

THE GREATER LOWELL REGIONAL OPEN SPACE STRATEGY: Analysis and Recommendations



Prepared for The Trustees of Reservations
by the Northern Middlesex Council of Governments

Funding Provided by the Theodore Edson Parker Foundation
and the Northern Middlesex Council of Governments

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I. EXECUTIVE SUMMARY

With its range of environments—from protected forests and wetlands to farms, suburbs, and an historic urban center—the Greater Lowell Region can offer its residents and visitors a variety of nature and landscape experiences. The region’s open space resources reflect the diverse landscape, cultural, and development histories of its nine communities: the City of Lowell and the Towns of Billerica, Chelmsford, Dracut, Dunstable, Pepperell, Tewksbury, Tyngsborough, and Westford. However, the region has a relatively small amount of land that is permanently protected as open space, and those protected lands tend to be highly fragmented, rather than linked in corridors of open space.

This challenging context attracted the attention of The Trustees of Reservations, the oldest land trust in the country. The Trustees is (“The Trustees” is singular) developing innovative approaches to its mission of preserving lands of exceptional value, including efforts to link urban populations with nature. In 2001, The Trustees approached the Northern Middlesex Council of Governments (NMCOG) to prepare an assessment of open space resources and needs in the Greater Lowell Region and to develop strategies for regional open space preservation in conjunction with municipal and nonprofit environmental and conservation groups.

This report contains a brief narrative of the environmental and development history of the region; an analysis of current trends and existing protected and unprotected open space resources, tools, and institutional actors; a brief discussion of the landscape ecology of the region and the relationship of ecological values to open space strategies; an analysis of gaps and priorities; potential opportunities for collaboration across the region; and recommendations for a regional open space strategy.

Two workshops and a regional strategy meeting were held in late 2001 and early 2002. These meetings brought together staff and citizen representatives of the City and every town in the region; members of local land trusts and other nonprofit organizations; watershed team members; and representatives of state agencies. Participants shared information on local resources and priorities, identified the barriers to effective regional open space planning, and discussed ways to overcome these barriers.

Findings

Preservation of open space is an increasingly important value in the region’s communities, all of which have Open Space and Recreation Plans. Community open space priorities encompass the following themes:

- *People are looking for opportunities to walk, hike and bike.* Pedestrian and bicycle paths get high priority almost everywhere.
- *Preserving roadside scenery* – the visual amenity provided by open space – is important to people’s sense of local identity. This priority is related to development pressures that are transforming communities in the region.
- *Expanding public access to water resources is a very high priority.* Although the region has many rivers, streams, and ponds, most provide limited public access because most shorelines are privately owned.
- *Creation of greenways*, particularly along rivers and streams, is a priority for preservation of water quality and wildlife habitat as well as for public access.
- Communities want to *preserve critical parcels*, which they identify as parcels on water, “last chance” farms and ensembles of farms, and parcels adjacent to existing protected land.

- *Stewardship and maintenance* of existing open space can be difficult where funding and staff are limited. Many communities must depend on volunteers for a range of services, from trail construction and maintenance to upkeep of athletic fields.

Although local officials and volunteers concerned about open space are generally aware of the importance of linking open space in networks, most operate in a climate of scarcity, reactive and opportunistic policy, and limited management and programming opportunities. They tend to concentrate on individual local parcels viewed as threatened by development, rather than on more regional, holistic approaches to open space preservation.

At the regional strategy meeting, participants discussed potential regional strategies under five themes:

- Emerging Greenways and Public Access to Rivers and Ponds
- Stewardship of Forests and Protected Open Space
- Urban Access to Nature and Biodiversity in City and Suburb
- Working Landscapes
- The Big Picture (open space issues within the framework of overall development planning)

In addition to many specific suggestions about regional approaches to these themes, the participants identified two key strategies that are fundamental to creating a regional open space network.

- *Promote more public outreach and education:* Residents of the region need to be better informed about the open space resources that already exist and about the potential for new regional connections.
- *Create a regional open space coordinating entity:* A coordinating and management entity is needed to forge continuing connections and enhance information exchange, harmonize local plans, build consensus on priorities, and help in fund raising for specific projects.

Recommendations: A Regional Vision and a Public-Private Partnership

The regional vision for open space in the Greater Lowell Region revolves around three concepts:

- *Connection and Access:* a network of greenways and trails linking major open space destinations and following the shores of major rivers and streams, as well as new public access points along the rivers and on the shores of ponds.
- *Experience and Understanding:* a community-based environmental inventory of urban, suburban and rural open spaces in the region to widen the constituency for open space preservation and enjoyment and to provide the foundation for regional priorities.
- *Stewardship and Heritage:* a program of regional criteria for open space protection and maintenance to create alliances of local land trusts, open space committees, historical commissions, and other appropriate groups to help them expand their capacity and enhance public knowledge of how local resources fit into a wider regional story of the interplay of nature and culture.

To meet the need for a coordinating entity, the Greater Lowell Regional Open Space Collaborative, a public-private program, would be created. A funded Program Director would coordinate the many public and private groups now working independently on open space issues in the region. A public-private partnership would take advantage of the strengths of each side in

convening all the interested parties and marshalling the array of public and private resources needed for success. The public partner could be a regional organization such as NMCOG, providing a home for the Collaborative and access to local and state public officials, programs, and funding sources for projects. The private partner could be a strong and capable nonprofit conservation organization, providing access to philanthropic and nongovernmental funding to support the Program Director and regional projects, as well as convening the local land trusts and other nongovernmental organizations and activists.

As a “collaborative,” the organization would be designed to be multi-faceted, cooperative, and horizontal in organization. It would be an information clearing-house, a forum for discussion, and a planning coordinator and organizer. A set of subcommittees could be established to work on specific issues such as greenways and trails, a regional environmental inventory, regional open space protection criteria, a land trust alliance, and farmland support and protection. Keeping several program directions active simultaneously would permit the Collaborative to take advantage of unforeseen opportunities, to enhance inter-municipal contacts and understanding, and to create a sense of momentum.

Creating and protecting an open space network that is environmentally healthy, while providing residents and visitors access to nature and the region’s landscape heritage, is a challenging goal in the Greater Lowell Region, where twentieth-century, low-density development models continue to expand. Only by looking at the region holistically can we avoid the further fragmentation of open space resources and can we take advantage of opportunities to restore connections. Although the Greater Lowell Region is not well-known for its open space resources, but rather for historic urbanization and suburbanization, it is precisely these characteristics which can make implementation of a regional open space agenda in the Greater Lowell area an innovative model for the twenty-first century.



II. OPEN SPACE, REGIONAL NETWORKS, AND GREEN INFRASTRUCTURE



In 2001, The Trustees of Reservations (The Trustees) approached the Northern Middlesex Council of Governments (NMCOG) to prepare an assessment of open space resources and needs in the Greater Lowell region and to develop strategies for regional open space preservation in conjunction with municipal and nonprofit environmental and conservation groups. The Greater Lowell Region is here defined as the City of Lowell and the eight member communities of the Northern Middlesex Council of Governments – Dracut, Tewksbury, Billerica, Chelmsford, Tyngsborough, Westford, Dunstable, and Pepperell. The project was funded by the Theodore Edson Parker Foundation through The Trustees, and by NMCOG. The purpose of the project is to create a regional open space assessment and strategy with the following elements:

- Identification of gaps in protection and management of ecologically significant, scenic, and historic landscapes
- Conceptual design of a proposed regional open space network
- Development of a regional strategy
 - To support existing efforts and close gaps
 - To coordinate the work of local governments, nonprofit organizations, and others on open space protection, management and programming
 - To promote open space and nature access for urban residents
 - To define potential roles for land trusts

The Trustees is known (“The Trustees of Reservations” is singular) as the oldest land trust in the country and the owner or protector of many properties of statewide or regional significance. Its mission is “preserving for public use and enjoyment, properties of exceptional scenic, historic, and ecological value throughout Massachusetts and protecting special places across the state.” Increasingly, The Trustees is seeking innovative ways to promote its vision, including efforts to link urban populations with nature. Examples of this new direction in The Trustees’ work include a collaboration with the Boston Natural Areas Network in maintaining and improving community garden infrastructure in Boston, the construction of the Doyle Conservation Center in Leominster, and the Southeastern Massachusetts Bioreserve project, in which The Trustees, the state, and the City of Fall River are cooperating in protecting and managing 13,600 acres of state, city, and private land. The Trustees will create a center for educational and interpretive programs on the ecological and human history and significance of the Bioreserve. This center will be within 15 miles of more than half a million people.

Currently The Trustees has a very limited presence in the Greater Lowell Region. Its subsidiary, the Massachusetts Land Conservation Trust, recently acquired one property in Tyngsborough. This limited presence, combined with The Trustees' interest in creating educational and nature experience opportunities for residents of urban and urbanized areas, provoked its desire to explore regional open space preservation strategies in the Greater Lowell Region.

The Trustees' new initiatives are part of a wider movement among environmental and conservation organizations and agencies to emphasize the importance of ecological and green open space networks rather than focusing on specific properties in isolation. The watershed approach to water quality and quantity issues, now part of federal and state policy, is another manifestation of this movement. The term "green infrastructure" is increasingly used to express this idea of linked open space networks. In a recent publication, the directors of the Conservation Fund's Green Infrastructure Program described the differences between traditional conservation efforts and the green infrastructure approach:

- "[Green infrastructure] focuses on the protection of connected natural ecosystems as the framework for both conservation and development.
- It recognizes that physical linkage between green space elements is key to sustaining natural ecosystems and landscape processes.
- It emphasizes the importance of planning and protecting green infrastructure before development.
- It recognizes the need to connect green space elements across multiple jurisdictions, scales and landscape types.
- It focuses on the creation of a green space vision that excites and engages people and guides implementation actions.
- It considers the needs of both nature and humans – addressing both the environmental effects of proposed development and the economic well being of a community.
- In doing all of these things, green infrastructure also helps provide a framework for development, ensuring that developers, citizens and communities capture the cost advantages of location and create and protect community amenities."¹

In theory, everyone is in favor of preserving open space. In practice, difficulties arise as people differ on what open space is and for what purposes it should be preserved; where scarce open space resources should be applied; and how to balance open space preservation with other needs. Open space can mean many different things to different people, for example:

- Views and vistas, especially from roads, to preserve a sense of rural or semi-rural character
- Land to protect environmental resources, such as drinking water supplies, even if it cannot be viewed or accessed
- Wildlife habitat
- Land for passive recreation and nature experiences

¹ Mark A Benedict and Edward T. McMahon, *Green Infrastructure: Smart Conservation for the 21st Century*, Sprawl Watch Clearinghouse Monograph Series, Washington, DC, 2002, p. 30. Available at www.sprawlwatch.org.

- Bike and walking paths, and rail trails
- Designed public parks and private landscapes
- “Urban wilds,” the remnant natural areas in cities
- “Working landscapes” such as farms, orchards, grazing lands, and woodlots
- Golf courses
- Athletic fields
- Neighborhood playgrounds

Most permanent protection of open space occurs in one of two ways: (1) outright purchase of the land by a public agency or a nonprofit conservation organization, or (2) purchase of the development rights on the land by a public agency or a nonprofit, leaving the undeveloped land in private ownership. Tax abatement programs, like Massachusetts’ Chapter 61, 61A, and 61B programs for forest, agricultural and recreational lands, can provide temporary protection. Open space preservation is also inextricably linked to the regulation of development and land uses, as the green infrastructure framework makes explicit. It is impossible and undesirable for public or nonprofit groups to purchase all undeveloped property or development rights. However, land use legal frameworks can promote certain development strategies over others, affecting open space opportunities in the process. For example, Massachusetts, unique among the states, has a feature of its state land use law that promotes the increasing phenomenon of house lots every 200 feet on every country road in the state. Combined with incentives built into the tax system, the land use framework in the state is systematically affecting scenic character, particularly in the outer suburbs of large cities like Boston and Worcester (also known as the “ex-urbs.”) ²

The Greater Lowell Region offers a particularly interesting opportunity for creating regional open space networks because it includes almost the entire continuum of landscape character – from intensely urban neighborhoods in the City of Lowell to working farms and protected state forests. Much of the region is dominated by suburban development, including the commercial strips and office and industrial parks typical of nonresidential suburbia. Green infrastructure approaches that emphasize the creation of open space networks as a way to structure and shape new development trends are relevant in parts of the region, but the urban and older suburban portions of the region offer different and more complex challenges because most of the land has already been developed.

² Approval-Not-Required (ANR or Form A) development gives property owners with land on a public way the right to develop the land as long as their project meets local zoning requirements (MGL Chapter 40A). The real estate tax system put into effect by Proposition 2-1/2 in 1981 effectively creates an incentive for municipalities to attract non-residential development as a way to increase tax base without increasing the number of family households, who typically use more services than they pay in taxes.

III. THE ENVIRONMENTAL AND DEVELOPMENT HISTORY OF THE GREATER LOWELL REGION



The Greater Lowell region is part of the southern New England Coastal Plains and Hills Eco-Region designated by the US Environmental Protection Agency. Four major rivers, the Merrimack, Concord, Shawsheen, and Nashua, drain the region. Numerous smaller brooks and streams feed into these rivers. Though generally a region of rolling hills, the area west of Routes 3 and 4, comprising west and south Chelmsford, Westford, western Tyngsboro, Dunstable, and Pepperell, has a more complex topography with higher hills. Retreating glaciers left a landscape of drumlins, oriented northwest to southeast, ledge and boulders, kettle ponds and eskers. Wetlands are distributed throughout the region and an extensive stream network threads between upland hills. The acidic soils still include some fragile peat bogs. Towards the center of the region, there is a basin of lower elevations in west Billerica and east Chelmsford stretching north into Lowell, while a few hills rise at the eastern edge of the region. (See Map 1: Environmental Resources in the Greater Lowell Area.)

The region has been affected by several waves of development in the last four centuries. Between the 1650s and the Civil War, the region was marked by severe deforestation, the rise and decline of agriculture, and the rise of urban industry. Industry remained successful during the second half of the nineteenth century and then entered a prolonged stagnation and decline after 1920. Urbanization gave way to suburbanization after World War II – including the suburbanization of business. At the beginning of the twenty-first century, it is still possible to find a full range of landscape types that has existed since European colonization, from second growth forest and agriculture to a densely built urban core. At one end of the spectrum, agriculture has been retreating and forests have retaken much undeveloped land. At the other end of the spectrum, the city has lost primacy as an economic and population center. In the region today, the most representative developed areas are suburban residential and commercial land uses, while forested lands are the most salient natural feature.

Our regional landscape was being managed long before the arrival of Europeans. Although we often think of precolonial America as being “wild” or “pristine,” in fact Native Americans managed the environment, particularly through selective, cyclical burning. This created a variety of habitats and lands at different stages of forest succession. Native Americans also moved around during the year between a variety of environments and their relatively small populations had a correspondingly small impact on the land. European settlers also sometimes

used fire, but their land use practices, including fixed property, grazing animals, the use of the plow in agriculture, and monoculture, had different effects. In contrast to England, where there had been a timber shortage for generations before the colonization of America, New England seemed to have inexhaustible forests and the colonists cut down trees with abandon. The deforestation of Massachusetts land in our early history had the same results it has anywhere: temperature fluctuations became more extreme, floods more common, some streams dried up altogether, aquifers received less infiltration, certain favored species of trees – such as white pines, white cedars, white oaks -- became more scarce, and habitat for certain kinds of wildlife disappeared.³

First settled by colonists moving north from Woburn, Cambridge, and Concord in the second half of the seventeenth century, the towns of the Greater Lowell Region were established as agricultural communities. The church, the common, the school, and the minister's house first formed the nucleus of the town center. Streams were dammed to power the sawmills and gristmills that served the needs of a dispersed farming population. Home-based craftsmen made furniture, barrels, shoes and other manufactures. Eventually inns and taverns sprung up to serve travelers along farm roads.

Settlers cut down trees to clear land for agriculture, for buildings and fencing, and to burn in fireplaces, ovens, and eventually, forges. Atlantic White Cedar, a swamp tree favored because of its resistance to rot, became scarce in the region. Some of the peat bogs contained iron, which was harvested to make "bog iron" in small forges in towns like Dunstable and Westford. Remnants of these resources persist in the region: a rare stand of Atlantic White Cedar was recently acquired by the Town of Dracut near Peter's Pond and Dunstable's Hawk Swamp is a peat land.

At the end of the eighteenth century, nascent industry began to take advantage of the region's river system. The Pawtucket and Middlesex Canals opened water routes through the region between Boston and New Hampshire. The Middlesex Turnpike improved land transportation to Boston. These developments brought increased wealth and population to the town centers of Chelmsford, Billerica, Westford and Tyngsborough.

The industrial revolution arrived with more efficient harnessing of the waterpower of the Merrimack and Concord Rivers, Stony Brook, and Beaver Brook. Foundries and mills were established in North Billerica, North Chelmsford, and in Graniteville and Forge Village in Westford. The Faulkner wool mill established in 1881 on the Concord River in North Billerica was the first textile mill in the Merrimack Valley. With the foundation of the Merrimack Manufacturing Company in 1821, the founding of Lowell, the nation's first planned industrial city, was underway. A separate municipality by 1826 with a population of 2500, Lowell became the textile-manufacturing powerhouse of the nation and grew to a peak population of 113,000 in 1920. (In

³ William B. Cronon, *Changes in the Land* (New York: Hill & Wang, 1983), pp. 122-126.

2000, with a population of 105,000, Lowell had yet to regain that population level.) On the region's other major river, the Nashua, a paper mill with its mill village was established in East Pepperell in 1834. The smaller mill communities of the region modeled themselves on Lowell, the mills surrounded by worker housing and company stores, and local farms supplied the mill village markets.

The Middlesex Canal was constructed to bring Lowell's textiles to Boston, but it was soon superseded by the Boston and Maine Railroad, which lowered the cost of transportation and encouraged larger and more efficient industry. Railroad connections extended to the smaller industrial towns in the second half of the nineteenth century, intensifying industrialization. Outside of village and mill centers, the rest of the region remained primarily agricultural, though granite quarrying, particularly in Chelmsford and Westford, was a notable enterprise.

Foreign immigrants arrived by train to go to work in the mills, but the trains also made it easy for the farm population to send many of its sons and daughters out to the fertile lands of the Midwest. As farmers abandoned fields in the 1840s and the 1850s, white pine colonized the old farm fields, growing up amid the stone walls. These pines then became a valuable timber commodity as the raw material for packing boxes for the mills. When the mill economy began to stagnate after 1910, hardwoods such as maple and oak succeeded the pines, creating yet another kind of secondary forest. The successive deforestation of the region explains why the many of the forest patches that we see today are made up of trees of approximately the same size and age.

As Lowell grew in the second half of the nineteenth century, the City became more congested and unhealthy. Around the turn of the century, typhoid and other epidemics swept the city. Parks were established as one element of the public health measures instituted to improve quality of life in the City. Lowell's first public park, Lucy Larcum Park, was dedicated to preserving "breathing spaces" in the City, and the North and South Common were created with the same aim. Frederick Law Olmsted, Charles Eliot, and the famous landscape architecture firm they founded designed Tyler Park, Rogers Fort Hill Park, Belvidere Park, the North and South Commons, Pawtucket Boulevard and Monument Square.

These Olmsted parks constitute the most significant collection of "designed landscapes" in the region. Unlike other parts of eastern Massachusetts, the Northern Middlesex region did not attract wealthy builders of large estates and summer homes with their designed landscapes. Rather, this region provided seasonal respite to the urban middle class and prosperous working class in the lakeside communities and in the rod and gun clubs that can be found in most of the towns. Summer cottage communities were built around the turn of the twentieth century on large lakes and ponds in Billerica, Tewksbury, Chelmsford, Westford, Dracut, and Tyngsborough. Made up of modest cottages without sewer systems on small lots and a dense grid of narrow

streets, these vacation spots brought development right to the edge of lakes and ponds. At that time, urban residents could easily reach the rural town centers of the region by train and trolley.

Since World War II, sweeping changes have transformed much of the Greater Lowell Region, changing the amount and character of its environmental and open space resources. Beginning around 1950, successive waves of suburbanization have washed over the entire region, repeatedly extending development into more rural areas. In the 1950s and 1960s Billerica, Chelmsford and Tewksbury attracted residents from Boston and its inner northern suburbs. These three towns are now mature suburbs, with limited amounts of developable land. By the 1970s, suburban development was expanding into Tyngsborough, Westford, and the more rural parts of Dracut, a trend that has continued into the present. The summer cottages were winterized and occupied year-round, exacerbating pollution of the ponds and lakes as septic systems failed. Although Dunstable has remained more rural in character, the majority of landowners do not depend on farm activities for their livelihood. Pepperell in the 1980s and 1990s has increasingly been incorporated into the ex-urban fringe of suburban housing, particularly through the construction of houses on Form A lots along the town's country roads.

During recent decades, developable land combined with transportation access in towns like Billerica, Chelmsford and Tewksbury has also attracted industrial and office development. Lowell is no longer the principal employment center in the region today; a small majority of its residents work outside the city. Greater Lowell has become part of a larger metropolitan region oriented towards growth poles in Nashua, New Hampshire to the north, the Route 128 and 495 technology belts, and the Boston-Cambridge economic core.

The impact of these changes on the environmental and open space resources of the region has been substantial:

- Between 1950 and 1975, the number of developed acres in the region grew 155%.
- Between 1950 and 1991, 67% of the region's agricultural land was developed or taken out of production.
- Between 1971 and 1991, more than 20 percent of the region's open space acreage was converted to residential or commercial/industrial development.

The impact of this history from an environmental and open space point of view has been the increasing fragmentation of forests, farms and natural areas. (See Map 2-Environmental Resources)

IV. CURRENT CONDITIONS AND OPEN SPACE PLANNING



The nine communities of the Greater Lowell Region have a combined population of over 281,000 people in almost 200 square miles. As late as 1940, three-quarters of the region's population was concentrated in the City of Lowell. Today, the City accounts for 37 percent of that population and continues to have the highest density, over 7,000 people per square mile. Billerica, Chelmsford, Dracut and Tewksbury, the early suburbanizing communities with population densities of over 1,000 people per square mile, together account for 46 percent of the region's population. The remaining communities, where much of the development activity occurred during the 1990s and continues today, account for 17 percent of the region's population.

Greater Lowell Region - 2000 Population, Housing Units, and Density

	Population	Housing Units	Total Square Miles	<i>Density per square mile</i>	
				Population Density	Housing Unit Density
Billerica	38,981	13,071	26.38	1,505.90	504.90
Chelmsford	33,858	13,025	23.28	1,495.00	575.00
Dracut	28,562	10,643	21.36	1,366.70	509.00
Dunstable	2,829	944	16.74	171.00	57.00
Lowell	105,167	39,468	14.54	7,635.60	2,865.50
Pepperell	11,142	3,917	23.17	493.80	173.60
Tewksbury	28,851	10,158	21.06	1,392.30	490.20
Tyngsborough	11,081	3,806	18.50	657.40	225.80
Westford	20,754	6,941	31.33	678.00	226.80
<i>total</i>	<i>281,225</i>	<i>101,973</i>	<i>196.36</i>		

Source: US Census 2000

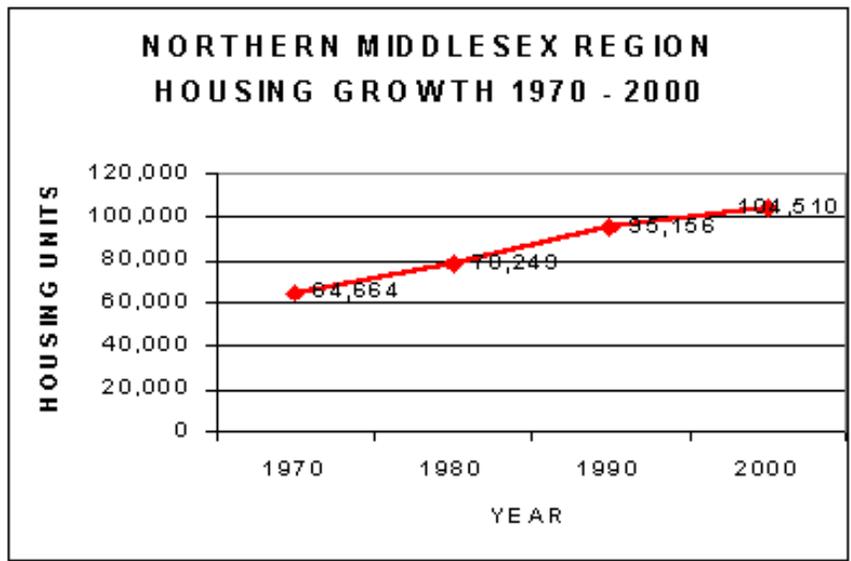
Despite the increasing urbanization of the region during the last 50 years, traces of all the layers of settlement and land use persist. Agricultural lands remain in significant portions of Dunstable, in northern Pepperell, and in east Dracut. A working farm and orchard, a cranberry bog, and another orchard are publicly owned and leased to farm operators in Westford, Chelmsford, and Pepperell respectively.

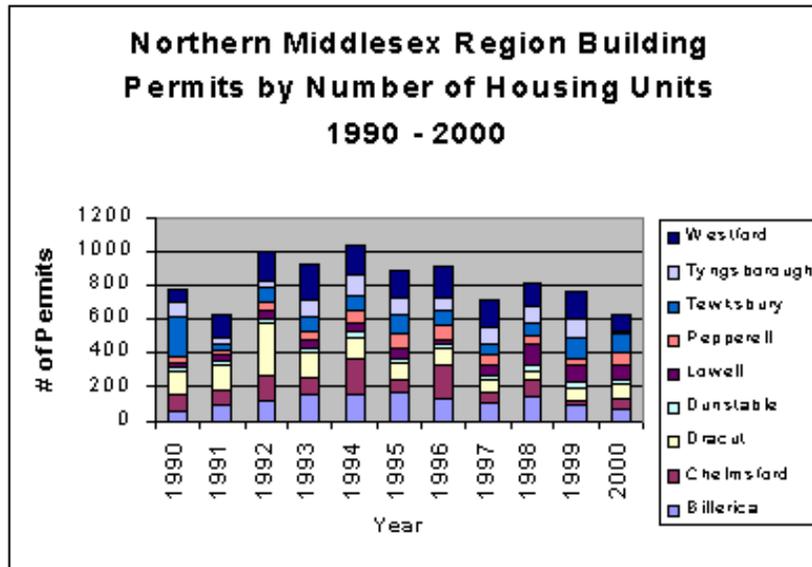
Greater Lowell Region 1999 total acreage in different land uses *	
Forest and shrub	39.5 %
Residential	34.8 %
Wetlands and water	6.3 %
Crops and pasture	5.4 %
Commercial/industrial	4.8 %
Transportation	1.7 %
Other	7.5 %

*Land use (not zoned use) from interpretation of 1999 aerial photography for GIS

Historic town centers are identifiable in most towns, though often compromised by insensitive new development or infrastructure changes. The City of Lowell has made its history part of a new economic base through the National Historic Park and other projects, such as the incorporation of canal locks into the landscape design along the river near Tsongas Arena.

The predominant land uses in the region are forest/shrub and residential. This reflects the reforestation of the region after 1920 because of the decline of the traditional industrial economy with its demand for packing crates, and the increasing marginalization of agriculture since 1950 replaced by expanding suburban development. Residential uses continue to be the major source of new development. During the 1990s, new subdivisions occupied 7,241 acres of land, incorporating 5.8 percent of the region's total area. These numbers do not include Approval-Not-Required (Form A) residential development along public roadways, which also continued apace. Map 2-Land Use and Development Pressures shows the expansion of residential subdivisions into areas north and west of I-495 during the 1990s.





Open Space

The Greater Lowell Region includes a wide range of open space types managed by many different public and private entities:

- *Federal Wildlife Refuge.* A small part of the Great Meadows National Wildlife Refuge along the Concord River extends into south Billerica.
- *State Fish and Wildlife Lands.* The Department of Fish Wildlife and Environmental Law Enforcement (DFWELE) owns land in Tyngsborough.
- *State Forests.* The Lowell-Dracut-Tyngsborough State Forest straddles the boundary of those three municipalities and Warren Manning State Forest in Billerica is located on both sides of Route 3 in northwest Billerica.
- *Protected Wetlands.* Wetlands are protected from development by the state Wetlands Protection Act and, in some cases, by local wetlands protection bylaws. Many wetlands are on private property.
- *Municipal Conservation Lands.* Municipalities own diverse types of conservation lands, such as town forests, water supply lands, and some wetlands. Municipal lands transferred to the custody of the Conservation Commission are legally under permanent protection. Water supply protection lands are typically owned by Water Districts, which may be independent or under town government control. Municipalities can acquire conservation lands through purchase, but they also receive donations of conservation land. In some cases, developers donate unbuildable lands as a way to avoid any tax liability for the parcels, but in other cases property owners donate land in order to preserve rural character. Many conservation

holdings have very limited public access, either because they are fragile (such as wetlands), or they lack parking areas and trails.

- *Land Trust Conservation Lands.* Private local land trusts preserve land in many municipalities, sometimes providing public access for nature-based recreation.
- *Cluster Subdivision Open Space.* Cluster subdivisions, by definition, provide open space by permitting smaller individual lot sizes within a much larger total subdivision land area, typically at least 10 acres. The open space can be permanently preserved through conservation restrictions or donation to the town, a land trust, or other conservation organization. The open space may be owned by the subdivision's homeowners' association, by a private organization, or by a public entity.
- *Conservation Restrictions and Agricultural Preservation Restrictions on Private Lands.* Private landowners can preserve all or a portion of their lands from development by granting a conservation restriction to a public agency or non-profit private land trust. Ownership and management of the property remains in the hands of the private owner, but the holder of the Conservation Restriction (CR) has the right to enforce the CR on the land to which it applies. CRs must be approved by the State Secretary of Environmental Affairs. Similarly, Agricultural Preservation Restrictions (APR) preserve the right to use the land for agricultural purposes but restrict development rights. APRs must be approved by the state Department of Food and Agriculture.
- *Private Rod and Gun Clubs.* Private hunting clubs exist in several towns in the region.
- *Private Wood Lots.* A few private wood lots provide firewood and other lumber products. Forest lands with a state-approved management plan can be enrolled in the Chapter 61 tax abatement program, which reduces the real estate taxes owed by the property owner because of the open space benefits of keeping the land as forest. This is not permanent protection but simply provides that when the land is sold, the town has first right of refusal. If the town does not purchase the land, the property owner must refund the abated taxes for up to 10 years of abatement. In many cases, forested land in private hands is no longer used for harvest but is being held as an investment.
- *Private and Municipally-Owned Agricultural, Pasture and Orchard Lands.* Farms, orchards, and pasture lands still exist in the region. Similar to the forest tax abatement program, Chapter 61A gives farmers an abatement if they keep the land in agriculture. Competition to use the land for other purposes is increasingly strong and the economics of farming are complex within a fundamentally suburban context. As a result, several towns in the region have purchased farms or orchards and

leased them to farm operators in order to preserve a remnant of rural character. Many remaining private farms will soon pass to a younger generation that may not be able or willing to continue farming.

- *Utility Line Rights-of-Way.* In other states, utility rights of way have been used as trails. Another possible use is for All-Terrain-Vehicles, which are a source of contention in parks and conservation lands because of their environmental impacts.
- *Urban Wilds and Empty Lots.* “Urban wilds” are the spaces in urbanized areas that are not being used. They are often abandoned sites waiting for redevelopment that have been recolonized by nature. They provide shade, cooling, water percolation, animal habitat, and other environmental services to the city, while sometimes serving as informal – if sometimes insecure – parks. In the City of Lowell, many of these sites are in tax title and the Lowell Parks and Conservation Trust has been successful in encouraging the City to convert them into conservation land or parks.
- *Major city parks, including Olmsted-designed Parks.* The designed landscapes of large city parks add to both the aesthetic and environmental quality of life for city residents.
- *Athletic Fields and School Lands.* Recreational fields provide open space for active recreation.
- *Neighborhood Parks.* Small parks and tot lots play the same role as larger urban parks serve neighborhoods but at a smaller scale.
- *Pedestrian/Bike Trails.* Trail networks exist in several municipalities in the region and several large-scale regional trails are under development.

(See Map 3-Protected Open Space, Recreational and Cultural Landscapes)

Open Space Resources

The City of Lowell

The City of Lowell is at the confluence of two major rivers, the Merrimack and the Concord. As part of the ongoing development of the historic city center with the National Historical Park as its centerpiece, a strong network of downtown historic open space sites has been created, including existing and planned river and canal walkways. Lowell also has a number of large city parks and neighborhood parks, one farm and one remaining orchard, brownfields sites with open space potential such as the closed and capped Lowell landfill, as well as a few other open sites that may be appropriate for new open space, such as East Pond and the West Campus of the university. It also includes part of the Lowell-Dracut-Tyngsborough State Forest. The State Forest is underutilized, has limited access and no programming. Except for one neighborhood, there are no community gardens. The city’s cultural and historic value is well known and recognized. Recent or ongoing activities in Lowell with an open space focus include

the Flowering City Initiative and Charrette, the Open Space and Recreation Plan Update, the Lowell Heritage Partnership, and the activities of the Lowell Parks and Conservation Trust.

Beginning in 1996 and sponsored by the Human Services Corporation, the Flowering City Initiative is “intended to initiate a 25-year effort to reconnect Lowell and its people to the region’s natural and manmade environment to improve the quality of life for Lowell residents, present and future.”⁴ The Initiative began with a two and one-half day planning and design workshop, the Project Anthonopolis Charrette. Over 100 people participated, setting the directions for the long-term initiative. The charrette developed a framework and a series of visions based on the themes of historic preservation, ethnic diversity and environmental improvement. The open space recommendations that emerged from the charrette were articulated under five categories -- Cultural Gardens, Greenways, Blueways, Environmental Ways, and Welcome Ways. These recommendations encompassed the following elements: Community gardens and a community-based Lowell Garden Center and Greenhouse

- Restoration of existing parks
- Expansion of the National Historical Park system
- Creation of an urban park system that is linked to the region
- Filling gaps to complete the Lowell canal system
- Creation of a River Meadow Brook Trail and a Concord River Trail to link with the region
- Linkage of Lowell resources to the Bay Circuit Trail and the Middlesex Canal
- Creation of pedestrian and public transit links between Cross Point and the Swamp Locks
- Greening of Lowell’s gateways, particularly the Connector entryway to the city

Because the charrette was intended to promote visionary and long-range thinking, participants were not immediately concerned with implementation and funding of their proposals. However, early steps have been taken on many of these ideas.

The City’s open space planning process is a case in point. Lowell is updating its 1994 Open Space and Recreation Plan. Elements of the next action plan include:

- New uses for the Westford Street capped landfill, such as nature study (the landfill functions as a locally rare grassland with ponds), a viewing station, or a golf course
- Recreational use of the Tanner Street superfund site
- Restoration of River Meadow Brook
- Linkage of East Pond open space with downtown
- Open space uses at the West Campus of UMass-Lowell after relocation of the education school to the Lawrence Mills

⁴ “Beginnings,” <http://floweringcity.org/charrette.htm>

- Design and construction of new downtown canal walkways and the riverwalk
- A cemetery preservation plan
- A study of neighborhood walking distance access to open space and identification of gaps in open space access for neighborhood residents
- Open space development as part of the Lawrence Mills revitalization project
- A park system restoration plan to reverse degradation resulting from overuse and implementation of improved maintenance practices
- Evaluation of the potential for access to the Christina Hill reservoir, which has views to Boston

Action has already begun to restore Tyler Park, designed by the Olmsted, Olmsted and Eliot landscape architecture office, and Fort Hill Park, as well as other open spaces in the city.

The Lowell Heritage Partnership (LHP), a coalition of organizations and agencies “formed to preserve and enhance Lowell’s natural, built and cultural heritage,” recently conducted a survey, funded by the Parker Foundation, to identify special places in each neighborhood. The LHP will create a brochure on neighborhood open space, cultural and historical attractions, and will translate the brochure so that it is accessible to the city’s non-English speaking residents. Among the open space issues identified in meetings and the survey are the need for more information and access on natural resources and open space in the city, support for the planned Concord River Greenway project, the need for improvements and safety on the riverwalks and overall maintenance improvements.

The Lowell Parks and Conservation Trust (LPCT) is particularly focusing its regional efforts on creation of the Concord River Greenway Park. When completed, this greenway will be an important new segment of the Bay Circuit Trail, connecting to the terminus of the Bruce Freeman Trail at Crosspoint (near the intersection of Routes 3 and 495). Within the City, it will link Rogers Fort Hill and Shedd Parks and the Lowell cemetery. The LPCT is coordinating with the Trust for Public Land on transfer of a 3-acre parcel to the City from Guilford Industries and is negotiating with other landowners for easements and acquisitions to complete the greenway. Complementary activities of the LPCT on the Concord River include rafting trips, the Jollene Dubner Park, alewife restoration and an ecological inventory completed in cooperation with Massachusetts Audubon. The Concord River Greenway Park is also part of a larger vision to create a walking path along the river from the Town of Concord to the City of Lowell under the rubric “American Revolution to Industrial Revolution”.

Billerica, Chelmsford, Tewksbury, and Dracut

The three “early suburbanizers” in the region – Billerica, Chelmsford, and Tewksbury – are close to buildout and show the typical land subdivision styles of the 1950s, 60s, and 70s.

From the point of view of natural environment, access to open space, and even visual character, these towns are more like Lowell than they are like Dunstable. Although there are more open space resources in these towns than many of their residents often realize, it is fragmented and there are limited opportunities to create corridors by connecting dispersed properties. The big question for these towns is how to manage their open space resources well and to make the experience of nature more available to their own populations, and where appropriate, to others in the region. Similar in some ways to these towns, Dracut is a hybrid community, with considerable remaining agricultural lands in the eastern part of town, while the western part of town is substantially urban and suburban in character with limited open space resources.

Billerica. Billerica has several cultural and open space resources of significant regional importance: Warren Manning/Billerica State Forest, the largest intact section of the Middlesex Canal, and a long stretch of the Concord River including the Mill Pond. In recent years the town has created several new parks, including athletic fields, and begun a forest stewardship program for town forests. In 2001-2002 Billerica's Open Space and Recreation Plan was updated and approved by the state. Among the goals that are particularly important from a regional point of view are efforts to improve access and day facilities at the State Forest and secure a park ranger; an inventory of opportunities along the Concord River for public access, which currently is limited to a few informal canoe landings; the long-term plan for the Middlesex Canal, including a park at the Concord mill pond and a reconstructed towpath to connect with Lowell. Billerica supports efforts to extend federal "Wild and Scenic River" designation from the Town of Concord and south Billerica all along the river and is also interested in the concept of the Concord River Greenway. The Yankee Doodle rail trail, which will be part of the Bay Circuit Trail and connect with the Minuteman Trail in Bedford, is another important long-term project.

Chelmsford. Chelmsford's open space is fragmented and the town is looking for ways to make connections, using the rail trails, potential trails along the Middlesex Canal corridor, and possibly the utility transmission lines, as well as on-street corridors, if necessary. In the words of the 2000 Open Space and Recreation Plan: "Many town-owned open spaces are unconnected and the absence of available land to connect them is largely irreversible." Under current zoning there are only about 1100 acres available for development. Protected open space includes three town forests, water district land adjacent to Hales Brook, which extends into Manning State Forest in Billerica and two open space areas that Chelmsford shares with Carlisle, including twenty acres of the 934-acre Great Brook Farm State Park. This high quality park has a ranger, a dairy barn, a variety of habitat and numerous trails. Chelmsford also shares a 310-acre cranberry bog property with Carlisle, of which 159 acres are in Chelmsford. The operating cranberry bog is located in the Carlisle portion.

The only public boat launch on the Merrimack River between Lowell and the New Hampshire border is located in Chelmsford at Southwell Park. It was constructed with state funds from the Department of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE) and is open to all, not just town residents. The Town is responsible for maintenance.

There are a few remaining agricultural lands in Chelmsford that the town sees as high priority for acquisition:

- the Parlee-Waite Farm on Rt 27 in south Chelmsford
- the Walter Lewis property across the road from Parlee-Waite
- Red Wing Farm near the two above and abutting the Freeman trail
- the Warren property between Route 4, Rt 27 and Bartlett Street, south of Chelmsford Center
- the Sheehan Property on Pine Hill Road near the Westford line.

In the recent open space planning process, the highest priorities were to find ways to link open space, provide bike trails, and create community gardens for apartment-dwellers.

Tewksbury. The major focus of open space concern in Tewksbury is the 778-acre State Hospital property, of which about 662 acres are open space, including land on Long Pond. In addition to considerable wetlands and the land on which the hospital is still functioning, there are about 300 acres of active crop lands and another 162 acres that have prime agricultural soils. The farm fields along the roads are among the remaining elements of rural character in Tewksbury, in contrast to the suburban residential and strip commercial character that typifies most of the rest of the town. Although there are several significant ponds in Tewksbury, there is currently no public access. A public parcel on Long Pond, however, offers potential for access. The town borders the Merrimack River and a river trail is under design. The town's primary open space goals are to preserve the hospital lands and to create a network of trails and river access points to link protected open space parcels.

Dracut. Dracut includes within its borders a diversity of landscapes: very urban residential neighborhoods close to Lowell, dense neighborhoods of former summer cottages around ponds, typical low-density suburban residential and commercial development, working farms, and the state forest. Approximately 924 acres of protected land are owned by the town or the state (6.75 percent of the town); Agricultural Preservation Restrictions cover 185 acres of farmland; and Conservation Restrictions protect a total of 127 acres. Over 1700 acres are in Chapter 61, 61A or 61B forest, agricultural or recreational tax abatement programs.

The town's Open Space and Recreation Plan has just been updated and reflects an intensified interest in preserving the farm land and natural areas throughout the town, particularly in east Dracut, where there are already two properties with Agricultural Preservation Restrictions.

One of the last remaining farming areas in the Greater Lowell Region, east Dracut has experienced increasing development pressures during the 1990s. Town Meeting voted to commit town funds to support the purchase of several parcels adjacent to a planned golf course, residential project and the existing Dunlap Sanctuary, and the town is hoping for a state grant to complete the purchase.

Dracut residents are also interested in creating trails and greenways that might connect to neighboring communities. Long-term goals include a floodplain greenway along Beaver Brook, where two small conservation parcels have already been acquired, and a Merrimack River Trail along the river, both of which could link to regional trail systems.

A Tufts University's "New Entry Sustainable Farming Project," which is funded by the US Department of Agriculture, gives Cambodian immigrants from Lowell access to approximately 10 acres on two farm parcels in east Dracut. In operation since 1998, the program currently works with 20 Cambodian farmers. Because they involve relatives and friends, the total number of people who benefit from the program is larger. The project managers are interested in expanding the program but currently do not have the resources to look for new acreage.⁵

Westford and Tyngsborough

The later suburbanizers, Westford and Tyngsborough, have taken somewhat divergent paths, but they have both become fundamentally suburban communities. The town of Westford has taken aggressive steps to shape development and to acquire open space, including one of the last working farms, which it has now leased to a farm operator. Tyngsborough in the last decade was one of the fastest growing towns in the region, and as a result, is now beginning to focus on open space preservation. One of the most important privately owned regional open space resources is shared by Westford, Tyngsborough, and Groton: MIT's Haystack Radio Astronomy Observatory. Approximately 500 acres of the MIT land are in Westford, 339 acres are in Tyngsborough, and the remainder is in Groton. Although local people use the area, MIT's official position is that they wish to protect the sensitive research activities on the site from disturbance and to preserve their ability to develop facilities to support these activities as necessary.

Westford. As Westford has become increasingly suburban, town residents have shown a willingness to invest in preservation of open space and the semi-rural character that attracted many of them to live there in the first place. The town currently owns approximately 2,600 acres in nearly 240 parcels, representing some 13 percent of town land. These lands include parcels along Stony Brook to protect water supplies, an operating orchard (leased to an orchard

⁵ Personal communication from Jennifer Hashley, Project Coordinator for the New Entry Sustainable Farming Project.

manager), and a working farm (also leased to an operator). Seventy-one vernal pools had been certified as of 2000. Trail connections are already established between Westford and Chelmsford, Acton and Carlisle, and the town is planning to extend the network to connect with Littleton, Groton, Harvard, Ayer, Bolton, and Berlin. Over 50 permanent trail easements have been created. Planning is underway for a trail on the abandoned right of way of the Red Line trolley to connect with the Bruce Freeman Trail (part of the Bay Circuit Trail) and trails in Groton. The town is now identifying preservation strategies for some of the last remaining large parcels, focusing on expansion of its holdings along the Stony Brook corridor over the aquifer in particular, and on greenways along waterways in general. The remaining large parcels include approximately 635 acres owned by six private camps and clubs mostly located in the northern part of Westford. Community preferences in the most recent open space survey were for bike trails, hiking and skiing trails, and neighborhood parks. In contrast to the substantial conservation holdings by the town, Westford's local land trust owns 120 acres in 17 different parcels.

Tyngsborough. Tyngsborough's western "panhandle" has seen substantial development in the last decade, which has transformed this part of the town significantly. Until this recent development boom, the town had not focused on protecting land from development, but interest has intensified under development pressure. The Town voted to implement the Community Preservation Act at 3 percent, the highest tax rate.

Tyngsborough has nearly 1,150 acres of permanently protected land, including part of the Lowell-Dracut-Tyngsborough State Forest, town conservation lands, water district lands, land trust properties, and Agricultural Protection Restrictions and Conservation Restrictions. The Massachusetts Land Conservation Trust, an affiliate of The Trustees, owns 68.7 acres. Recent town acquisitions of open space have focused on access to water or on border parcels that abut protected lands in neighboring communities. This approach is intended to maximize the value of the purchase by creating a larger habitat area through the combined parcels.

Among the recently acquired properties is the Sherburne House on approximately 80 acres of land, which was donated to the town. The Conservation Restriction on the land is held by The Trustees, and the town agreed to an annual appropriation of funds for maintenance of the protected land. Trails have been marked on the property and trail maps created. The Town plans to make the house into a Community History and Nature Center. High school students will conduct local history projects (an oral history session has already been recorded), creating a library of local history research; the Conservation Commission will have a room in the house; the property will serve as an outdoor classroom for the school department's K-6 science curriculum; and scout groups and other youth groups will be able to do community service projects on the property.

Tyngsborough also recently completed an update of its Open Space and Recreation Plan. During this process, residents expressed a desire for protection of critical parcels to preserve the town's semi-rural visual character, scenic views and wildlife habitat; more public access to the Merrimack River; walking and biking trails to connect open space parcels; and creation of a more defined town center through improvements to the historic buildings and landscape settings on Route 113. Discussions are ongoing about creating a Tyngsborough land trust, but the organization has not yet been formed. In addition to the MIT lands, Tyngsborough has two other institutional owners of large open space parcels: Notre Dame Academy and Boston University's corporate training campus. Like the MIT lands, these lands are unprotected and contribute significantly to the open space character of the town.

Dunstable and Pepperell

Located at the western edge of the region, Dunstable and Pepperell are different from each other and from the rest of the region. Substantial portions of both towns have been included in the recently approved Petapawag and Squannassit Areas of Critical Environmental Concern, which are discussed later in this report.

Dunstable. Dunstable has retained its rural character to a significant degree through the deliberate efforts of town residents to preserve farms and open spaces since the late 1970s. Permanently protected land in Dunstable has quadrupled since the town's first Open Space Plan in 1976, which alerted residents to the impending suburbanization of the town if they did not take action to purchase land for conservation and/or to encourage preservation of economic uses of the land. Between 1976 and 1998, town-owned conservation and forest land increased from 341 acres to 1,597 acres. Almost 3,000 acres are temporarily preserved from development by agricultural or forestry tax abatements. The Dunstable Rural Land Trust owns approximately 500 acres, including two substantial parcels (300 and 80 acres). The Nashua River Rail Trail follows the Nashua River from Ayer to Dunstable for 11.3 miles. The Red Line trolley right of way extends from Westford north to the west side of the Salmon Brook Valley in Dunstable. Most of this land is privately owned.

Dunstable priorities include completion of a greenway along Salmon Brook, which currently has approximately 5 miles of stream bank land in conservation, and creation of more linkages between conservation lands to create wildlife corridors. The Merrimack River Watershed Association is currently working on a detailed open space plan for the Salmon Brook Watershed, most of which is in Dunstable. One of the more difficult open space issues in Dunstable is preservation of the scenic, rural character of the Route 113 gateway into town from Tyngsborough. These lands are vulnerable to ANR development. A feasibility study for a bicycle trail along Route 113 is scheduled for fall 2002.

Pepperell. Pepperell is an example of ex-urban development, where suburban housing and farms coexist with a historic town center. Much of Pepperell's residential development since 1950 has been along existing roads, so the impact of ANR development is particularly clear there. As a former mill town, Pepperell still has a larger population than its neighboring towns and it is also less affluent. However, Pepperell has approximately 3,000 acres of permanently protected open space, including Conservation Restrictions and Agricultural Preservation Restrictions. Permanently protected lands are concentrated in the northwest part of the town and include more than 300 acres in the Nissitissit River Corridor, much of which is owned by the state Department of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE), the Conservation Commission, and the Nissitissit River Land Trust. The town owns an orchard, which is leased to an operator, but the majority of agricultural land remains in private hands and is potentially developable. The Town's recent Master Plan recommends creating an open space network by purchasing land or easements along stream corridors.

Bicycle and Pedestrian Trails

A substantial regional bicycle and pedestrian trail network is in embryonic stages. Trail projects are under discussion, in planning and design, being constructed, or already in place in the City of Lowell and in every town in the region. The major trail projects include:

- *Merrimack River Trail.* Sections of the Merrimack River Trail have been completed in the City of Lowell: Esplanade Park, the trail between Beaver Brook and the Lowell Sewage Treatment Plant, the Merrimack River Walk, and the unpaved Interceptor Trail from the mouth of the Concord River to the Tewksbury town line. A connection through Tewksbury would create a trail all the way to Lawrence. An extension of the Lowell Riverwalk from Boott Mills to the Concord River is in the planning stages. The connection to the Concord River will link the Merrimack River Trail to the Bay Circuit Trail.
- *Canalway Plan.* The National Park Service is implementing a long-term plan to provide pedestrian walkways along the City's extensive canal system
- *Northern Canal Walkway.* This pedestrian path, which also has potential for bicycles, provides a link between downtown Lowell and recreational and commuting sites along the northern banks of the Merrimack River.
- *Concord River Greenway.* This greenway is planned for the eastern bank of the Concord River in Lowell, with potential for extension farther south. Currently it consists of

several protected open space parcels with links on local streets, but further open space and right of way acquisition is planned. There is potential to connect this trail with Cross Point, the terminus of the Bruce Freeman Bike Path, which is discussed below.

- *Bruce N. Freeman Memorial Bike Path.* When completed, this handicap-accessible trail on an abandoned railroad right of way will extend from Lowell to Sudbury, forming part of the Bay Circuit. Design of the first phase, from Cross Point in Lowell to Westford, has been completed. The contract has been advertised and construction is expected to begin in 2003.
- *Yankee Doodle Bikeway.* This bikeway is planned for an old railroad right of way from Iron Horse Park in Billerica to the Bedford Town Line. Funding for design and construction have been included in a state transportation bond bill but design has not yet begun. The Town of Billerica is acquiring portions of the right of way that have devolved to private hands. The Yankee Doodle Trail will connect with the terminus of the Minuteman Trail in Bedford, adding another segment to the Bay Circuit Trail.
- *Middlesex Canal Trail.* Design of a canal park and path adjacent to the Concord River Mill Pond in North Billerica is at the 25 percent stage and negotiations are underway for site control. The Middlesex Canal Commission is planning a trail along the canal towpath from Billerica through Chelmsford to Winchester and transportation funds have been awarded to design a towpath trail in Wilmington as a pilot project.
- *Nashua River Trail.* This 11-mile rail-trail stretching from Ayer to Dunstable has just been completed in 2002. The northern portion of the trail includes an equestrian trail alongside the paved bike trail.
- *Route 113 Trail.* In fall 2002, a feasibility study will be conducted for a Route 113 trail through Dunstable that would connect with the Nashua River Trail.
- *Westford Trail Network.* The Town of Westford is developing a multi-use network of trails within the town. The abandoned Red Line Trolley line will become an 11-mile trail that will connect with the Bruce Freeman Trail and trails in Groton.
- *Tewksbury Trails.* The Town of Tewksbury has acquired an abandoned rail right of way paralleling Main Street near the town center and plans to create a trail. Another future

trail project would connect the Merrimack River Trail in Lowell with the trail in Andover, making a continuous river trail as far as Lawrence.

- *Strong Meadow Trail.* The Town of Tewksbury is working to obtain the donation of an abandoned rail right-of-way that would become a Bay Circuit Trail segment from Andover through Tewksbury, with future connections to Billerica.
- *Dracut Beaver Brook Greenway.* The Town of Dracut has acquired two small parcels along Beaver Brook, which flows south through the town to the Merrimack River. Future creation of a greenway and trail along Beaver Brook is a long-term objective in the town's open space plans.
- *Conceptual Merrimack River Trails.* There has been discussion of a trail in Dracut that would run between the Merrimack River and Route 110, and proposals to create a multi-use trail along the east side of the Merrimack River in Tyngsborough.

Local Land Trusts

Eight of the nine communities in the region either have existing local land trusts or are organizing land trusts. As is typical, the land trusts tend to be the brainchild of a small group of dedicated activists, and the amount of land they own is also small.

- | | |
|--|---------------------------|
| ▪ Chelmsford Land Conservation Land Trust | 76.46 acres |
| ▪ Dracut Land Trust, Inc. | CR on 40 acres |
| ▪ Westford Conservation Trust | 120 acres in 17 parcels |
| ▪ Lowell Conservation Land Trust | 6 acres in 3 properties |
| ▪ Dunstable Rural Land Trust | 500 acres |
| ▪ Nashoba Land Trust (Pepperell) | 289.9 acres in 30 parcels |
| ▪ Nissitissit River Land Trust (Pepperell) | 16 acres in 4 parcels |
| ▪ Liberty Land Trust (Billerica) | new |
| ▪ Tyngsborough Land Trust | under discussion |

Community Preservation Act

Four of the region's communities have implemented the Community Preservation Act by voting to assess a tax surcharge for the purposes of open space protection, historic preservation, and affordable housing. In all of these communities, the debate over the CPA and subsequent discussions suggest that most of the CPA funds will be directed to open space protection. Westford and Tyngsborough voted the maximum 3% surcharge, Dracut, which has historically been extremely sensitive to tax increases, opted for 2%, and Chelmsford voted for 0.5%. Of

these towns, the first three are acutely conscious of development pressures on open space during the last decade. Billerica voted against implementing the CPA but it already has its own open space fund. Dunstable, the community that is the most undeveloped and rural of the region's towns, as well as the town with the highest median income, also voted against the CPA. As noted above, however, the town has been focusing on preservation efforts for several decades.

With approval of the CPA, each of these four towns has been required to establish a Community Preservation Committee, which will recommend how CPA funds should be spent. These committees are developing criteria for evaluating potential open space purchases and other CPA projects.

Access and Maintenance Issues

Many of the protected open spaces in the Greater Lowell Region have limited or no access. With the exception of city parks and open spaces accessible by foot from nearby homes, access requires a car. In many cases, however, there is little or no parking at potential access points. Public transportation is limited to the Lowell Regional Transportation Authority bus system, for which Lowell is the hub, and the MBTA commuter rail line that passes through Lowell and North Billerica (and eventually will extend to Nashua, NH). Most bus routes focus on the city, where the population is densest. A few bus routes extend into Billerica, Tewksbury, Dracut, Tyngsborough and Chelmsford to employment and commercial destinations. The North Billerica commuter station is adjacent to the mill historic district, dam and mill pond on the Concord River, the Middlesex Canal Museum, and the future Canal Park and towpath trail. There is no public transportation in Westford, Dunstable and Pepperell. The public transportation system, therefore, provides almost no regular access to regional open space resources for people without private vehicles.

Many open space resources have also limited internal access and maintenance. The state forests in the region have almost no funding, no rangers, and no programs, and they have very limited parking at few access points. Town forests generally have few or limited trails, are often in need of maintenance, and also have limited access. There are a handful of public beaches or other access points on lakes and ponds, and most of the land on rivers and streams is privately owned.

In many communities, maintenance and stewardship tasks are performed by volunteer groups. Organized sports associations often maintain athletic fields. Scouts and other groups have cleared trails and created trail booklets in a few communities. In general, open space maintenance does not compete effectively with other uses of funds, particularly in those communities where there is no staff person with a responsibility for open space and recreation issues. In addition, while state grant funds and CPA funds are available for open space

acquisition or, in some cases, for construction of recreational facilities, maintenance and operational funding must be internally generated.

V. THE LANDSCAPE ECOLOGY OF THE GREATER LOWELL REGION



“Landscape ecology” is a relatively new scientific field that provides useful ways to understand how the relationship of different parts of a region, built and unbuilt, are related to one another and how they affect the natural environment.⁶ It provides a framework for understanding open space on a regional level. In the context of landscape ecology, a “landscape” might encompass the amount of land area that can be seen from an airplane. From that vantage point, a landscape reveals itself to be a mosaic of repeating land uses, spatial elements, or local ecosystems. The landscape mosaic is made up of both natural systems and human land uses and is entirely composed of three types of elements:

- Patch – a relatively homogeneous area
- Corridor – a strip of land that differs from the land on both sides and links patches
- Matrix – the background ecosystem or land use type in a landscape

Applying basic landscape ecology principles to an open space analysis helps in understanding existing landscape dynamics, the effects of current trends, and the potential to enhance the desired landscape character, particularly for the preservation of environmental resources. This analytical approach permits us to make generally valid assumptions about the ecological function and value of landscape types without having to perform detailed ecological and biological surveys of each piece of land.

In the Greater Lowell Region, analysis of the landscape mosaic shows concentrations of both human uses and natural systems in specific core areas or large patches; a variety of corridors at different scales that extend out from these core areas; and a number of fragments that are less well integrated into a linked network of patches and corridors. In Map 4-Landscape Mosaic, residential subdivisions permitted since 1990 are highlighted in red, illustrating how greenfields development (in contrast to infill on vacant lots or replacement of existing structures in established neighborhoods) has been moving outward into the periphery of the region. Table One provides examples of how specific places in the region can be understood as part of a landscape mosaic.

⁶ A brief and practice-oriented overview is available in Wenche E. Dramstad, et al., *Landscape Ecology Principles in Landscape Architecture and Land-Use Planning* (Washington, DC, 1966), and a detailed scholarly treatment can be found in Richard T.T. Forman, *Land Mosaics: The ecology of landscapes and regions* (New York, 1995).

Table One: The Greater Lowell Regional Landscape Mosaic*			
Landscape Element	Human Uses and Systems	Mixed	Natural Systems
Core areas – large patches	<ul style="list-style-type: none"> ▪ City of Lowell 	N/A	<ul style="list-style-type: none"> ▪ Lowell-Dracut-Tyngsborough State Forest ▪ Manning/Billerica State Forest ▪ Dunstable adjacent farm and forest lands
Other large patches	<ul style="list-style-type: none"> ▪ Mill Villages (Billerica, Chelmsford, Dracut, Westford, Pepperell) ▪ Town Centers ▪ Dense development around Great Ponds 		<ul style="list-style-type: none"> ▪ East Dracut adjacent farm and forest lands ▪ Pepperell adjacent farm and forest lands ▪ MIT Haystack Observatory lands ▪ Town Forests ▪ Tewksbury State Hospital lands
Major Corridors	<ul style="list-style-type: none"> ▪ Routes 3, 495 		<ul style="list-style-type: none"> ▪ Merrimack River ▪ Concord River ▪ Shawsheen River ▪ Nashua River
Minor Corridors	<ul style="list-style-type: none"> ▪ Other arterial roads with strip development such as Routes 3A, 38, 110, 113 	<ul style="list-style-type: none"> ▪ Bruce Freeman Trail ▪ Nashua River Trail ▪ [Yankee Doodle Trail] ▪ [Middlesex Canal Greenway] ▪ Utility rights of way 	<ul style="list-style-type: none"> ▪ Nissitissit River ▪ Salmon Brook ▪ Stony Brook ▪ Beaver Brook ▪ other brooks and streams ▪ associated wetlands
Fragments and small patches	<ul style="list-style-type: none"> ▪ Subdivisions ▪ Houses and driveways along roads ▪ Industrial parks and office parks 	<ul style="list-style-type: none"> ▪ Playing fields ▪ City and Suburban Parks ▪ Isolated Farms 	<ul style="list-style-type: none"> ▪ Municipal Conservation Lands ▪ Isolated Wetlands ▪ Lowell Capped Landfill ▪ Vernal Pools ▪ Ponds with undeveloped shores ▪ Isolated Woodlots

* Elements in brackets are in the planning stages.

Biodiversity and the Greater Lowell Region

State environmental agencies recently completed studies and maps of biodiversity in Massachusetts. According to these resources, except for the western portion of the region, which is located in the Nashua River Watershed, the Greater Lowell area has a limited number of intact terrestrial and wetland ecosystems that support biodiversity. Natural habitat communities and areas of rare species populations were selected to appear on the state BioMap based on a judgment of their viability, that is, their probability of persisting over time. Viability was judged by three factors:

- Size – the geographic size of an area and the size of rare species populations
- Condition – the maturity and reproductive success of species, diversity of species, and the relative lack of invasive exotic species and disturbed land
- Landscape context – the level of connectivity and fragmentation and the condition of the surrounding landscape.

