. Include a series of loop trails from major access points to enable public enjoyment of the Great Meadows and adjacent conservation land, including the D'Augustus land, throughout the year. This is particularly important from the Waldorf School, Emerson Gardens, and Sheila Road entry points.
4. Either make trails passable throughout the year or temporarily close off trails in wet areas to prevent further erosion to the wetlands. Any bridges should be designed to deter bicyclists, if bicycling is to be prohibited.
5. Distribute maps to orient people.

Security:

Great Meadows is a relatively remote wild land with a variety of access points and a maze of trails. In most areas the visibility is open and the site is well used by a variety of people, both of which increases public safety. It is important to note that some corners are off the beaten path, are screened by dense vegetation, and are not easily accessible by public safety vehicles. Often it is difficult for fire department to know where to go to put out a fire because there is no location system in the Great Meadows.

Brush fires are a somewhat frequent occurrence at the Great Meadows. Some of them are escaped camp fires and others are likely set by teenagers and others. None have harmed nearby residences. Ground fires are the most difficult to contain as they burn in the peat and can smoulder for days.

Recommendations:

1. Enhance public safety by maintaining the openness of the area and keeping at least the main trails marked and well maintained. Dead-end trails into inaccessible corners should be blocked off. A well-marked trail system will encourage appropriate use by the general public.
2. A formal emergency response plan should be developed in cooperation with the police and fire departments of both towns.

Community Support

The Town of Lexington has a long history of protecting conservation land and active stewardship. Over 1300 acres of open space have been preserved in Lexington. These town lands are distributed evenly throughout the town. As a result of this strategy, each neighborhood now shares the benefits of open space (Lexington 1997 Open Space Plan, 3). Since 1966 the Lexington Conservation Commission has been concerned "not only with the preservation of our natural resources, but also with their efficient use and management for the benefit of the Town's citizens." Lexington is one of the few towns in the Commonwealth to have established a Stewardship Committee. Many of the objectives and guidelines in the *Stewardship Manual for Lexington Conservation Land* are relevant to this project.

Although Great Meadows is owned by Arlington, it has been prominently featured in the 1997 Lexington Open Space Plan as one of the top priorities to protect for its natural

resources and recreation value. The plan notes that the Minuteman Bikeway opens up access to existing open space properties and provides an incentive to protect land adjacent to it, in particular, Great Meadows. It states that the East Lexington Community Association, organized in 1987, lists Great Meadows as the most valued resource. The open space plan also cites the need to coordinate bike and hiking trails with surrounding towns and for Lexington to work with Arlington to be sure Great Meadows is properly maintained. The 1971 Hydrology and Land Use Report sponsored by the Joint Committee from Arlington and Lexington recommended maintaining it as a conservation area. Numerous publications by the Citizens for Lexington cover the natural history of Arlington's Great Meadows. These publications indicate the ongoing public interest in the preservation of the natural resources.

Support groups include:

Arlington Open Space Committee
East Lexington Community Association
Lexington Stewardship Committee
Citizens for Lexington Conservation
Mystic River Watershed Association
Arlington Conservation Commission
Lexington Conservation Commission

This rich resource of community support should be mobilized to further the goals and recommended actions of this plan.

SECTION THREE
ANALYSIS AND RECOMMENDATIONS

I. Values

The following list is a summary of the special values of Great Meadows, many of which are found throughout the body of this report.

Ecological

Overall Great Meadows provides watershed protection for a variety of ponds, streams, and wetlands and serve as the important habitat for numerous birds, mammals, reptiles and amphibians, and plants.

- Part of a network of natural open space within the triangle formed by Rte 128, Rte. 3, and Rte 2 - These green spaces support the last remaining habitats for wildlife in these urbanized towns. Each of the nearby areas enhances the value of the others.
- Linkage to open space west of Route 128 by the Minuteman Bikeway and other wetland and upland routes. Linkages provide for movement of wildlife and potentially the genetic viability of populations over time.
- Eastern-most connection from the west to Mystic Lakes.
- Largest contiguous piece of undeveloped land in Lexington (Lexington Open Space Plan 1997, 163) with a variety of flora and fauna in its own right.
  - 100 species of birds recorded, over 56 species nesting.
  - 11 species of amphibians and reptiles.
  - 251species of plants in 8 different plant communities.
  - One of only six vernal pools certified in Lexington.
- Unusual habitats for area:
  - One of several wet meadows in the area including Tophic, Dunback, Metropolitan State Hospital, Rocky Meadow and Clematis Brook, which together provide extensive habitat for birds.
  - Oak savannah, little bluestem grasslands, and successional shrub land all sustained by a cultural history of burning.
- Protects portion of Sickle Brook.
- Provides essential flood protection for Arlington Reservoir.
- Links other conservation lands with Munroe Brook as well as Sickle Brook, thus enhancing value of each.

Cultural/Aesthetic

- Scenic vistas over marsh.
- Open grasslands and woodlands with stonewalls and historic cartpaths, which are unusual scenic amenities.
- Historically known for playing a part in the early history of Lexington – the site of Winship family house and mill.
- Part of the old railroad right-of-way.

- Used by William Brewster, a renowned Harvard University ornithologist, for bird watching in the late 1800s.

Passive recreation

- Extensive and naturally variable trail system throughout much of the 183 acres. which is used by walkers, joggers, bike riders, berry pickers, and cross-country skiers.
- A scenic stop along Minuteman Bikeway which is used by thousands.
- Location near, and regularly used by, two schools with students of various ages:
  - Waldorf School - Kindergarten through 9th grade.
  - Lexington Christian Academy - track and field team uses trails.
- Located within densely populated East Lexington, and abutted by single family residences and Emerson Gardens condominiums, and thus accessible to large number of area citizens.
- Popular birding spot cited in numerous bird guides.

Educational

- Variety of educational resources – geological features, plant communities, variety of animals, wetlands and vernal pools, which make Great Meadows an ideal outdoor classroom.
- Located next to two schools.
- Opportunities of nature education for all visitors.
- Potential to be part of the state's Watchable Wildlife program.

II. Concerns

Protection

Several threats could affect the existence of Great Meadows and its ecological, cultural, recreational, and educational resources. The overarching threat is the conversion of land-use from a natural open space to a more developed status which would impact the existing unique values of Great Meadows. As long as Great Meadows is unprotected open space, development remains a possibility and continues to divert citizen support from managing the property. Those attending the public forum in December 1999 listed permanent protection of Great Meadows as a priority.

To date, those concerned about the preservation of Great Meadows have not conducted a thorough analysis of the development and protection options. This analysis should be done in order to develop an appropriate strategy. Much of Arlington's Great Meadows is wetland surrounded by slender areas of upland, with the exception of the north area. The wetlands and nearby perennial streams, and their statutory buffer zones, should be delineated to determine the extent of developable land. Access is extremely limited and, even if possible, would go through well-established neighborhoods probably creating community resistance. The threat by development to flood control and values of water supply have been documented in extensive reports. It is important to investigate what is feasible and probable given the citizen concerns and political will to help focus resources.

Options for protection have not been studied thoroughly. Below are some possibilities, which could be selected and combined:

- Arlington dedicates the Great Meadows as conservation land so that it is given protection under Article 97
- Arlington and Lexington develop a Memorandum of Understanding on the management of the property to help share costs and responsibilities.
- Arlington sells the property in fee or sells a conservation restriction to Lexington
- Lexington buys the property for other public uses
- Lexington acquires the land for conservation purposes.
- Arlington sells the property to a private owner
- Another conservation entity aids the communities of Arlington and Lexington in protecting the site.

Stewardship

Active management of the property is essential to sustain the many values of the open space. Of prime concern is maintaining the unique natural communities that rely on periodic natural disturbance, such as fire. Without ongoing disturbance, the successional grassland and oak savannah community types will return to forest communities. Also, if not controlled, invasive exotic species will dominate and change the ecological and scenic attributes of the site.

A third major challenge is balancing the potential increase in public use while maintaining ecological and scenic values. While public access is essential for long-term public support, turning Great Meadows into another suburban park would greatly diminish its special qualities. Increased publicity and public use can disturb wildlife, degrade natural communities, increase erosion of trails, and decrease the natural tranquility of the site. Furthermore, stewardship can be expensive. While the cost of posting signs is relatively minor, maintaining gates and safe trails requires careful planning and conscientious supervision. Once more people use the property, fewer brush fires will be set and therefore active management of the successional habitats will be necessary to keep them open. However, this being said, there are opportunities to involve the many existing community groups that already have shown interest in helping. Different state programs such as the Division of Fisheries and Wildlife's Upland Management Program, Executive Office of Environmental Affairs' Wetlands Restoration and Banking program, and the Department of Environmental Management's Watchable Wildlife program could be incorporated.

Also, it is important to realize that all the recommended actions do not need to be done at once. While it is important to maintain the momentum of interest generated by this report and associated meetings, small steps of placing signs, conducting walks, and developing volunteer projects are a sufficient start to establishing proprietorship over the property.

*Ecological**:***

- Increased visitation, especially by people with dogs and mountain bikes, increases disturbance to wildlife, causes soil erosion, and degrades plant communities.
- Increased numbers of informal or formal trails fragment and degrade remaining habitat.

- Spread of invasive exotic species, such as swallow-wort, phragmites, and buckthorn, threatens native plant communities.
- Lack of management of natural succession will reduce area of oak savannah and grassland habitat, which are unusual habitats in the region.

Public Use:

- Restrictions of access by abutting private landowners, such as Waldorf School or East Lexington Rehabilitation and Nursing Center, would greatly reduce public access and use.
- Public access points with adequate parking are extremely limited and parking on side streets may cause conflicts with neighborhoods.
- Impassable trails in wet seasons prohibit visitors from using trails, although reduction in visitation in spring, especially, is a benefit to wildlife and fragile plants.
- Trail erosion in wetlands and steep hillsides by mountain bikers and dirt bikes, in particular, make trails impassable.
- Myriad unmarked trails can cause confusion and a sense of unease to visitors.
- Lack of signs indicating ownership or desired uses means that those visiting the site do not know who owns the land or what the regulations are, if any. This reduces accountability and limits enforcement.

III. Recommendations

The following is a summary of the recommended actions to protect and steward Arlington's Great Meadows. The intent is to help guide the Conservation Commission in its efforts to work with the rest of the town and other interested parties in the protection and stewardship of the unique resources of Arlington's Great Meadows:

Overarching recommendations

1. Determine long-term protection status and goals for Great Meadows
2. Protect and manage existing plant communities and wildlife values, thereby also preserving unique scenic qualities.
3. Encourage compatible public use and enjoyment
4. Work cooperatively with Town of Lexington and surrounding neighborhoods to meet these goals.

Specific recommended actions

1. Establish a joint management committee with representatives from Arlington and Lexington to protect and manage Great Meadows:

- Determine the best means to permanently protect the Great Meadows.
    - Research current status under Article 97 and dedication process under G.L. Chapter 40 Section 8
    - Assess potential for development including extent of wetlands, access, and zoning constraints
    - Review options for protection

- Develop a schematic trail design that would retain natural features while providing safe public access. Use this to sell the project to citizens.
- Develop a detailed ecological management plan for the grassland, oak savannah communities. Consider feasibility of prescribed burns or mowing practices.
- Determine public use policies and post property with signs of ownership and regulations.
- Develop citizen support for Great Meadows through publicity, programs, and volunteer activities

2. Manage Great Meadows for ecological values by developing and instituting clear plans and policies and monitor effectiveness:

- Focus on most sensitive ecological areas:
    - Great Meadow marsh including north lobe, which has very limited exotics
    - Successional grasslands to north and west of Great Meadow marsh and adjacent Oak and Pitch Pine Woodlands
    - Infinity Pond and Peat Pond
- Control invasive exotic plant species

  1. Eliminate swallow-wort immediately
  2. Control garlic mustard near entrances at Emerson Gardens and Fottler Avenue
  3. Control expansion of phragmites in central marsh.
  4. Consider introducing biological control for purple loosestrife.
  5. Control spread of honeysuckle and work to eliminate it from existing sites - this is a relatively easy shrub to pull out.
  6. Monitor northwest wetland for invasive purple loosestrife and other exotics. This is the least disturbed and healthiest wetland.
  7. Develop strategy for control of glossy buckthorn. Buckthorn is the most pervasive and difficult to control exotic in the uplands and much of the wetlands and is taking over new areas.
  8. Work with managers of Minuteman Bikeway to control exotics along bikeway, including Japanese knotweed.
- Develop management plan to maintain natural openness of landscape and to reduce fire hazards.
    - Investigate feasibility and cost of prescribed burns
    - Investigate feasibility and cost of mowing regimes
    - Determine what can be done by volunteers
- Design and maintain a trail system that protects sensitive natural communities and wildlife.
- Manage bird habitat
    - Protect nesting areas and Woodcock display ground
    - Put up bluebird boxes along with tree swallow boxes.
- Protect vegetation of Infinity Pond - cutting of shrubs enhances skating but reduces opportunity for frogs and turtles to find shelter and food.
- Maintain linkages to other conservation lands, particularly Cataldo Reservation along Sickle Brook
- Complete inventory work for insects and mammals and continue to add to plant lists.

3. Enhance compatible, safe public use:

- Maintain and develop public entry points in cooperation with neighborhoods and abutting institutions:
    - Develop parking lot off Maple Street.
    - Erect or maintain pipe gates at Emerson Gardens, East Lexington Rehabilitation and Nursing Center, and Sheila Road, to prevent dumping and other illegal uses
    - Talk with private landowners about access
    - Lexington Christian Academy
    - Waldorf School
    - Emerson Gardens
    - East Lexington Rehabilitation and Nursing Center
    - Work with neighborhoods on on-street parking possibilities.
- Devise public-use policies including restrictions on dog walking and mountain biking.
- Develop trail system, which includes a series of short loops, and mark at least the main trail system.
    - Close off unnecessary small trails with brush and other natural obstructions.
    - Consider publishing maps for sale, which include information on stewardship of valuable natural resources.
    - Provide bike racks at Minuteman Bikeway entrance so that bikers can stop and walk (not ride) through .
    - Develop an overlook at Glacier Knoll to accommodate use
- Develop a security plan with emergency access routes and procedures with Lexington fire and police departments.

4. Preserve cultural values:

- Maintain scenic vistas across Great Meadows and woodlands.
- Manage habitats to maintain sense of openness and naturalness of area.
- Provide 2-3 interpretive signs indicating historical significance of site.
- Develop a complete land-use history of the site.

5. Enhance educational resources:

- Promote cultural and natural history values of the site to nearby schools, community groups, and conservation and historical organizations.
- Continue to provide natural history information and walks through Lexington and Arlington Conservation Commissions and land trusts.
- Consider becoming a part of the Commonwealth's "Watchable Wildlife" program.
- Involve school in interpretive signage to increase educational value and respect for the property.

IV. Conclusion

Arlington's Great Meadows in Lexington is a major asset to the region for its ecological, scenic, recreational, and educational values. For over thirty years, citizens of both Lexington and Arlington have been concerned about the protection and care of Great Meadows. Committees have been formed and reports written, yet Arlington's Great Meadows continues to have uncertain protection status and minimal stewardship. As the region continues to develop the last open spaces, the Great Meadows will only increase in value. It is time for citizens to work together to determine the benefits of this unique resource to the community. It is hoped that this report will help facilitate this action.

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