Protecting the Commonwealth's Most Vulnerable Agricultural Lands: the Role of the Massachusetts Agricultural Preservation Restriction (APR) Program

A thesis submitted by
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Abstract

Farmland loss due to sprawl is a significant problem throughout the dense Northeastern Unites States. While a variety of regulatory and non-regulatory tools and techniques are available to encourage better management of growth and preservation of agricultural resources, since 1980 Massachusetts has relied heavily on the success of the Agricultural Preservation Restriction (APR) Program. The APR program has permanently protected 803 farms, or 67,089 acres in 13 counties across the Commonwealth, however the APR restriction has historically been used less in rapidly developing areas of the Commonwealth like Middlesex County. As budgets shrink and land values increase, the APR program has the potential to become less efficient in preserving Massachusetts's most vulnerable agricultural lands. To remain effective, the APR program must adapt its methodologies to become more proactive, develop a stronger working relationship with regulatory land use planning, and adopt alternative financing instruments that will allow the APR program to remain financially competitive.

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Chapter 1: Introduction

The Northeastern settlements of the United States were born on a foundation of agrarian values that emphasized independence, self-sufficiency, moral integrity and a cultural identify rooted in the land that sustained the lives of its inhabitants. Over the years industry has supplanted agriculture and most of us have lost the skills, the knowledge, the desire and the ability to sustain our own lives through cultivating the land. Meanwhile populations have grown steadily and land has become a commodity – and ultimately development and sprawl have supplanted agriculture. In recent decades, farmland preservation has become a topic of significant discussion and research. The pastoral landscapes and clapboard farmhouses of the Northeastern United States provide much more than a time capsule of tradition and history. Their preservation offers benefits such as food security, economic development and a way of life for many Americans.[1]

Since the mid-20th century, growth in disposable income, continued inflation, uncertainty in the stock market and a growing demand for open, recreational space has made land an attractive investment.[2] Investors and speculators have eagerly sought out flat, buildable land in the urban fringe, which most often tends to be active or inactive agricultural lands. If rising land prices have served as the incentive for farmers to sell their lands, steadily declining farm income has become a stark disincentive that has discouraged farmers from making necessary investments in their farm operations to remain relevant and profitable. As a result,

farmers have been encouraged, and often times compelled, to exploit the investment potential of their land without much regard to its impact on a sustainable agriculture system in Massachusetts and the Northeast.

Compared to the rest of the County, the Northeast is unique due to its high concentration of urban centers with large, dense populations. Land in close proximity to urban areas is historically under the greatest development pressure due to its relatively high land values. In the Northeast over half of all farms are located in or near metropolitan areas on the urban edge, in the direct path of development.[3] Consequently, agricultural real estate values in Massachusetts have skyrocketed to over $12,000 per acre, the highest in the country, which has contributed to the decline in the long-term economic viability of farming operations, as well as the rapid loss of prime agricultural lands to development.[4]

Despite being at the epicenter of growth in the Northeast, Massachusetts has maintained a vibrant agricultural economy. Currently 10 percent of Massachusetts's total land area, or about 518,000 acres, are in farms. Of this land area only 119,000 acres are classified as cropland with prime agricultural soils – the best land for food production. The problem is that prime agricultural lands are often prime for other uses as well. Over recent decades Massachusetts state and municipal governments have implemented numerous regulatory and non-regulatory tools to influence development and protect the most valuable agricultural lands. Conventional policy approaches have involved market

intervention to reduce costs, enhance the profitability of farm operations, and restrict or eliminate the development potential of the land. While these preservation programs have been met with varying degrees of success, they rely on incentives to attract participation. They are competing against a culture that highly values property rights, individual freedom and the opportunity to create personal wealth. These are core values that have created a system that places the commodity value of land well above its current productive use value, something particularly apparent in the urban fringe.[5]

It is because of these core societal values and the threat of infringing on personal property rights that we have become heavily reliant on incentive-based farmland preservation programs. One program in particular, Massachusetts's Agricultural Preservation Restriction program (APR) has been particularly effective at the state level. Since 1977, the APR program has permanently protected over 67,089 acres of the states most productive farmland.[6] While the APR program has been used across the state, the majority of acquisitions have been in western and central Massachusetts.

This thesis seeks to conduct a policy analysis of the APR program, a farmland preservation tool used to preserve prime agricultural lands within Massachusetts. This thesis will look specifically at the ability of this program to protect farms on the urban edge in Middlesex County, as compared to the explicit goals and methodologies of the APR program. Middlesex County is the most populous

county in Massachusetts and the 23rd most populous county in the United States.[7] Despite a population of over 1.7 million people, Middlesex County remains home to over 700 farms and 33,893 acres of farmland.[8] In 2007 farms in Middlesex County produced over $68 million dollars in crop sales, much of which came from a rapidly growing and innovative direct-to-consumer market in the Boston metro area.

Given the expected continual increase in land values, and the growing threat of development pressure from sprawl, significant questions remain about the long-term sustainability of these farms on the urban edge in Middlesex County without programmatic assistance. Each farm lost in Middlesex County contributes to the growing fragmentation of agricultural resources and operations. As farmland becomes increasingly noncontiguous, running and monitoring an economically viable farm becomes more difficult, thereby further reducing the necessary support structure for existing farms to withstand development pressures on their own.[9]

1.1: Outstanding Questions

For this thesis, I will be investigating and seeking answers to questions that will help identify whether or not Massachusetts's APR program as it is currently structured can efficiently and effectively preserve farmland that is subject to increasing pressure from non-agricultural development and urban services. The main questions I will look to answer are the following:

1. Has the APR program been used in Middlesex County, and if so does the APR internal selection criteria support or hinder the acquisition of farmland that is located on the urban edge?
2. Is the active agricultural economy and land base in Middlesex County vibrant enough to justify increased programmatic attention and funding from the APR program?
3. What are the incentives, which currently exist, that encourage participation in the APR program, and are they strong enough to entice farmers in urban areas to voluntarily participate in the program?
4. How can the APR program be more efficient and more strategic in protecting farmland on the urban fringe?
5. Are there other farmland preservation strategies/tools or policies that are not being used or are being underutilized that could more effectively increase farmland preservation efforts in Middlesex County?

1.2: Methods

Literature Review:

The primary methodological approach to this thesis will consist of a thorough, multi-disciplinary literature review that will examine the diverse literature on public policies and tools for preserving farmland and managing open space and growth in the urban edge. Sources will include peer-reviewed journal articles, government reports, organizational publications, books and analyses of comparable farmland preservation programs.

Interviews:

In order to gather a more in depth understanding of farmland preservation efforts in Middlesex County and across the Commonwealth, targeted interviews were conducted with various stakeholders directly involved with the APR program, as well as other farmland preservation efforts in Middlesex County and across the Commonwealth. Interview subjects included APR program staff, USDA Farm and Ranchland Protection Program (FRPP) staff, Metropolitan Area Planning Commission staff and Community Preservation Coalition Staff among others. A complete list of interviews is included in Appendix G. Interviews were generally conducted over the phone and typically lasted about one hour. The interviews were comprised of structured questions, but they also remained flexible to engage the individual expertise of each interviewee. Explicit goals of these interviews included, but were not limited to:

- Collecting information regarding the status of current planning and policy tools that encourage farmland preservation within the Commonwealth of Massachusetts;
- Gathering data regarding respondents' perceptions to a wide range of APR program features and impacts at the state, regional and local levels; and
- Gathering data regarding respondents' thoughts on new or underutilized policies or tools that could enhance the effectiveness of open space planning and agricultural preservation across the Commonwealth.

Geographical Information Systems Analysis:

One additional component of this research involved the use of GIS software to create two sets of maps that will accompany chapters three and four of this analysis. The first map set accompanying chapter three analyzes land use change in Middlesex County between 1971 and 2005. Following an NRCS model, the MassGIS Land use cover data was reclassified to create four maps that visually identified changes in land use, and specifically agriculture use within Middlesex County over time. These maps quantitatively and visually demonstrate the change in the total percentage of developed, undeveloped and agricultural lands, as well as the location of current agricultural land and the change in total acreage. The second set of maps, (which accompanies chapter four), were created by the National Resource Conservation Service and presents a spatial soil analysis of Middlesex County, which allows the reader to identify active, unprotected, agricultural soils that may qualify for acquisition pursuant to the APR program. Unfortunately a deeper analysis is limited by the available GIS data in Massachusetts. Currently, there is no parcel-level farm data that accurately provides information on farm location, size, outputs or value that would support a deeper analysis of a farm's eligibility for the APR program.

1.3: Thesis Outline

Chapter two introduces the topic of urban sprawl and the concept of the urban growth machine, however only for the context of understanding the development pressures that have contributed to the decline in farmland in the Northeast. It briefly defines selected factors that characteristically impact the vulnerability of

farmland on the urban edge, examines the societal and economic values that commonly drive farmland preservation, and finally, provides a brief overview of policy tools that are available to combat these challenges in the Northeast.

Chapter three uses data from the National Agriculture Statistics Service and the U.S. Department of Agriculture's Census of Agriculture to examine how farmland in Massachusetts has changed over the previous decades and how farms have adapted in the face of increasing development pressures. This chapter introduces the study area of Middlesex County and provides an overview of relevant demographic and economic characteristics, as well as a summary of agricultural land change and farm adaptation in Middlesex County. Finally, this chapter incorporates four maps created with Geographical Information Systems (GIS) Arc Map software that depict changes in agricultural and developed land uses over time in Middlesex County between 1971 and 2005.

Chapter four introduces and examines Massachusetts's Agricultural Preservation Restriction (APR) program. The chapter examines the legislation (Chapter 184 sections 31-33) that overrides the common law provision (Chapter 184 section 27) prohibiting perpetual restrictions on private land, and provides the Commonwealth with the authority to acquire conservation restrictions that permanently protect agricultural and forest resources. It then provides a summary of the history and organizational structure of the APR program, emphasizing historical and current funding sources as well as the internal selection criteria and

processes used to prioritize and acquire APR restrictions. This chapter also examines available incentives such as Massachusetts General Laws Chapter 61A, and the more recent state conservation land tax credit that encourage landowner participation in the APR program.[10] Chapter four concludes with a brief analysis and GIS mapping exercise that examines the location and quantity of unprotected, prime agricultural soils within Middlesex County.

Chapter five builds on chapter four and offers recommendations that have been identified through the literature review and interviews that could improve the efficiency and effectiveness of the APR program and overall farmland preservation efforts in in Middlesex County. Recommendations include: application of installment purchase agreements, or IPA agreements; development of proactive statewide and regional preservation strategies and the provision of organizational support for the development of local and regional transfer of development rights (TDR) programs.

Chapter six summarizes key findings and outcomes from this study. It also discusses the limitations of this thesis and provides suggestions on the future of farming and farmland preservation in the urban edge.

Chapter 2 Literature Review

The following chapter conducts a literature review that examines a variety of topics that impact agriculture on the urban edge. These include, but are not limited to: the concept of the urban growth machine; vulnerability characteristics; the values behind farmland preservation; and an overview of select farmland preservation tools.

2.1: The Theory of the Growth Machine

After World War II, upper and middle-class populations sought refuge from the continually declining conditions of life in the urban core. Rising crime rates, increasing racial tensions and aging infrastructure drove young couples and families towards inexpensive land in the urban fringe.[11] At the same time, the U.S. Government was promoting a back-to-the-land movement that supported dispersal and home ownership. Mortgages were cheap and available, especially for military veterans, the personal automobile became affordable and highways were being built at a rapid pace to connect suburban communities with the downtown core.[12]

The continued flight of homeowners from the city in search of low-density development is referred to as urban sprawl. Sprawl characteristically radiates outward from the urban core, creating low-density, auto dependent development on rural lands with an emphasis on segregated uses.[13] Today, the lure of cheaper

land and home ownership continue to draw people to the suburbs, but the underlying catalyst of sprawl is best understood through Molotoch's theory of the city as a growth machine. The growth machine recognizes land, the building block of place, as a market commodity that provides wealth and power to those who acquire and exchange it.[14] Each parcel of land represents an interest, and subsequently each landowner has an intended use for that given piece of land. This relationship is most often straightforward in that as the profit potential of the land increases, so does one's own wealth.[15] In reality any interest in land is bound to the future of the surrounding parcels, however each landowner will often seek to enhance the profit potential of their land at the expense of others, which has the potential to contradict the collective best interest. Combine this with the uncertainty of the stock market and alternative investments options over the years, and you begin to understand how land has become one of the most important sources of wealth, status, and power in urban, suburban, and rural social systems.

As the growth machine has continued, and some may even argue has accelerated, urbanization and decentralization of the population have quickened the conversion of rural land for urban uses. The growth machine, once limited to the boundaries of cities, has become a driving component of sprawl in traditionally rural areas. Land use activities that require central locations easily out-bid competing land uses in rural areas, and have placed incredible pressure on farmland resources in urban fringe communities.[16] Decentralized, low-density

development threatens the viability of resource-based industries like agriculture and the many ecological services and benefits they provide.[17]

2.2 The Tenuous Relationship Between Farmland and the Urban Fringe

The model of the growth machine, which sees land as source of power and status rationalizes how western cultures have commoditized land into a powerful form of capital. In North America, and in the Northeast in particular, land ownership is tightly bound to property rights, individual freedoms, and wealth that often place the productive use of a parcel of land well below its potential highest and best use in the open market.[18] Agricultural lands are particularly at risk because farms have retained high property values, while the cost to develop them remains very low. As a whole, the Northeast has a fairly rugged topography, which often places farmland in river valleys and other flat areas that make it the easiest and the most cost efficient choice to build upon.[19] A new development on a hillside may sell homes or lots for more money, but it will also require increased infrastructure, excavation and construction costs that may not be offset by the increase in revenue.

At the individual farm level rising agricultural land prices can be both a blessing and a curse. Farm operators are often cash poor and land rich, relying on their farm to grow in value and ultimately provide them with a source of capital for retirement.[20] To fully understand how sprawl affects agricultural lands, it is necessary to break farmland into three separate value components. The first

component is productive use value, which is the value of the land for continued agricultural use. The second component is consumptive use value, which is the value of the site as a home whether the owner farms the property or not. The final component is speculative use value, which is the increased value over the first two components that is a direct result of development pressures.[21] Rapid increases in agricultural land prices can be attributed to speculative land practices.

One result of increasing land prices is often a sense of uncertainty, and insecurity of farm operators of the long-term viability of agriculture in their area.[22] The literature commonly refers to this symptom as the impermanence syndrome, which is characterized by a belief that agriculture has no future and that urbanization will ultimately absorb their farm and farms in their region. Studies have demonstrated that as land values increase in anticipation of urban development, investment in agricultural enterprises declines.[23] The impermanence syndrome can also manifest itself in other ways. Farmers may sell off tracts of land or shift their crop selection to those that are less labor or capital intensive, thereby limiting the ability of their enterprise to keep up with the rapidly increasing taxes associated with inflated land prices.[24] As a result, farmers become stuck in a cycle of declining income and production, waiting for their day to cash out. While the sale of an individual farm may benefit one family financially, like a ripple in a pond each farm lost has far reaching effects on the collective agricultural system.

2.3: Characteristics of Farmland Vulnerability

Before examining the benefits of preserving farmland, or the tools to accomplish this goal, it is necessary to identify common characteristics that define or contribute to the vulnerability of agricultural lands on the urban edge. Unfortunately, this research has uncovered a lack of existing literature that evaluates the complete breadth of factors that influence farm vulnerability in metropolitan and rapidly urbanizing areas. It is important to note that chapter four analyzes farmland preservation program selection processes and protection criteria. Therefore this section does not discuss how the vulnerability criteria impact a parcel's chances of preservation, but instead focuses on how these factors more generally affect viability.

Agricultural Land Fragmentation

As rural landscapes are sub-divided and developed into homes and commercial centers, agricultural infrastructure disintegrates. While each farm lost has direct impacts on the environment, economy and rural society, there are also less observed outcomes on farm contiguity and local and regional fragmentation. Fragmentation of agricultural lands from urban sprawl affects the long-term production capacity of the land as well as its rural and scenic qualities in two distinct ways.[25]

Regional fragmentation occurs when farmland loss leads to a decline in farm support operations and facilities that ultimately raise operating costs. These

services can include co-operative feed outlets for livestock, pesticide and seed wholesalers, or even sources of labor. With the loss of its support structure, running an economically viable farm operation becomes increasingly difficult.[26]

As individual farms are lost to development, remaining farms become parcelized, which creates a sporadic distribution of non-contiguous farmland across the landscape.[27] Parcel fragmentation is problematic for a number of reasons. Farmers are often required to cultivate scattered parcels that increase equipment transport costs and time and reduce the operator's ability to effectively monitor crops and pests. It is also common for isolated farms to receive increased complaints from neighbors, and an overall lower level of support from local officials and regulations.[28]

Environmental Factors

A number of environmental factors exist that influence the viability of farm operations on the urban edge. These include, but are not limited to topography and distance from urban determinants. Urban determinants can be broadly defined as services or infrastructure that are characteristic of existing or impending development like town and commercial centers, public sewers, power lines and major roads or highways.

A study conducted in 1998 by D.F. Levia looked at farmland conversion factors in Leominster Massachusetts, an area that had experienced an 11.9% decline in

farmland between 1988 and 1998. The study evaluated farmland that had been converted over the previous 10 years by a number of characteristics that included: topography, distance from the city center, distance from I 90, (the closest major highway) and farm size. The results of the analysis concluded that over 60% of farmland lost could be statistically attributed to the aforementioned environmental characteristics.[29] The remaining factors included mean annual household income and construction permit applications, but could not be proven statistically significant. The limited literature seems to support the view that development will follow the path of least resistance and that flat farmland in close proximity to urban centers and highways will be at increased risk of development.

Increasing Land Values

In the urban fringe speculative land practices can trigger a dramatic increase in land values, which are always followed by an equally staggering increase in property taxes. The literature estimates that property taxes can often consume as much as 20% of a farmers net income. In densely populated regions like the Northeast, real property taxes can easily equal, or exceed net farm income.[30] Once speculation has taken hold in a township or region, the farm property is no longer taxed at a rate equal to its productive or consumptive use value, but is instead taxed at a rate equivalent to its speculative use as a subdivided community, condominium association or commercial center. If the tax burden on farms cannot be reduced, the impermanence syndrome takes hold, which can lead farmers to sell their land, rather than continue to hold out and lose money.

Local Commitment to Agriculture

Local development trends can affect municipal goals and regulations relating to expansion and growth, which ultimately impact local sentiment towards agriculture. A municipality has the power to implement regulations and policies that can support or undermine existing agricultural infrastructure.[31] The presence or absence of right-to-farm legislation and local farmland preservation funds or programs can reduce or increase farm vulnerability to development pressures or nuisance suits. Local zoning regulations have the greatest impact on agriculture. Underlying zoning has the power to preserve or destroy existing agricultural resources by directing future development to or away from valuable open space resources. A good way to judge a communities level of support for their agriculture is to examine local zoning ordinances or the local comprehensive plan.

2.4: Farmland Preservation Values and Goals

As a result of development pressure continues to expand farther from the historic urban core. In response, local, regional, state and federal land preservation programs have been created to stem the loss of invaluable agricultural soils and to protect a critical mass of farms and farmland in order to keep agricultural support operations viable. Land preservation can be defined as restricting the uses of a property over time. [32] During the 1970s the farmland preservation movement gained momentum, however there was a lack of agreement over the true goals and benefits of agricultural land preservation initiatives. Early objectives included

safeguarding the family farm, conservation of prime agricultural soils and protection of agricultural land from conversion to urban and related uses.[33]

Current literature and research still demonstrate that one of the greatest hindrances to the success of preservation efforts remains disagreement over, and a lack of coordination and understanding of, the values and goals of farmland preservation. Farmland protection programs are often expensive, therefore it is critical to tailor programs to local conditions and preferences to generate broad support from local taxpayers.[34] The following are four common "goals" of farmland protection found in existing literature.

Economic:

According to the most recent US Census of Agriculture, despite the typically small size of farms in the Northeast, the market value of all agricultural products sold in New England in 2007 (MA, CT, RI, VT, NH, ME) was estimated at $2.6 billion dollars.[35] This figure does not include revenues to local and regional economies through cash receipts, wages paid and property taxes. The population of this region is growing dramatically, and there are studies that report that if agricultural infrastructure is protected from development pressures, than urban sprawl and population growth will create new markets for products, which could increase farm income and viability.[36]

Not only do farms contribute to the economic vitality of their locality, but they are also less demanding on local municipal services than are residential land uses. A

2010 Fiscal Impact Analysis done by the Trust for Public Land found that in Nassau and Suffolk County New York, residential development on average costs $30,200 a year more per acre than it supplies in property tax revenues.[37] While agricultural land does not pay for itself, the study also found that agricultural land requires more than $2,960 more in government services per acre than it generates in property tax revenues. While the fiscal expenditure for agricultural land is significantly less, the real difference is found in the fact that agricultural land directly contributes to the economy through direct sales, wages paid, support services and tourism.[38] By preserving agricultural land a municipality benefits not only from an increase in economic revenue, but from an overall lower expenditure on community services, which can in turn reduce the property tax burden on local residents.

Smart Growth Development:

Farmland preservation is not only a tool to protect vulnerable land, but is hailed by some as an instrument to manage growth and counter the negative impacts of development and urban sprawl. Smart growth strategies approach growth management through proactive implementation of incentives and disincentives that direct growth into defined areas.[39] Smart growth rarely outright prohibits growth, which is both an asset to and a target of criticism against the movement's effectiveness. Farmland often becomes a common preservation target due to the wide political appeal of conserving the scenic views, open space and environmental benefits associated with farms.[40]

Food Security/Agricultural Viability:

There is a debate within the literature about whether or not the continued conversion of farmland in the Northeast (and the country as a whole) will have an impact on our nation's long-term food security.[41] Fueled by concerns over food safety, food transport miles and an overall broader understanding of the nutritional and health benefits of fresh, locally sourced foods, demand for local food has increased dramatically across the nation over recent years. While some loss to the agricultural land base may not devastate our food production system, it will increase our reliance on other parts of the county for our food and thereby hurt the burgeoning local food movement. It is therefore widely agreed upon that any loss of limited, prime agricultural soils is not something we can afford.

Prime farmland is characterized by the highest quality soils and is integral to this country's production of food and commodities.[42] As our population continues to grow and prime soils are lost, farmers will resort to converting and farming wetlands, forests and other marginal land with less productive soils. Studies claim that for every acre of prime soil lost, more than an acre of marginal soil must be cultivated to meet the demand for food and commodity products.[43] Given past and current rates of development and population growth, it is easier and likely more cost efficient to preserve prime farmlands now than farm marginal lands in the future.[44]

Public Benefits:

Hellerstein et al. contend that despite the persistent conversion of farmland to developed uses, our capacity to "produce food and fiber is not at risk."[45] Many farmland preservation programs are instead designed to protect an array of rural amenities and public benefits. Rural amenities are defined as goods and services that come from agricultural lands that do not include food and fiber, but do include scenic views, an agrarian cultural heritage, wildlife habitat and a way of life.[46]

Public benefits overlap slightly, and also include storm water management, protection of wildlife habitats and corridors and protection of scenic views. According to Nelson, it is almost impossible for the free market system to account for and quantify the value of rural amenities and public benefits to the larger population.[47] If one day we are able to include the value of these benefits in the land value, than it is very possible that the productive or consumptive use value of agricultural land will exceed its speculative value, and by the power of the open market will remain in agricultural use without any market intervention. If the productive or consumptive use value of agricultural land equaled the speculative use value, then the landowner would have less financial incentive to sell their land to a developer. Until that day, farmland preservation tools attempt to correct this market failure by preventing the loss of the irreplaceable public benefits associated with agricultural land.

2.5: Farmland Preservation Tools and Techniques

The role of federal, state and local governments in land management in the Northeast has evolved dramatically over the past forty years. In the 1960s, farmland protection consisted of a series of fragmented, localized efforts lacking national support and credibility.[48] In the 1970s, environmentalists sought national legislation that would regulate land use and minimize the environmental costs of development on valuable agricultural lands, wetlands and estuaries.[49] While initial efforts were met with little success, eventually the movement gained momentum. States, municipalities and eventually the federal government helped design programs that would form the basis of large scale national effort to protect our most valuable agricultural lands.[50]

According to the literature, there has been a universal progression of farmland protection programs over the past 40 years and the techniques can be cataloged under two categories: direct and indirect land use controls.[51] Direct land use controls attempt to limit the use of the land, while indirect controls offer incentives (carrot and the stick model) to encourage landowners to keep agricultural land in farms or as open space.[52] A toolbox of skills, laws and regulations exist within each of these categories, all used, to preserve valuable farmland. These tools are currently available for use across the Commonwealth, however their implementation is dependent on the political climate and public sentiment at the state and local level. This section will briefly introduce the most

common direct and indirect tools used in the Commonwealth.

Agricultural/Farm Use Zoning

Agricultural zoning was the first direct farmland preservation tool used in the Northeast and around the country. This regulatory approach does not exist as a body of law, but is implemented with the intention of designating zones within a municipality that can be used solely for agricultural purposes.[53] Designation of agricultural zones typically increases the acreage requirements for residential lots, which enhance the chances that the farmland will remain farmland as developers are unable to subdivide the farm into smaller lots.[54]

There are clear advantages and disadvantages associated with agricultural zones. One advantage is that unlike other techniques, zoning does not require extensive capital to maintain the program, and is not voluntary. It is believed that the designation of an agricultural zone keeps land speculation at bay, land prices more stable and preservation of large, contiguous areas of farmland possible.[55] The zone designation is intended to promote stability by limiting or removing development pressure and increasing the chance that farmers will invest in their farms.

One disadvantage is that an agricultural zone designation limits the possible uses of the parcel within that zone. Subsequently, it is possible that a restrictive zoning designation that singles out a select number of parcels may potentially be subject to a "takings" challenge, which accuses the government of taking private property

without just compensation.[56] This thesis will not discuss the details of a takings challenge in great detail, as it would require a much larger discussion on the legal ramifications of land use planning and zoning. For the purposes of this thesis it is important to note that while agricultural zones are intended to reduce development pressure and tax burdens on local farms, farm operators are often opposed to their use.[57] Land within an agricultural zone is worth less, as its ability to be purchased and subdivided has been restricted. Farmers tend to be cash poor and land rich, and an agricultural zone can remove or reduce the equity and credit value of the farmers land.[58] Ultimately the literature deems that agricultural zones are only effective in diverting initial development pressure and are seen by many farmers as an infringement on their property rights.[59]

Use Value Assessment

Given that zoning may be ineffective alone, a second-generation, indirect tool was developed that aimed to enhance economic viability.[60] Under this approach the farmer is offered tax incentives to keep his land in agriculture through what is called "current use value assessment" rather than the traditional "market value assessment" associated with speculative land practices.[61] As discussed earlier in this chapter, land which is actively farmed is assessed a tax rate that is reflective of its use value rather than its speculative, or highest and best use value, which can offer substantial savings to farmers as the value of lands increases.[62]

The belief is that a reduction in taxes will increase the profitability of the farm operation enough to discourage conversion of farmland into non-farm use.[63] The

dominant opinion is that property taxes can't be reduced enough to prevent the spread of urban uses to farmland and to ensure farmers will not accept high offers for their land. Instead, it is believed that this tool effectively, albeit temporarily inhibits premature divestment while other techniques or funds are raised to ensure long-term preservation.[64]

One drawback of the program is that the farmer only receives the benefits of the use value assessment if the land remains actively farmed. Should the farmer decide to stop farming or sell the farm, the farmer is subject to payment of back taxes and even to the right of first refusal by the municipality in the sale of their farm.[65]

Agricultural Districts (AD)

Realizing that use value assessment promoted protection of isolated farms, a new indirect tool emerged that combined tax relief with the creation of regions that would protect contiguous lands where agriculture was the preferred use.[66] Agricultural districts are a state-by-state legislative adaptation designed to protect and encourage development and improvement of agricultural lands.[67] Farmers that control a minimum of 500 acres of land in a town or region where farming is the preferred economic activity may qualify for the creation of a district. The landowners receive protections in exchange for an agreement not to use their land for purposes contrary to the states agriculture preservation objectives.[68]

Short-term benefits of an AD are similar to a use value assessment and offer a reduction in local property taxes.[69] Additional benefits of an AD include relief from regulations that may unreasonably restrict farm structures or farming practices in addition to the of right-to-farm laws that protect farmers from nuisance suits as a result of noise, lights, or smells associated with sound farm practices.[70]

Ultimately, agricultural districts, much like use value assessment, are voluntary and tend to only slow the loss of farmland by redirecting initial development pressures. The chief drawback of this tool is that formation of an AD is a time consuming and complicated process.[71] Additionally, for a state to recognize an agricultural district there needs to be an area of concentrated agricultural land, so this tool is of little use to those who have the last active farm within their town or county.

Agriculture Conservation Easement

The most recent adaptation has been the use of conservation easements, a voluntary, legally recorded restriction placed on a landowner's property to protect a natural, or man made (such as historic) resource.[72] The most common program names for agricultural conservation easements include: purchase of development rights, agricultural conservation easements and agriculture preservation restrictions. A conservation easement is usually obtained through donation or purchase of the lands development rights that pay the farmer the difference between the fair market value (value if sold for development) and the fair

agricultural value of the land.[73] There are significant advantages and disadvantages to use of this tool.

One advantage is that the conservation easement protects not only the land and its resources, but also the needs of the farmer and of the agricultural business. The easement allows the farmer to diversify and expand operations that are essential to remaining economically viable.[74] By removing the development rights from the land the speculative value of the parcel is eliminated, thereby lowering the total value of the land, and ultimately reducing the landowner's property tax burden. The sale of the development rights provides the landowner with capital that can be used towards farm operations, economic enhancement projects, or retirement savings[75] In exchange for the sale of their development rights, a permanent restriction will be added to the landowner's deed that prohibits the use of the land for anything but agriculture, forest or conservation use.[76] The hope is that the money will be reinvested into farm operations, pay off farm debt, or be put towards retirement, however I did not find any research that examines how farmers utilize proceeds from conservation easements.

The main drawback of easements is that they are extremely expensive. With the high cost of farmland, state and local municipalities as well as non-profit land trusts have a difficult time raising enough funds to preserve every farm under development pressure. Many programs have instituted creative financing solutions such as real estate transfer taxes and issuance of bonds; however there

never are never enough funds.[77] Reliance on the easement as the primary tool can result in fragmented, instead of contiguous preservation of lands. As previously discussed, if farms remain protected in isolation than development pressure is only abated temporarily. Conservation easements and purchase of development rights will be discussed in greater detail in chapter four.

Transfer of Development Rights

Transfer of development rights is a direct preservation tool that has the potential to compensate landowners for any lost value when their land is placed under one of the aforementioned preservation programs. Similar to PDR programs, a TDR program compensates landowners for a perpetual restriction that removes the development potential of their land. Unlike PDR programs, the sale of TDR credits does not entirely extinguish development potential, but instead is a tool to shift development rights from low-density sending districts, to receiving districts that can accommodate higher densities.[78] As discussed below, a developer will commonly purchase TDR credits (the development rights) from a landowner in the sending district to take advantage of the benefits that they afford in the receiving district. These include, but are not limited to increased building height, decreased lot sizes and increases in floor-area-ratio.[79]

Equally important to the success of TDR programs, disincentives must be established to discourage development of open space resources in sending districts. For example, a TDR program may increase the lot size to five times the existing base zoning, which decreases the development potential of the land in the

preservation district, where the TDR credits originate.[80] Sending districts may protect a variety of preservation areas that include a municipal water supply, historic buildings, wetlands or wellheads, but they are most often used to protect prime agricultural lands. TDR programs are most effective when the sending area contains large, contiguous blocks of farmland (or open space land) currently in farm use.[81] The receiving district is most often a portion of a town or county that has been designated as a "growth activity center."[82]

Receiving districts are areas that are typically growing and have the both the space, and the capacity to accommodate higher densities. These areas are usually on or near the urban fringe, and benefit from existing public infrastructure that includes public transit oriented neighborhoods.[83] An individual or municipality can also purchase development rights as a way of preventing further development.

A successful TDR program would potentially create an open market system that could bring landowners more money than the sale of a purchase of development right (PDR). Consequently, the burden of raising large sums of money for preservation efforts would no longer fall on local governments or non-profit organizations.[84] TDR programs are attractive on paper, however their main drawback remains that few functional, active models programs exist. Transfer of development rights along with their role in Massachusetts will be discussed in greater detail in chapter five.

Chapter 3: Adaptation of Agriculture in Massachusetts

Since the 1980s agricultural land protection has been one of the leading land use issues addressed by federal, state and local agencies that have worried about the loss of farmland and the farm support structure that drives our nations food production.[85] Despite a steadily increasing awareness, the concern for farmland protection is not universally shared across the nation or even within states. Politicians, researchers and the public all have differing opinions on how much farmland is being converted to other uses, and the long-term impact it will have on our nation and the worlds food supply. Using data from the NASS Census of Agriculture and MassGIS, this chapter will examine how farmland in Massachusetts and in Middlesex County have been affected by and have adapted to mounting development pressure over the years. Data tables referenced in this chapter can be viewed in Appendix A.

3.1: Agricultural Land Use Trends Across the Commonwealth

Massachusetts has a rich and diverse agricultural heritage that remains an integral part of the state's economy, landscape and social structure. According to the MassGIS, between 1971 and 1999 Massachusetts lost approximately 79,000 acres – about 2,900 acres annually – of agricultural lands that included cropland, pasture, and woody perennials like cranberry bogs.[86] Between 1992 and 1997 the National Resource Institute (NRI) estimates that the rate of farmland conversion

in Massachusetts further increased, with residential and commercial development overtaking 5,440 acres of cropland and pasture annually.

Unlike many other states, Massachusetts has managed to slow the historical trend of farmland loss, although not completely. As of 2002, the Commonwealth had 518,570 acres of land in farms representing 10 percent of the state's total land area.[87] This does not mean, however, that there were 518,570 farmable acres across the state. Over 50 percent of the agricultural lands in the state at the time were forested or covered by wetlands and therefore were not farmable in their current state. [Table 3.1] Of the state's total agricultural land area, the acreage that represents "prime" farmland – the land best suited physically and chemically to produce crops – represents just over 50 percent, or 277,500 acres, of the state's total farmland.[88] Even a smaller percentage of total prime soils, 52 percent, are actually farmable. [Table 3.2]

Viewed alone, it is very difficult to draw any conclusions regarding the overall health of the agricultural land base of Massachusetts in 2002. Therefore, it is necessary to provide a more recent point of comparison to examine how agricultural land use trends in Massachusetts have changed since the rapid agricultural conversion of 1990s. Despite continued development, between 2002 and 2007 the overall agricultural land base only declined by roughly 700 acres, a negligible amount. [Table 3.3] This does not necessarily indicate that no farms were lost during this time. It could instead signify that previously fallow or

inactive agricultural lands began to be cultivated, which could have offset any losses. It is interesting to note that during this period the number of farms increased, while the average farm size decreased. This could signify a shift in production or distribution methods, or changes in crop selection that would support the economic viability of smaller farms. Ultimately, these statistics demonstrate that agriculture remains a vibrant industry in Massachusetts.

3.2: The Evolution of the Commonwealth's Agricultural Economy

As of 2007, farms in the Commonwealth generated nearly $490 million in sales of farm products, an additional $118 million in wages, and another $461 million in production expenses that went to agriculture support services.[89] Picturesque New England towns with their rolling hills and pastoral farms also serve as a significant attraction for Massachusetts's $12 billion annual tourism industry.[90] While the impact of agriculture on local economies varies by community, it is clear that the state has a vested interest in protecting its agricultural heritage and industry from an economic standpoint.

As previously discussed, competing demands on farmland for housing and urban uses have caused agricultural land values across the Commonwealth to skyrocket to over $12,000 per acre.[91] In response to the financial instability of the agricultural land base, farm operations have evolved to meet rising land prices and an increasing demand for locally sourced food. The "buy local" movement has exploded in Massachusetts where the total value of agricultural products sold directly to individuals between 2002 and 2007 grew from $31 million to $42

million.[92] Common direct-to-consumer sales channels include farmers markets, community supported agriculture (CSAs), farm-to-school programs as well as direct sale opportunities with local restaurants and super markets. For example, as of 2008 there were 72 CSAs and over 164 farmers markets across the state, and the numbers have only grown since then.[93] Farmers who participate in local food supply chains are likely motivated by the potential of retaining a greater share of the retail price for their product. By eliminating the middleman, the USDA Economic Research Service estimates that farm operators can retain on average between 13 and 62 percent of the retail price of their products depending on the location and the number of competing producers among other factors.[94]

One criticism of the local food movement is that access to the direct consumer supply chain can be cost prohibitive for many farmers. To capture the extra revenue that would traditionally be lost to mainstream chains, producers must take responsibility for costly and time intensive supply chain functions like processing, distribution, and marketing.[95] Participation in competitive local markets often requires producers to change or diversify their product offerings, and to focus on the production of high value, labor-intensive products like fruits and vegetables, nuts, grains, breads, eggs etc. Massachusetts' farmers have responded. In 2000, a study conducted by the University of Massachusetts demonstrated that Massachusetts' self-sufficiency in food products, or the ability of the Commonwealth's farmers to satisfy local food needs, was on the rise. Nearly 65

percent of fruit purchases and 33 percent of vegetables purchases across the state were produced from within Massachusetts' borders.[96]

3.3: A Snapshot of Middlesex County

The remainder of this analysis will focus on Middlesex County, a section of Massachusetts that is situated directly to the North West of Metro Boston and is located within the Boston, Cambridge and Quincy metropolitan statistical areas.[97] In 1997 county governments in Massachusetts were abolished, and as a result have no political power or authority. County designations have remained solely for administrative and legal purposes and in the absence of county authority, municipal governments have taken on a larger role in Massachusetts's politics.

Middlesex County is home to over 1.5 million people in an area just over 817 square miles. This means that Middlesex County is home to 23 percent of the state's population and 22 percent of total housing units on just 10.4 percent of the total land area in the Commonwealth. As a result, the population density of Middlesex County is calculated at 1,827.9 person per square mile, over two times the state's average population density.[98] [Table 3.4]

Among other factors, proximity to jobs in downtown Boston and the extension of the MBTA commuter rail lines into many towns over the years have turned parts of Middlesex County into bedroom communities of Boston and surrounding cities. As a result of development pressure and speculative land practices, in 2010 the median value of owner-occupied housing units in Middlesex County was

$427,400 – 20 percent greater than the state wide median value.[99] [Table 3.4] Consequently it is more expensive to live in Middlesex County, so we would expect that the profile of Middlesex County residents might be slightly different than the average Massachusetts resident. The median household income for Middlesex County was $77,672 – 21 percent greater than the statewide median income level. Residents of Middlesex County are also over 10 percent more likely to have a bachelor's degree or higher level of educational attainment as compared to the rest of the state. [Table 3.4]

3.4: Agricultural Land Use Trends Across Middlesex County

As demonstrated in Table 3.5, agricultural land use change in Middlesex County mirrored the larger land use trends occurring across the state. I used MassGIS to develop four maps that track historical agricultural and developed land use trends in Middlesex County at four intervals: 1971, 1985, 1999 and 2005. As previously mentioned, this spatial analysis was limited by the availability and quality of land cover data. Currently, MassGIS utilizes two sets of aerial photography that have been digitized into land use cover data for the entire Commonwealth. MassGIS land use cover data categorizes agricultural lands by the following uses: cropland, pasture, orchards, nurseries and cranberry bogs. Agricultural lands can be seen in red, while developed lands can be seen in yellow. The purpose of these maps was to visually demonstrate where development patterns in Middlesex County have spread, and how they have impacted agricultural lands over the past 40 years. The four maps can be found in Appendix B: Figures 3.1 – 3.4.

Using the Census of Agriculture it is possible to get more recent, accurate data regarding land use trends. Between 2002 and 2007, the number of farms increased by 21 percent, while the average size of those farms decreased by 16 percent. Although two percent is an insignificant amount, the total active agricultural acres in Middlesex County increased by over 700 acres, which would indicate the creation of roughly 15 new farms at an average size of 48 acres[100]. [Table 3.5]

At first glance it seems that Middlesex County's agricultural lands and farms are following a similar pattern in the face of development pressures across the state. Looking more closely at the 2007 Census of Agriculture data, there is a striking difference in the average estimated market value of farmland and farm buildings. Across Massachusetts the average value of farm land and associated buildings in 2007 was $829,090, which equated to $12,313 per acre.[101] In Middlesex County, the average per value of farmland and buildings was $1,031,520 – or $20,975 per acre. The average value of farmland and farm structures in Middlesex County is 25 percent greater per farm, and nearly 70 percent greater per acre than the average values across the Commonwealth.[102]

While higher land and farm values in Middlesex County may benefit individual farmers who sell their land to developers, they are detrimental to the system in a couple ways. First, higher land values mean greater property taxes. With the average farm size in Middlesex County decreasing by nearly 16 percent, farmers are under more pressure to make money off of less land. If farm income is unable

to keep up with rising taxes, than the impermanence syndrome sets in and increases the chances a farmer will sell his/her land to a developer.[103] The second problem is that higher land prices are a barrier to entry for new farmers. The average age of farm operators in Middlesex County is 56 years old, approaching retirement years.[104] Unless land is transferred generationally it is highly unlikely a young, aspiring farmer could purchase a 46-acre farm in Middlesex County for over one million dollars.

3.5: The Evolution of Middlesex County's Agricultural Economy

Despite being home to only 6.5 percent of the state's total agricultural land area, in 2007 Middlesex County was number one in the Commonwealth in the total value of agricultural products sold at $81.7 million dollars. Across 700 farms, this equates to an average of $116,726 in sales, which is 83% higher than the state average of $63,687.[105] [Table 3.6] Given the county's strategic location to Boston metro area, it could be expected that higher sales could be partly as a result of growth in direct sales opportunities in response to the booming local food movement. In 2007, Middlesex County was number two in the state behind Worcester County in direct sales at $6.5 million annually, however the data also indicates that between 2002 and 2007 total direct sales in Middlesex County actually decreased.[106] [Table 3.6]

While a deeper statistical analysis is required to fully understand and explain the success of farms in Middlesex County, the data demonstrate that farms have learned to cater to their neighborhood demographics. By breaking down the value

of sales by commodity group, we see that Middlesex County was number one in the state in two categories: nurseries, greenhouse, floriculture and sod, and horses, ponies, mules, burros and donkeys.[107] With a housing density over two times the state average, lawns as well as flora for landscaping are in high demand to accommodate new construction.[108] Additionally, the existence of equestrian enterprises are usually associated with higher socio-economic areas, which could explain why they are clustered in Middlesex County, where the average household income is nearly 21 percent higher than the state average.[109]

The point of this analysis was to demonstrate that Middlesex County agriculture is an active, growing and integral component of the local, regional and state economies. Despite high land values, there is a strong case to preserve farms in this region. Chapter four will take one step further, providing an in-depth look at the Massachusetts Agricultural Preservation Restriction (APR) Program. It will also examine the programs' selection criteria and acquisition strategies, and how they have impacted farmland preservation efforts in Middlesex County.

Chapter 4: Massachusetts Agricultural Preservation Restriction Program

This chapter provides a detailed overview of the APR program that examines the program's history, organizational structure, internal selection criteria and methodology for parcel acquisition among others. It concludes with an analysis of the historical and current impact of the APR program in Middlesex County.

4.1: The Rise of Purchase of Development Rights

Since the 1926 United State Supreme Court decision of Euclid Ohio v. Ambler Realty Co., 272 U.S. 365 (1926), zoning has still not evolved into a tool that can be relied upon to preserve local, regional and state open space resources, including prime agricultural lands. While there are instances to the contrary, the majority of zoning in Massachusetts and across the country remains steeped in the Euclidian tradition of segregating land into geographical districts based on single uses.[110] While Euclidian zoning is considered by many to be easy to implement, it is extremely inflexible and unaccommodating of the vibrant, mixed-use, high-density and pedestrian friendly development, and it is deficient in its ability to direct development away from important open space and natural resources.[111] As a result, open space planners, and particularly farmland preservation efforts, have become heavily reliant on a tool commonly referred to as a purchase of development rights (PDRs) used to preserve open space and agricultural lands.

The purpose of a PDR program is to remove the development rights from a section of land through the purchase of what is commonly referred to as a conservation easement. For the purposes of this thesis, and when referencing farmland preservation, a development right is a term used to define the right of a property owner to use his/her land for a commercial purpose that is not directly supportive of the use of that land as a farm or for agricultural purposes.[112] In separating the development rights from a piece of land, a conservation easement is used to assure the permanent preservation of that land in its current state of naturalness at the time the easement is acquired. Easements can be referred to as both positive and negative. Positive easements generally allow for the owner, or the public to make some active use of the land subject to the easement. The National Park Service was one of the earliest proponents of this tool, and has purchased positive easements since the mid 1900s that have allowed the public access to protected landscapes.[113] This thesis is concerned only with negative easements, which prevent the owner of the underlying land interest from engaging in specific uses of that land.[114]

While the concept of purchasing a less than "fee," or a non-ownership interest in land, is not new and can be dated back to Roman times, its application for farmland preservation is more recent.[115] The benefits of purchasing an agricultural conservation easement over fee interest are many. For one, purchase of the development rights is significantly cheaper than purchasing am ownership interest. Secondly, it allows the farmer to retain ownership of and actively farm

the land. This keeps the land in the tax base for the municipality, while supporting the productivity and integrity of local agricultural and agricultural support enterprises.[116]

In Massachusetts, acquisition of conservation easements for agriculture, affordable housing and watershed restriction among other uses are authorized under Massachusetts General Laws Chapter 183, Sections 31-33. Section 31 defines an agricultural preservation restriction (APR) as "a right, whether or not stated in the form of a restriction, easement, covenant or condition in any deed, will or other instrument executed by or on behalf of the landowner of the land appropriate to retaining land or water areas predominantly in their agricultural farming or forest use." [117] Since 1977 land under an APR is restricted from construction, excavation, dredging, or other acts that may be detrimental to the retention of this land for agricultural uses.

4.2: Massachusetts Agricultural Preservation Restriction Program

Enabling Legislation

With the development of the agricultural preservation restriction tool under Chapter 184 of Massachusetts General Law, the state needed a program that would actively support farmland preservation efforts. Therefore, under Chapter 20, Section 23 - 26 the state authorized the development of the APR program that would be administered by Massachusetts's Department of Agricultural Resources, and would assist in the acquisition of APR restrictions across the state.

There were two major outcomes of Chapter 20. The first was the declaration that the APR program would be appropriated funds annually that could be used to purchase an APR restriction from a landowner. The second outcome was the development of an agricultural land preservation committee that has been charged with the task of evaluating and subsequently accepting or rejecting APR project proposals submitted by cities and towns. As of December 25, 2009, the committee members included: the Commissioner of Agricultural Resources, the Director of Housing and Community Development, the Director of the Office of State Planning, the Chairman of the Board of Agricultural Resources, or their respective designees, four members appointed by the Governor, who shall be owners or operators of farms within the Commonwealth, the Dean of the College of Food and Natural Resources of the University of Massachusetts, and the State Conservationist of the United States Department of Agriculture Soil Conservation Service, or their respective designees. The selection criteria and methodologies of this selection committee will be discussed later in this chapter.[118]

APR Program History and Organizational Structure

The APR program was established in 1977 as one of the country's first voluntary PDR programs that enabled both the Commonwealth as well as local governments to purchase the development rights of agricultural land. The APR program was modeled after a PDR program in Suffolk County, New York, which has served as one of the most successful models in the country to date. The APR program

legislation was passed almost unanimously in the wake of a summary growth report published by the Office of Planning in 1977, which called for the legislature to end the rapid decline in farm acreage and changing character of the state's landscape.[119] Since the program's first acquisition in 1980, the APR program has protected 803 farms, or 67,089 acres in 13 counties across the Commonwealth. About 13 percent of the total agricultural land in the commonwealth is currently protected under APRs.

A small staff of eight individuals operates the APR program, which is housed under the Massachusetts Department of Agricultural Resources, a sub-office of the Massachusetts Office of Energy and Environmental Affairs. The APR program has divided the state into four regions, Central Massachusetts, Eastern Massachusetts, Northwestern Massachusetts and Southwestern Massachusetts. Four of the eight staff members are field representatives, who specialize in guiding farms that may apply from their respective regions through the application and review process.[120]

Currently, the APR program is one of 20 state level farmland preservation programs in existence across the country.[121] A state level program indicates that the program was enacted and is primarily staffed and funded with state resources. The majority of farmland preservation programs around the country are more traditionally housed at the local level. While the APR program has been viewed as effective, there are numerous challenges and critiques of state level programs.

One common criticism is that state level programs are often less aware of local conditions, and therefore are less reactive when important agricultural soils may be in jeopardy of conversion to non-agricultural uses. Chris Chisholm, APR Field Representative for Eastern Massachusetts who agrees with this claim, elaborated on steps the APR program has taken to address these challenges. "The APR program has a very small staff, so we feel that we are more responsive than many other state level departments."[122] Chisholm further explained that in a continual effort to become more responsive and connected to local conditions, "the APR program has developed relationships with land trusts, local officials and conservation agents across the Commonwealth that serve as the program's eyes and ears on the ground, and can make us aware of potential projects that may be of a time-sensitive nature."[123] Despite the criticism, state level programs do hold one distinct advantage over local and regional farmland preservation efforts: access to funding. While the current economic conditions across the country may refute this charge, state level programs often have access to greater and more reliable funding sources to realize their missions.

APR Funding

State Funding

As a state level initiative, the APR program is primarily funded through passage of the State Environmental Bond Bill, last issued in 2008 and reauthorized every five years. Historically the bond allocates between eight to ten million dollars annually, however there is a level of uncertainty as to future annual appropriations

because of budget uncertainty.[124] Total funding can exceed 10 million, but budget cuts can also reduce the annual funding to well below the annual average. The good news is that the total funds authorized for use by the APR program have increased over the past decade. The 2008 bond bill authorized $67.75 million compared to $48 million authorized in the previous bond bill in 2002.[125] Excluding unforeseen budget cuts, this equates to roughly $13.35 million annually between 2008 through 2013. According to MDAR between 2003 and 2007, state funds have accounted for roughly 57% of total APR acquisition funding.[126] To extend the programs reach in the face of rising land prices, the APR program has demonstrated an impressive record of leveraging additional federal and local funding sources.

Federal Funding

According to MDAR, during the same period between 2003 and 2007 roughly nine to ten percent of APR funding was procured from the Federal Farm and Ranch Land Protection Program (FRPP).[127] FRPP is a voluntary federal conservation program that provides matching funds to eligible entities to purchase permanent conservation easements on farm and ranchlands. According to Chisholm, "the APR program requires that all APR applications qualify for FRPP to take full advantage of federal funding." FRPP will reimburse the APR program up to 50% of the value for a qualifying parcel. FRPP funding for the APR program fluctuates annually, but has historically averaged between two and four million dollars annually.[128] Similar to state funding trends, over the past few years

federal funding levels have also increased. In 2010 over $8.6 million dollars in FRPP funds were leveraged into protecting an additional 20 farms, or 1746 acres.[129] According to Barbara Miller, Massachusetts State Resource Conservationist and Farm Bill Program Manager, the APR program has been in position to use unused funds in the program. "Because the APR program is so efficient, and normally has projects in the queue at the end of the year, the APR program often qualifies for extra FRPP money that will not be used by another state."[130] The idea is that if a state can't spend all its money in the given time frame, or a project falls through, the money is reallocated to other states instead of returning it to the General Fund.

Local Funding

According to MDAR, during the same period between 2003 and 2007 roughly 33 to 44 percent of APR funding was procured from local contributions.[131] Since the development of the Municipal Grant Program (MGP) in 2004, the APR program has traditionally required a 20% local financial match.[132] The MGP is an APR applicant assessment tool that evaluates local actions in support of agriculture. According to Chisholm, a local match is typically met through four methods; municipal, local and land trust contributions, landowner bargain sale donation and Community Preservation Act (CPA) funds.

Many small communities and small land trusts across the Commonwealth would have a difficult time gathering the necessary funds to meet the APR local match

requirement. Therefore the APR program has developed a series of criteria designed to reward communities that have a demonstrated commitment towards local agriculture. If these criteria are met, then the local match requirement can be reduced. For example, for each of the following principles implemented the community will receive a 5% match reduction: establishment of a local agricultural commission, enacting a town right-to-farm bylaw and finally, implementing a tracking system to prevent issuance of building permits for unauthorized construction on protected farmland.[133]

The second way to meet the local match requirement is through a bargain sale. The benefits of a bargain sale will be further discussed later in this chapter, however a bargain sale is the sale of an interest in land to a government body or land trust at a price less than the fair market value. The difference between the fair market value and the bargain sale price can be applied towards the local match requirement.[134]

The other common way to meet a local match is by leveraging CPA funds. "CPA is a Massachusetts smart growth statute that when adopted, allows communities to create a local CPA Fund that sets aside up to three percent of local property taxes annually for open space protection, historic preservation, affordable housing and outdoor recreation."[135] As an added incentive, every October communities that adopt CPA receive funds from the state's Community Preservation Trust Fund, which provides a substantial percentage of their annual CPA funding.[136]

According to Chisholm, "CPA funds have been very important in helping to stretch the APR's investment, access additional federal dollars and meet local match requirements."

To date, 50 APR projects have been at least partially funded by CPA funds.[137] Between 2001 and 2009, CPA funds accounted for more than $12 million of the total APR value of over $35 million for acquisitions across the Commonwealth.[138] The greatest challenge to better utilizing CPA funds is improving timing and communication. According to Katherine Roth, Associate Director of the Community Preservation Coalition, "Community Preservation Committees in rural communities sometimes meet only once every other month, and the CPA project review process can be time-consuming, which can make it difficult to coordinate appropriations of CPA funds for time-sensitive APR projects." Historically the APR program has successfully leveraged federal and state level funding, however there seems to be an opportunity to better utilize CPA funds and to better coordinate with local CPCs.

4.3: APR Program Selection Criteria and Acquisition Strategy

This section will introduce how the APR program's selection criteria and acquisition strategy impact farm eligibility and participation across the Commonwealth. Since the APR program is entirely voluntary, the first step for a farm to enter the process is to submit an application for the APR Municipal Grant Program (APR-Muni) in conjunction with their local municipality. A copy of the

application must also be submitted to the local Conservation Commission to alert the municipality of the proposed acquisition. As previously mentioned, the APR program uses the APR-Muni to conduct an initial screening of a municipality to determine whether or not the town demonstrates support of local agriculture from a planning perspective and has enough agricultural activity to be sustainable.[139] If the application passes this initial test, they are put on a track for priority funding. If an application happens to fail one or more of the initial municipal tests, the APR program can employ additional evaluation criteria before they eliminate a parcel from contention. According to the Municipal Grant information, if the project meets two of the following three criteria, they can remain eligible for second tier, or lower priority funding. These include: an ability to meet the 20 percent local match requirement, if the parcel would be added to an existing APR block of at least 200 acres and/or if the parcel is part of a farmland block of which 75 percent or more are protected.[140]

Ensuing steps include a thorough site visit by an APR field representative and a screening of the farms application against a set of minimum eligibility criteria. The criteria require: that the farm be at least five acres in size; that the land has been actively devoted to agriculture for the two immediately preceding tax years; and finally, that the farm produces at least $500 dollars in gross sales per year for the first five acres, plus an additional five dollars for each additional acre or 50 cents per each additional acre of woodland and or wetland.[141] Parcels that pass both initial screenings then undergo a more thorough review and ranking process.

The principal component of the APR review process includes a deep qualitative evaluation to determine project eligibility. Easement programs across the country employ programs with one of two types of evaluation methodology; qualitative or quantitative. In the era of Geographical Information Systems (GIS), programs are more commonly employing or adapting their evaluation programs to tools and methodologies that rank parcels based on the weighting of individual criteria.[142] The APR program utilizes a qualitative system that still uses formal criteria but relies more heavily on the discretion of their field representatives to weigh selection criteria. This does not mean that the APR program does not employ quantitative criteria, but instead references how the APR program utilizes a more subjective methodology that takes into account how well the parcel fits the program's conservation objectives. When the APR program was developed over 30 years ago, GIS and other mapping technologies that facilitated more proactive, quantitative methodologies were not available. As a result, the APR program has rarely had to proactively seek out agricultural land and has been successful in letting interested landowners come to them.[143]

Of all the many goals of the APR program, the most important for the Commonwealth has been to save the best and most productive agricultural land remaining in the Commonwealth. While other easement programs may have different definitions of agricultural productivity, the APR program places an

increased emphasis on soil quality. [1] Historically, soil quality was not always weighted as heavily, but as the need grew to leverage federal matching funds, the APR program updated their criteria to ensure that for all parcels were eligible for the FRPP requirement, at least 50 percent of the parcel contain prime, unique or other productive soils.[144] Additional criteria include but are not limited to the following: proximity to development pressure, likelihood of intergenerational transfer and local commitment indicators like the establishment of an agricultural commission and local regulations that institute buffer requirements on non-farm development adjacent to agricultural lands.[145] If the municipality has not enacted certain local commitment criteria, they can be given partial or full points for making the future commitment to sanction actions. The full APR-Muni Application can be viewed in Appendix E.

Ultimately, the fate of the top ranked applications rests in the hands of the agricultural land preservation committee. If the parcel is accepted, the entire process can take around 18 months from application to closing. Thanks to limited funding, it is extremely common for the program to carry over applications. For example, in 2010 the APR program still had 59 projects involving 4,600 acres that had made it through the initial evaluation stage, and 14 projects involving 850 acres that ready to move towards closing.[146] With adequate funding the APR program can complete projects that are carried over in ensuing years.

[1] See Appendix C, Table 4.1 for a full list of common qualitative and quantitative easement program criteria

4.4: The APR Program Within Middlesex County

As mentioned in Table 3.5 of chapter three, Middlesex County is home to 33,983 acres of active agricultural land. Given the county's proximity to the greater Boston area, it is reasonable to assume that the increased development pressure of this area could necessitate greater use of the APR program to protect regional farms and agricultural lands, however this has not been the case. According to APR project records, since the programs inception in 1977 APR easements have been acquired on 51 farms for a total of 2,469 acres. Permanent APR restrictions in Middlesex County only account for 7.6 percent of the county's total agricultural lands, and 3.7 percent of all APR restrictions across the Commonwealth.[147]

One immediate limitation that has stood in the way of increased use of the APR program within Middlesex County is acquisition cost. As discussed in chapter three, Middlesex County's proximity to Boston and dense population has only hastened rapidly escalating land values and home prices. The APR program has a variable, yet fixed budget that requires financial discretion in order to maximize the program's impact and total acreage protected. For years, the APR program employed a 10 thousand dollar per acre cap on APR acquisitions and only recently was this cap was loosened. Currently, the 10 thousand dollar per acre limit can be bumped up to 20 thousand dollars per acre if certain conditions are met. These include: a certified appraisal that supports the higher per acre figure; the parcel must contain highly qualified soils; and there must be other APRs in the

area.[148] It is important to remember that the APR program is voluntary, and consequently there is uncertainty as to whether 20 thousand dollars per acre is a strong enough incentive to compete with the robust development values of farmland in Middlesex County. Unfortunately the APR program does not have data readily available that summarize average land value and easement price for APR acquisitions within Middlesex County.

While costs likely impact both landowner and APR program interest in easement acquisitions, it is not the only factor that has likely obstructed APR interest and success within the county. According to Chisholm, one reason why there may not have been more APR acquisitions to date from within Middlesex County is that the APR program currently will not acquire prime farmland that is forested and has limitations on acquisition of land used for equestrian operations (breeding, recreational horseback riding and boarding).[149] For land on an equestrian facility to be eligible for an APR, there can be no structures, however the land can be used for hay production as long as an active pasture management plan exists.[150] According to the 2007 U.S. Census of Agriculture, nearly 34.5 percent, or 11,694 acres of agricultural land in Middlesex County is currently forested. The census also discloses that Middlesex County is the number one county in the state with 56 farms devoted to equestrian operations, 8 percent of all farms.[151] Without more detailed GIS data it is not possible to analyze the geographical distribution of forested and equestrian farms, however it could be possible that roughly 35 to 40

percent of farmland within Middlesex County may not be eligible for APR acquisition as a result of the current land cover or use.

One other potential explanation for a lack of APR acquisitions in Middlesex County could be that prime soils are largely absent or that existing prime soils are already protected leaving only marginal soils. To assess this potential challenge this thesis used GIS to conduct a soils analysis of Middlesex County. As a result of categorical differences, it is important to note that the 2005 MassGIS land use cover data differs from the U.S. Census of Agriculture, and indicates that there are 20,202 active (un-forested) acres of agricultural land in Middlesex County compared to 22,199 acres identified by the U.S Census of Agriculture. As seen in Appendix D: figures 4.1 – 4.3, when the NRCS prime soils data set is intersected with total agricultural land, GIS finds that 13,179 acres, or 64.4 percent of total agricultural land in Middlesex County contain prime soils.[152] If the prime agricultural lands data set is then intersected with the protected APR parcels data set (figure 4.2), then GIS is able to identify that there are currently 12,237 acres of unprotected, prime agricultural soils across the county (figure 4.3).

It is very likely there is a certain margin of error in these figures, however the purpose of this exercise was to demonstrate that a lack of prime soils is not likely responsible for discouraging APR acquisitions across Middlesex County. In 2009 NRCS conducted a similar GIS inventory of unprotected, prime agricultural lands across the Commonwealth. As seen in Appendix D: figures 4.4 and 4.5, the

NRCS study supports the earlier soil analysis and demonstrates that outside of downtown Boston, there is currently unprotected agricultural land on prime soils in almost every community across the county. Figure 4.5 further shows that there are over 13 townships in Central and Northwestern Middlesex County that currently have between 230 and 860 acres of unprotected agricultural land on prime soils. It is important to make note that these two maps reveal that the majority of the Commonwealth's unprotected prime soils are located in Central and Western Massachusetts.

To date, it is clear that the APR program has been used only sparingly across the county, yet figures 4.6 and 4.7 in Appendix D reveal that farmland preservation efforts have been effective and efficient in preserving prime agricultural soils. Partly thanks to a smaller agricultural land base, there are over a dozen communities around the greater Boston area that have protected 51 percent or more of their prime agricultural soils. There are only five other townships across the entire state that have preserved as high a ratio of prime agricultural soils. What is important to note from figures 4.6 and 4.7, is that there are roughly 17 communities located in the Northern and Northwestern parts of the county where between 70 and 99 percent of total prime agricultural soils remain unprotected.

Thanks to a dearth of parcel level farm GIS data a deeper analysis into the eligibility of the unprotected, prime agricultural soils in Middlesex County is not feasible. From this analysis it is clear that some agricultural lands across the

county may not be eligible for the APR program, however a lack of prime soils is not likely the factor that has limited APR use within the county. It is also apparent that while the APR program has been used sparingly, farmland preservation efforts have targeted available prime soils. The next section will examine the capacity and effectiveness of select incentives to attract landowner participation and keep the APR program competitive against development pressure and speculative use values.

4.5: Landowner Preservation Incentives

Since the programs inception, APR Regional Planners have never had to knock on doors to generate interest or participation from qualified farmers. On almost an annual basis, applications have exceeded available funding which has created an often-welcomed backlog of APR applications. In recent years though, Chisholm commented, "Worcester County and Eastern Massachusetts have started to produce fewer applications than they historically have generated." There are a number of reasons that application numbers could be going down. For one, the current economic recession was triggered by real estate collapse. With new housing starts and new development slowing to a crawl, speculative land values and development pressure on the Commonwealths farms may have subsided slightly. Farmers therefore may want to wait until land prices return to pre-recession figures. There is the possibility that the remaining unprotected farms may not qualify based on one or more APR selection criteria like soil requirements. Finally, there is also the possibility that the intrinsic incentives connected to the APR program may not be enough to attract landowner

participation against strong development pressures and prices. This section will discuss the strengths and limitations of major incentives that have the potential to impact APR participation: local property taxes, state and federal income taxes, as well as the more recent APR Improvement program.

Massachusetts General Law Chapter 61A

Chapter 61A is the Commonwealth's agricultural and horticultural land tax classification program designed to encourage farmland preservation and promote active agricultural and horticultural land uses. For property tax purposes, this program values active farmland at its productive use value for farming purposes, which offers significant tax benefits to property owners. In exchange for these tax benefits, landowners make a long-term commitment to retain their land and keep it in active agricultural use. To qualify for these benefits the Commonwealth has designated a series of criteria. First, the property must consist of at least five contiguous acres. Second, the land must be actively devoted to agriculture that produces at least $500 in minimum gross sales for the first five acres, and five dollars for each additional acre.[153]

Unlike a conservation easement which typically preserves land in perpetuity, Chapter 61A is voluntary and the agreement can be terminated at any time. To encourage participation from local municipalities and to discourage landowners from leaving the program, the Department of Revenue has instituted a penalty tax. If the landowner removes their land from active agricultural status and sells the

property for a non-qualifying use within 10 years of the date they acquired the land, they must pay one of two taxes. The first tax is a rollback tax, which requires the landowner to pay back taxes for a five year period that are equal to what the landowner would have paid if the land was assessed at its fair market value and not its productive use value. The conveyance tax would be greater than the rollback tax rate, and is based on the conveyance tax rate of the fair market value of the land at the time of sale. This conveyance tax rate is 10 percent if sold within the first year, nine percent if sold within the second year and so on.[154] If the parcel is sold to or bought by the municipality than the rollback tax is waived.

As discussed in chapter two, use value assessment programs like Chapter 61A are designed to enhance the profitability of agricultural land while discouraging disinvestment. For farmers committed to their agricultural enterprises Chapter 61A might extend their agricultural career, but it does not prevent them from selling their land to a developer upon retirement. Because of the presence of penalties or disincentive, it is also possible that qualified landowners who want to keep their options open in what they do with their land may choose not to participate in the program to avoid paying back taxes. Section 61A is an important land use tool that remains an effective part of Massachusetts's preservation strategy, however it is very unlikely that this tool plays any role in attracting APR program participation. Instead the opposite is more likely to be true. Landowners whose land is permanently restricted are more likely to participate in Chapter 61A to maximize the benefits they receive from their restricted land.

State and Federal Income Tax Benefits

For the first time in the history of Massachusetts, the state has authorized a state tax credit for voluntary land conservation under 301 CMR 14:00. As of January 2011, the credit has been available for perpetual land conservation transactions conducted with an incorporated land trust government agency or town, and certified by the Secretary of Energy and Environmental Affairs. If the conservation transaction is certified, the tax credit is worth up to 50 thousand dollars. The state will wipe out any state income tax for that year and will write the landowner a check for the difference between that year's tax and the 50 thousand dollars or the appraised value – whichever is smaller. [155]

This state tax credit is in addition to the regularly available federal tax incentives for charitable contributions of land. The IRS code allows for two principal forms of tax benefit: a federal tax deduction and an estate tax exclusion. For the purposes of this thesis I shall discuss the former. The enhanced easement incentive typically allows qualified donors a 50 percent deduction from their annual gross income (AGI), however farmers and ranchers are allowed to deduct up to 100 percent of their AGI for up to 16 years.[156] By increasing the maximum deduction and the years a deduction can be claimed, the landowner is able to realize more of the value of their donation.

The catch is that landowners do not qualify for the aforementioned tax incentives through an outright sale of their lands development value. Instead, the landowner

must either outright donate their land, or employ a bargain sale that includes part donation and part sale. Through a bargain sale, the landowner would receive cash payment for an agreed upon portion of the sale, and the remaining donated portion would potentially qualify for state and federal tax benefits. A donation or a bargain sale is a great way to extend the purchasing power of a preservation/conservation agency like the APR program. A bargain sale benefits both the seller and the buyer in a conservation sale. The seller benefits from the ability to claim tax deductions at both the state and federal level, and the buyer (in this case the APR program), benefits from a reduction in the value of the easement value. While the total compensation is not likely to approach fair market value, the conservation partner and the landowner are able to preserve important valued lands at a reduced cost while maximizing the value the landowner receives from the sale.

APR Improvement Program (AIP)

The purpose of the APR improvement program (AIP) is to provide technical, business and financial assistance in an effort to help sustain active commercial farmland that has been protected through the APR program. The goals of the AIP program are similar to those of MDAR's Farm Viability Enhancement Program (FVEP), but AIP was designed and is available only for landowners of APR protected farms. In Phase I, AIP participants are offered technical and business planning assistance with focus on areas like marketing, finance, management, engineering and environmental sciences. In Phase II, farms that complete a

business plan and commit to implementing farm improvement strategies may be eligible for a grant up $75 thousand dollars.[157] For active commercial farms operated by an individual who is not approaching retirement, the AIP program could be a tool to enhance the viability of the farm. According to the U.S. Census, the average age of farm operators in Middlesex County is 56, which means they are likely five to seven years away from retirement.[158] While further analysis would be required, this could mean that the AIP program would be less applicable to farmers in Middlesex County.

From the all the incentives above, the state and federal tax incentives are the most likely to entice prospective landowners to participate in the program. While these incentives do make conservation a more financially competitive alternative, in Chisholm's experience, "what it really comes down to is a matter of heart."[159] The value that the landowner receives back from an incentive only ends up being a bonus. The more incentives the better, however ultimately the landowner will only approach the APR program if he/she wants to see their land preserved as a farm forever. No matter how many incentives are available, in the end the APR program can't compete with developer prices. What is clear is that a majority of landowners are unaware of the existence of a significant number of incentives like the AIP program and state income tax benefits.[160] Moving forward increased efforts need to be taken to more effectively market available tools and incentives to prospective landowners whose land may be eligible for preservation through the APR program or another land preservation organization.

Chapter 5: Recommendations to Increase the Efficiency and Effectiveness of the APR Program

After a thorough analysis and examination of the APR program's funding structure, selection criteria, acquisition methodology, existing incentives, as well as its historical impact across the state and in Middlesex County, it is clear that the APR program is a valued and successful tool in protecting the Commonwealth's critical agricultural land base. This next section will additionally offer three recommendations that have the potential to increase the long-term efficiency and effectiveness of the APR program. It would be very easy to conclude that the APR program could be more successful if they had access to increased funding, however given the current economic climate increased financial support from the local, state or federal level is unlikely. Moving forward, the APR program will be lucky if it is able to maintain its current level of funding amidst a plethora of likely budget cuts. Instead, this thesis will offer both internal and external strategies that allow the APR program to work effectively within the constraints of their existing resources and without drastically expanding their organizational capacity during difficult economic times. These recommendations can improve the effectiveness of the APR program across the state, but more specifically they will help the APR program become a more competitive alternative to development in parts of the Commonwealth experiencing the greatest rates of growth.

The first recommendation introduces installment purchase agreements (IPAs), a tool that has the capacity to extend the purchasing power and increase the

efficiencies of the APR program's limited funds. The next recommendation addresses the long-term need for the APR program to implement both a statewide and regional proactive preservation strategy through internal programmatic changes, as well as development of external relationships that encourage a closer working relationship with regional planning agencies and regulatory policies. The final recommendation will examine the potential for development of a state directed, regionally implemented transfer of development rights program and the impact this could have on the APR program.

5.1: Installment Purchase (IPA) Agreements

One of the most significant challenges facing the APR program is the inability to acquire conservation easements on all interested farms across the Commonwealth. With limited funding, the APR program must be strategic to maximize the total number of farms and acreage it preserves annually. Historically, this has manifested itself through fewer APR restrictions in areas of the Commonwealth like Middlesex County, where development pressures and land values are the highest. A subsequent consequence of limited funds has also been the development of a consistent wait list of farms that have applied to receive an APR restriction on their farm. From application to closing, a landowner in Massachusetts can wait 18 months or longer to receive funds for the development rights on their property.[161] For a landowner who is looking to sell their farm, this can be a long time to wait.

While state and local appropriations for the APR program are subject to annual fluctuation, it is highly unlikely that total funding will dramatically increase in ensuing years. The challenge for the APR program is therefore how they can more efficiently use existing resources to preserve land from willing sellers while landowner interest remains strong and land values remain relatively stable. One solution that is growing in popularity encourages agricultural preservation programs to offer alternative financing mechanisms that maximize the extent and reach of available financial resources. This section will discuss the strengths and weaknesses of the installment purchase agreement (IPA), and how it has the potential to enhance the program's attractiveness as well as increase the total annual acreage preserved in spite of a limited budget.

What is an IPA and how does it work?

An IPA is an innovative payment plan that offers a contract between the landowner and the preservation program (in this case the Commonwealth of MA), in which the Commonwealth agrees to pay the purchase price (or a portion thereof) of an easement on a future date.[162] In return for a delay in payment, the landowner would receive two annual tax-free interest payments at a pre-fixed rate from the government. For a 100-acre farm these payments could average out to about 25 thousand dollars per year.[163] Unlike an all-cash transaction that is subject to immediate capital gains tax of up to 20 percent, an IPA allows the landowner to defer the principal payment and subsequently, the capital gains tax for up to 30 years. When a landowner choses to acquire a conservation easement rather than

sell their land to a developer, they have already made the conscious decision to accept significantly less money. To immediately lose up to an additional 20 percent of easement proceeds to capital gains can be a persuasive argument against preservation for many landowners with concerns about their financial future. The following financial example is an excerpt from a story first published in 2001 in the Philadelphia Inquirer:

> If a landowner was able to sell the development rights of their farm for $500,000 dollars, they could be subject to an immediate capital gains tax of $99,000 dollars, leaving the landowner with a net gain of $401,000. If this money were then invested in Treasury bonds at a 6 percent interest rate, the income would still be subject to federal income taxes. Assuming a 28 percent income tax rate, the farmer could potentially earn $821,696 from the sale over 30 years. If the landowner opted for an IPA, the payment of the 500,000 dollars would be deferred for up to 30 years. Assuming an interest rate of 5.7 percent and a 28 percent income tax bracket, the farmer would receive $28,500 annually in after-tax income over a 30-year period. Since the interest rate is locked in, over 30 years annual payments would come to $855,000 dollars. If you then include the lump-sum payment, minus the capital gains tax ($401,000), the farmer comes out with $1,256,000 dollars.[164]

It is clear that the value received from an IPA has the potential to be significantly more competitive with development prices. The interest rate paid to the IPA holder is pegged to the rate on treasury bonds the day before the final settlement. To cover the final lump-sum payment, the state or other eligible entity typically purchases zero-coupon bonds. "Zeros," do not generate regular interest, but instead yield a large lump sum when the bond matures.[165] The benefit of zero coupons is that they can be purchased for a fraction of their eventual face value, so the public entity is able to more efficiently leverage existing financial resources.

Benefits of IPAs

As discussed above, choosing to structure an easement sale through an IPA has the potential to yield significant financial benefits the can postpone capital gains tax, provide tax-exempt annual interest payments and increase the total value obtained from the easement sale. IPAs have historically been more attractive to older landowners that are looking to secure a supplemental income stream during retirement, while postponing or even preventing capital gains taxes during their lifetime. One additional benefit is that IPA agreements are transferable. IPAs can be left to children or heirs and sold in the bond market as a way to pay estate or capital gains taxes.[166]

For the public entity, IPAs allow available funds to be stretched farther. By deferring payments it is possible to purchase more easements while land is

available and relatively affordable. Purchasing zero coupon bonds also allows the entity to spend a fraction of the negotiated purchase price at the time of closing.

Challenges to Implementation in Massachusetts

According to Chisholm, there has been no discussion to date around APR implementation of IPA agreements. There has been talk about the possibility of paying landowners over multiple fiscal years, however there is hesitation in upper level management to commit to a new, protracted funding structure when there is so much potential for variability in the state budget.[167] The APR program seems worried that they may be unable to pay a landowner who had been promised money, which could dramatically damage the credibility of the program.

Fortunately, IPA agreements eliminate some of the uncertainty inherent in shorter-term payment plans through the purchase of reliable securities. While lump-sum balloon payments can be covered cost effectively through purchase of zero-coupon bonds, questions remain as to where the APR program would find a dedicated funding steam to cover annual interest payments. This topic necessitates further research, however there are a couple initial avenues worth mentioning. Zero-coupon bonds typically cost a fraction of their mature worth, so it could be possible to pool any savings from zero coupon purchases into a fund that is used towards annual interest payments. It is also possible that APR program and the Commonwealth could better leverage CPA funds, or could raise new revenues through a implementation a developer impact fee that would levy a tax on

developers and or landowners who convert agricultural land to a non farming or forest use.

An additional drawback is that the process of developing an IPA can be both lengthy and costly. Depending on the jurisdiction, and because IPAs are backed by the full faith and credit of the government or municipality, IPA agreements may require the same approval process as a general obligation bond.[168] The literature demonstrates that it costs between 5 and 20 thousand dollars to complete a single IPA transaction. These costs cover legal counsel and fees from bond rating agencies among other expenses.[169] Typically, this expense is passed on to the landowner, however there are instances where this fee is split between the two parties or covered entirely by the public entity.

It is important to remember that IPAs are a financing alternative, and it is unlikely that the majority of landowners will choose to participate in this form of agreement. To control landowner interest in IPAs, many municipalities impose minimum eligibility requirements. For example, Maryland will allow an IPA as long as the seller's IPA totals $100,000 or more.[170] Minimum requirements may limit the number of transactions that are eligible, and increase the likelihood that the value of the IPA will offset the potential costs.

Ultimately landowners are not interested in IPAs because of what they get up-front, but because of what they get to keep. Farmers get to retain ownership,

actively farm their land and receive significant tax benefits over traditional purchase of development rights programs. By offering alternative financing methods the APR program only increases its attractiveness to landowners. For a program that has relied entirely on voluntarily farmer participation, this could be an important step in remaining a competitive alternative to development. IPAs could allow the APR program to utilize cash on hand for farmland that is at a higher risk of divestment due to landowner retirement or development pressure. Assuming sufficient landowner interest, the APR program could then use IPAs to acquire more expensive farmland that would normally take up a larger portion of the current budget. Ultimately, the potential for IPAs to net more value for the landowner could increase landowner interest in the eastern part of the state where development pressures are greatest.

5.2: Develop a Regional and Proactive Preservation Strategy

All too often planners and preservationists see land use and land preservation as two distinct and unrelated entities. To date, land preservation efforts have focused more on acquiring land and easements than on how land preservation has and continues to influence local growth patterns.[171] The same is also true for planners. There is often a pervasive lack of understanding as to how local land use policies impact open space preservation. As a result, land preservation programs have become reactive, ad hoc tools capable of mainly responding to growth and development pressures. Despite past successes, this has put the future of programs like PDRs in jeopardy.

Growth is inevitable, which will only increase the pressures and land values of existing agricultural resources in the commonwealth. While the APR program should remain an integral preservation tool moving forward, relying too heavily on this program to replicate past and current successes will result in a significant capital expenditure for Massachusetts's taxpayers that will grow continually larger.

Critics of farmland preservation efforts have commented that our current preservation tools are often an attempt to buy out bad local, regional and state planning.[172] In theory, if local zoning regulations could manage and direct growth away from open space resources, than expensive farmland preservation efforts like PDRs would not be needed. Instead, poor local or regional planning is often responsible for not only creating the development pressure, but also contributing to the dramatic increase in the speculative use value of agricultural lands. Development rights are very closely related to the infrastructure that makes development possible. In a perverse realization, taxpayers actually pay twice for land preservation efforts. They first pay to construct or extend the municipal services that make development possible: roads, sewers, water and other facilities. Taxpayers are then asked to purchase the development rights of agricultural lands whose value was driven up by the very services funded by the tax base.[173] Over recent decades, most open space preservation programs have replicated this system and methodology. The APR program is no different and has primarily functioned (albeit successfully) as a reactive farmland preservation tool. With

APR application numbers shrinking from key areas of the state and the prospect of continually increasing land values, it is time that the APR program consider adopting a more proactive methodology that will help shape - and not simply react to - decisions about land use and urban infrastructure.

There are two primary challenges to the APR program becoming more proactive. The first is a result of the unique political structure inherent to Massachusetts. With the dissolution of County Governments in the late 90s, local governments have reigned supreme and remain highly protective of land use decisions within their borders. As a result, townships are not required to – and therefore rarely consider – the effect of local land use and open space decisions on neighboring communities and the region as a whole.[174] Massachusetts's regional structure will be discussed in greater detail later in the chapter, but it is worth noting that a local focus may be too myopic for development of a more proactive APR methodology. The second challenge is a result of significant limitations posed by the limited organization capacity of the APR program. The small APR staff is highly capable, however they are already overworked. It is not currently clear as to whether the APR program has or will have the resources to add additional staff, however for the purposes of this thesis we will assume they will not. Therefore where possible, the following two sub-recommendations in this section will be attempts to work within existing organizational constraints of the APR program.

Recommendation #1: Expand State and Regional Agricultural Planning Efforts

The APR program has experienced success with the current qualitative evaluation methodology, so this thesis is not recommending that they completely abandon what has worked. Instead, the two strategies offered in this sub-section are intended to help the APR program adapt to future challenges. It is likely the APR program does not have the staff or funds to undertake these recommendations alone, so it is recommended that the APR program partner with the American Farmland Trust (AFT), who has undertaken comparable analyses. It is possible that AFT's resources could be better leveraged to expand or adapt past and future studies to be more useful for the APR program.

Strategy #1 - Conduct a Statewide Farm Inventory:

This recommendation would involve taking steps to dramatically improve existing statewide GIS data. Currently there is no parcel level farm GIS data at the state level, which would dramatically hamper any efforts by the APR program to become more proactive. This recommendation would not require that the APR program actively pursue individual parcels, however it would provide them with the option to do so. After my interviews it is apparent that there are no clear answers to some significant question surrounding the APR program like: why applications from Central and Western Mass may have gone down in recent years, and why there has historically been fewer applications from Middlesex County? This thesis has made conjectures based on available data; however better data is required to accurately address these types of questions.

A thorough statewide analysis of all agricultural lands would allow the APR program to identify the remaining unprotected lands that currently qualify for acquisition. It would allow the APR program to understand why application submissions have gone down, why certain farms may not qualifying and how criteria may need to be adapted in the future to reach currently ineligible parcels. Most importantly, it will allow the APR program to become more strategic with current and future funds.

Strategy #2 – Expand APR's Measure of Agricultural Productivity:

The standard qualifications of agricultural soil quality have historically provided the most widely used standard for evaluating agricultural conservation easement proposals across the County. [175] As a result of a strong relationship with NRCS, the APR program similarly uses agricultural soil quality as the dominant criteria in identifying and preserving the Commonwealth's prime agricultural lands. More recently, advances in farm technology and the growth of a variety of agricultural commodities that do not require prime soils have suggested that agricultural productivity can be measured through alternative metrics. Of particular relevance to Massachusetts, many easement programs are also choosing to expand their definition of agriculture to include non-traditional uses like nurseries, sod farms and equestrian facilities. [176]

The APR program should consider expanding its definition of agriculture. This study has only looked at Middlesex County, however it is clear that under the current administration there are a significant number of farms that do not fall within the traditional definition of agriculture, and therefore do not qualify for the APR program. For the purpose of this thesis, an assumption will be made that soil quality will remain the defining qualifying feature. By expanding its definition of farms that qualify, the APR program will have the potential to protect a significant number of additional prime agricultural soils. In Middlesex County, this could involve including sod farms, nurseries or expanding the agricultural land that would qualify as equestrian operations. Even including a one or two of these categories could dramatically increase the number of eligible farms in Middlesex County. It is important to remember that the current use of a farm is not static, and is subject to change over time, however the underlying quality of the soils cannot be replicated.

Recommendation #2: Improve Regional Coordination

Both planners and preservationists have been slow to recognize the power and potential of land preservation as a planning tool. While this has been changing recently, there are steps that can be taken that can ensure farmland preservation plays a key role in future smart-growth planning efforts. Again, organizational capacity is a restricting factor, however the APR program needs to look beyond property and political boundaries, and to build partnerships that can set mutual priorities, share resources and collaborate effectively. Improving the effectiveness

of regional planning efforts and regulatory tools has the potential to increase the efficiencies of farmland preservation efforts while dramatically reducing APRs annual expenditures.

Strategy #1 – Increase Involvement in Regional Planning Efforts:

Ultimately, if land use planning and regulatory tools are going to better control development and preserve open space, it will be necessary to step up involvement with regional planning agencies, particularly in the Eastern part of the state. Regional planning in Massachusetts is a conundrum. County governments have been abolished, however there over a dozen regional planning agencies that actively promote cross border collaboration through regional planning. These agencies, however, can only make recommendations and hold no authority to implement land use decisions. That is, unless a regional plan receives the support of an executive order from the Governor that requires all state agencies to give precedence to implementing priorities in the regional plan.

Currently, there are four regional planning agencies that are active within Middlesex County: The Metropolitan Area Planning Commission (MAPC), the 495 Metro-West Partnership, the Northern Middlesex Council of Governments and the Merrimack Valley Regional Planning Commission. To date, the APR has had no regular involvement or relationship with any of these entities. As an initial step this thesis recommends that the APR reach out and become more connected and involved with the aforementioned regional planning agencies. Appendix F

provides a summary of the current efforts of the four Regional Planning organizations to preserve open space and agricultural lands within their regions.

It is clear that APR involvement with any or all of these organizations has the potential to dramatically improve open space and agricultural preservation regional planning strategies in Middlesex County. Since the APR program is the most prominent farmland preservation organization in the state, their involvement could lend credibility to the open space planning process that might increase the likelihood that these strategies are adopted and implemented. The APR program could also leverage the resources and mapping abilities of these organizations in pulling together a statewide agricultural plan. While APR staff time is already spread thin, participating in more of these regional planning meetings could help provide more legitimacy to regional planning efforts and increase the rate of smart growth adoption across the region and the Commonwealth.

5.3: Support the Implementation of Local and Regional TDR Programs

To date Massachusetts is ranked by the American Planning Association as one the states with the weakest and most-outdated land use laws.[177] In the Commonwealth, the responsibility for land use planning is almost entirely a local matter, however the state laws that set the framework contain unclear and restrictive provisions that often subvert local planning authority by laying down an obstacle course of exemptions, prohibitions and zoning challenges.[178] It is these same outdated regulations that have unsuccessfully prevented sprawling

growth and the dramatic loss of open space and agricultural resources across the Commonwealth.

To address these challenge the Commonwealth has proposed the Comprehensive Land Use Reform and Partnership Act (CLURPA). CLURPA is the first major overhaul of Commonwealth's planning/zoning and subdivision control statutes in over 35 years. As a broad stroke overview, CLURPA is designed to eliminate statutes that have restricted sustainable development, affordable housing, and the protection of natural resources, and to return the land use control back to municipalities. An entire thesis could be written on CLURPA and Massachusetts's land use woes, however this section will focus on how CLURPA authorizes cities and towns to implement Transfer of Development Rights Programs (TDR) within and among municipalities.[179]

For a review of TDR basics please refer back to chapter two. This section will briefly examine the structure of a TDR program and TDR markets, look the effectiveness of TDRs in preventing agricultural land loss, and examine TDR use around the Commonwealth. Local and regional TDR programs would not replace the APR program and other PDR acquisition programs, but if properly designed, they could help address the APRs growing cost issues. Over the life of the APR program the average price paid per acre has been $2,864, however in 2007 the average price paid per acre was $6,847. This dramatic increase has led to an 18 percent decrease in average acres protected annually.[180] Assuming land prices

continue to climb, alternative approaches will need to accompany the APR program to maintain or increase current preservation levels. It is recommended that the APR program advocate for and support the development of a TDR program that could work in concert with the APR program to effectively compensates landowners and that is not influenced by the current value of real estate, but instead creates incentives and disincentives that work with development to promote smart growth strategies that protect key open space resources.

The Preservation vs. Incentive Approach

A successful TDR program starts with a strong comprehensive plan at the municipal level. Every TDR program is dependent on the formation of successful incentives and disincentives, however some programs rely more on one or the other as their dominant tool. Similar to the APR program, A TDR program allows the landowner to sever the development rights from their land in exchange for a permanent restriction limiting the development potential of their property. As previously mentioned, a PDR program does not rely on a specific program or organization to raise the funds necessary to purchase a conservation restriction. Instead, a successful TDR program creates a market for TDR credits.[181] As discussed below in greater detail, a landowner will commonly sell their TDR credits to a developer who is seeking to utilize the incentives that the credits offer.

Preservation Approach

Successful TDR programs create disincentives for developers to pursue development projects within the sending or preservation districts. The most common disincentive in sending districts is to increase lot size requirements, or downzone the base zoning. For example, a TDR program may increase the lot size to five times the existing base zoning, which decreases the development potential of the land.[182] It is critical to consider the cost of development when creating incentives and disincentives. Comprehensive plans can place limits on building heights, institute excessive parking requirements, increase necessary permitting and even increase environmental regulations.[183] All of these factors increase the cost of development in an effort to deter growth within the sending area.

Incentive Approach

While disincentives are important, a TDR program must offer meaningful and relevant incentives to landowners and developers to ensure participation in the program. Attention must be paid to the land economics to ensure there is sufficient demand in the receiving district to encourage sale and transfer of rights. The most frequent incentive is to create what is called a density bonus. In the sending district a landowner may have a lot that could be developed with 20 dwelling units, all available for transfer. When the receiving district has the capacity to accept additional density, the permit granting authority may give density bonuses up to 50 percent of the rights transferred.[184] This allows

landowners in the sending district to be compensated for and transfer up to 30 dwelling units, thereby giving the property owner a large bonus for selling their development rights through the program. Furthermore, the receiving zone must also allow building density that is 50 percent greater than the underlying zoning. Thus, there is a 1-1.5 incentive for landowners and developers to purchase and use their development rights within the receiving zone.[185]

It is critical to the success of the TDR program that the relative cost of development in the receiving district be lower than in the sending district. Receiving districts are theoretically more developed and therefore will have greater public infrastructure in the form of roads, sewers, schools etc.[186] This substantially lowers development costs and increases incentives to build in the receiving district.

Establishing a Successful TDR Market

TDR programs use private markets and private funds to preserve agricultural and open space lands more efficiently than through outright purchase or PDR programs. Where TDR programs struggle, is in selecting and developing a receiving zone that contains a significant demand for available TDR credits. To strengthen demand, the transferable rights must have or represent something of value to the community. TDRs seek to preserve all kinds of natural resources, and more often seek to preserve agricultural lands.[187] Subsequently, TDRs can help to

preserve prime agricultural lands and increase the economic viability of our agrarian economy.

TDR Credits as Currency

In communities that use TDR programs, TDR credits are the currency of development. To construct a successful market it is important that steps are taken to ensure a stable price for TDR credits. Weak market demand for credits can depress prices, while an unconstrained market can lead to higher prices that handicap credit transfers. Using the New Jersey Pinelands plan as an example, this report will explain the basic structure for allocating development credits.

In the sending district a baseline formula must be established for allocating credits to landowners. In NJ Pinelands, credits are awarded based on two factors: total acreage and current and future productive capacity of land use. For example, owners of farmland are awarded 1 credit for every 39 acres of upland. Less productive lands like wetlands, forested lands or inactive bogs are awarded only .2 credits for every 39 acres of land.[188] Credits are awarded on a fractional basis, however the Pinelands program does not award anything less than a tenth of a credit. Therefore, small landowners of a quarter acre or less have a significant incentive to participate in this program.

Once purchased, development credits can be transferred and used to increase the density of development within the receiving district. While each program is

different, municipalities designate zoning districts that allow for densities that range anywhere from .5 dwelling units per acre to over 12 dwelling units per acre. In the NJ Pinelands program each development credit can be translated into 4 additional housing units.[189]

Pricing of TDR units varies dramatically depending on the strength of the local real estate market. In the NJ Pinelands program for example, TDR credits sold for as high as $15,000 a credit, which paid landowners on average $1,000 per acre.[190] As a point of comparison, Calvert County's TDR program was slightly less expensive, with an additional TDR lot costing developers $10,000 on average.[191]

TDR Banks Stabilize Demand and Prices

As Massachusetts has discovered with their APR program, demand for the program annually outstrips the states funding and ability to purchase the development rights of the Commonwealth's farms. Even though TDR programs are not dependent on public funds, there are still times when willing sellers of TDR credits will outnumber buyers with development projects. To ensure participation and a consistent market, mechanisms need to be in place that encourages the sale of credits not just at times when development projects are pending.

One way to accomplish this goal is to open the TDR market to the public. TDR purchases can become a general investment for local citizens, land trusts or any

other interested party. The second option is for the municipality or preferably the state to step in and act as a broker, forming what is called a TDR bank. The TDR bank can purchase credits that can then be sold at any time in the future as development projects arise.[192] Banks help to ensure a stable market for development rights in two ways. The presence of a TDR bank or similar entity ensures that there is always a market for development rights. On any given day property owners and developers can determine the specific value that is associated with development credits. A TDR bank serves a role similar to the Federal Reserve Bank and has the ability to buy, hold and even retire rights that protect a critical habitat while simultaneously stabilizing TDR prices.[193]

Finally, TDR banks cultivate a sense of legitimacy and lower administrative costs associated with TDR transactions. TDR banks maintain active information about the program, keep lists of potential sellers and buyers and are actively involved in educating the community about the program. The banks also provide protection from any potential legal challenges.[194]

Success of TDR Programs in Preventing Agricultural Land Loss and Fragmentation

Studies on the success of TDR programs have shown that they are most effective in mitigating agricultural land loss and fragmentation when used in concert with existing land use tools. A study done by Brabec and Smith of Montgomery County, Riverhead and Southampton looked at the effectiveness of TDR, PDR

and cluster developments on farmland loss and fragmentation. The study established that in these three areas TDR programs preserved on average 1,768 acres per year, PDR programs preserved 195 acres per year and cluster developments preserved only 41 acres per year.[195] For the PDR program to be as successful it would require a 10-fold increase in annual funding.

This study also analyzed parcel contiguity, a defining feature of parcel fragmentation. In review of the three programs, 75 percent of protected parcels were adjacent to other protected parcels.[196] As discussed in chapter two, agricultural land contiguity is strongly correlated with overall farm viability, and the presence of a TDR program has been shown to have a dramatic effect on aggregation of protected lands over the three programs. TDR programs have resulted in the aggregation of 91 percent of agricultural lands into a contiguous area that averaged 465 acres in size.[197]

In its final analysis the study looked at the rate of active agricultural use of parcels under one of the three preservation programs. While the rate varied depending on parcel size, under the TDR program in Montgomery Country, 82 percent of protected parcels were in active farm use.[198]

Have TDR Programs Worked in Massachusetts?

Since NYC implemented the first TDR program in 1968 hundreds of communities across the United States have adopted TDR programs. More than half of these

programs are located in California (28), Florida (17) and Pennsylvania (13).[199] There are a number of towns across Massachusetts that have enabled TDR transactions, but between 2001 and 2008, only one program (Groton) resulted in more than one transfer.[200] Admittedly, there has likely been more TDR activity since them, however there is a dearth of literature that analyzes TDR programs in the Commonwealth. According to Mark Racicot, Land Use Division Manager for MAPC, a number communities have had limited success with variations of TDR programs. For example, the town of Hadley has used TDRs to promote commercial, not residential development to build their local tax base.[201] In the Golden Triangle area of Framingham and Natick, TDRs are used to encourage denser development by allowing developers to build at a higher floor area ratio (FAR).[202] In the Golden Triangle, developers pay the city a fee to build at the higher FAR, which can then be used by the city to purchase priority preservation lands (easement or fee).[203] While this sounds like a developer impact fee, as long as the money is used to purchase open space, it remains a TDR program.

TDRs have always drawn significant interest, however they have faced two imposing challenges that have limited their effectiveness. The first is that everyone is supportive of preserving open space, but very few communities are typically willing to accept higher density development within their borders. The second major problem is that developing a successful TDR market has proven to be extremely difficult. Currently, the Southeastern Regional Planning and Economic Development District has undertaken a TDR Market Feasibility Study

that is examining the potential to implement a regional TDR program that will promote priority development and preservation areas along the new South Coast Rail Corridor. The study found that between 2000 and 2008 the APR program purchased development rights on eight farms for a median per-acre value of $14,000.[204] While a detailed sending area analysis is pending, the study estimates that sending area development credits would be valued at $14,000, which would make them competitive with pre-recession APR program acquisition values. Obtaining these types of prices for TDR credits may be difficult in the current real estate market, but this study demonstrates that there is interest in TDRs, and a belief that they can be used to both promote smart growth and preserve open space and agricultural resource. The APR program will remain the primary agricultural land preservation tool, however they would be smart to work with the state and regional planning agencies to support the development of a TDR program.

Chapter 6: Conclusion

Since WWII, the urban growth machine has fueled the spread of development and services into undeveloped rural lands continually farther from urban centers. While no land is safe from the clutches of suburbia, farmland has been found to be at the greatest risk of development pressures. Farmland is widely available, is relatively flat, and contains soils that support the cost effective cookie cutter development that has become the trademark of modern residential and commercial real estate construction. As a result, the speculative use value of agricultural lands have sky rocketed, creating what has been commonly referred to as the impermanence syndrome. Farm costs have increased, land values and property taxes have increased, however the prices for traditional agricultural products have remains relatively stable. As a result, farming is becoming less profitable in many areas, which has driven farmers to cash in on their large real estate holdings.

While the merits and benefits of preserving farmland may differ for each community, there is no disagreement over the need to preserve the lands that will continue to feed our growing population. Since the first acquisition in 1980, Massachusetts's state mandated Agricultural Preservation Restriction (APR) Program has been one of the most successful farmland preservation tools in the country. The APR program will likely continue to drive farmland preservation across the Commonwealth, however looming budget cuts and an enduring economic recession threaten to hinder the programs effectiveness. This thesis

examined the farmland preservation climate across Massachusetts and conducted a policy analysis that examined the historical use of the APR in the rapidly developing area of Middlesex County.

Through a thorough literature review, chapter two examined the societal and economic values that commonly drive farmland preservation and provided an introduction to the most commonly used farmland preservation tools across Massachusetts and much of the Northeast. While the Massachusetts economy is not defined by agriculture, Chapter three used relevant data from the NASS, USDA Census of Agriculture to examine how agricultural land use across the Commonwealth has changed over time and to demonstrate the economic, environmental and social benefits of preserving agricultural resources within Middlesex County. Chapter four conducted a comprehensive analysis of the APR program that examined historical organizational and funding structures as well as the internal selection criteria and processes used to prioritize and acquire APR restrictions. This chapter also examined available farmland preservation incentives and concluded with an analysis of the APR programs successes and challenges in Middlesex County.

Ultimately, the main goal of this policy analysis is to identify strategic and concrete recommendations that have the potential to increase the long-term effectiveness and efficiency of the APR program. While purchase of development rights programs are traditionally the most effective farmland preservation tool,

they require a significant and steady stream of capital to combat growing development pressures and land prices. The first recommendation in chapter five is for the APR program to utilize installment purchase agreements (IPA), an alternative financing method that would offer significant tax benefits to the landowner and would allow the APR program to preserve more land upfront by deferring a large percentage of the acquisition cost. The second recommendation in chapter five includes a series of steps that encourage the APR program to undertake a more proactive state and regional approach to farmland preservation. These include, but are not limited to, improving coordination and partnership development with regional planning agencies and undertaking a statewide agricultural land inventory. Finally, the third recommendation encourages a stronger working relationship with regulatory land use planning that will better utilize tools like Transfer of Development Rights (TDR). TDRs continue to gain popularity as a policy instrument that has the potential to cost effectively promote smarter, denser development, while preserving key resources like agricultural lands. TDR programs are not necessarily the answer for every community, however a closer examination of their potential across the Commonwealth should be an initial step.

This thesis attempts to demonstrate that agricultural land preservation efforts cannot operate independently from growth management and planning efforts. By encouraging a closer working relationship between land use and open space planning, it is possible that the cost and effort required to preserve key

agricultural resources can be lessened. Future scholars should realize that agricultural land preservation is not just about identifying which lands are worth saving. There needs to be a better understanding of agricultural land vulnerability and the factors that define and impact the vulnerability of land to development pressures. Agricultural land is an invaluable resource that provides a multitude of benefits to our society; therefore we must undertake every effort to ensure that our preservation efforts are as comprehensive, collaborative and efficient as humanly possible.

Appendix A: Data Tables: Land Use Trends Across Massachusetts and Middlesex County

Table 3.1: Land Cover as a Percentage of Total Agricultural Lands

Land Use	Total Acreage (2002)	Percentage of Total	Total Acreage (2007)	Percentage of Total
Forested	210,891	41%	212,539	41%
Cropland	207,734	40%	187,406	36%
Pasture	31,279	6%	48,120	9%
Undisclosed Land Use (including Wetlands)	68,666	13%	70,100	14%
Total	**518,570**	**100%**	**517,879**	**100%**

Source data: "Massachusetts State Summary", USDA NASS Census of Agriculture, 2007, accessed November 16, 2001.

Table 3.2: Land Cover as a Percentage of Total Prime Agricultural Lands

Land Use	Total Acreage (2002)	Percentage of Total
Forested	132,000	47.5%
Cropland	119,000	43%
Pasture	26,500	9.5%
Total	277,500	100%

Source data: AFT, 2008. 4

Table 3.3: State Trends in Land Agricultural Land Use Between 2002 and 2007

	2007	2002	% Change
Number of Farms	7,961	6,075	+27%
Land in Farms	517,879	518,570	0
Average Size of Farm	67	85	-21%

Source data: "Massachusetts State Summary", USDA NASS Census of Agriculture, 2007

Table 3.4: Snapshot of Middlesex County

	Middlesex County	Massachusetts	% of Total
Population (2010)	1,503,085	6,547,629	23%
% Pop with Bachelors Degree or Higher (2005-2009)	48.4%	37.8%	N/A
Housing Units (2010)	612,004	2,808,254	22%
Median Home Value $ (2005-2009)	$427,400	$357,600	120%
Median Household Income (2009)	$77,672	$64,057	121%
Land Area, Sq./Miles (2010)	817.82	7,800.06	10.4%
Persons per Sq./Miles (2010)	1,837.9	839.4	218%
Agricultural Land Area	33,893	517,879	6.5%

Source data: "Middlesex County Profile," USDA NASS Census of Agriculture, 2007

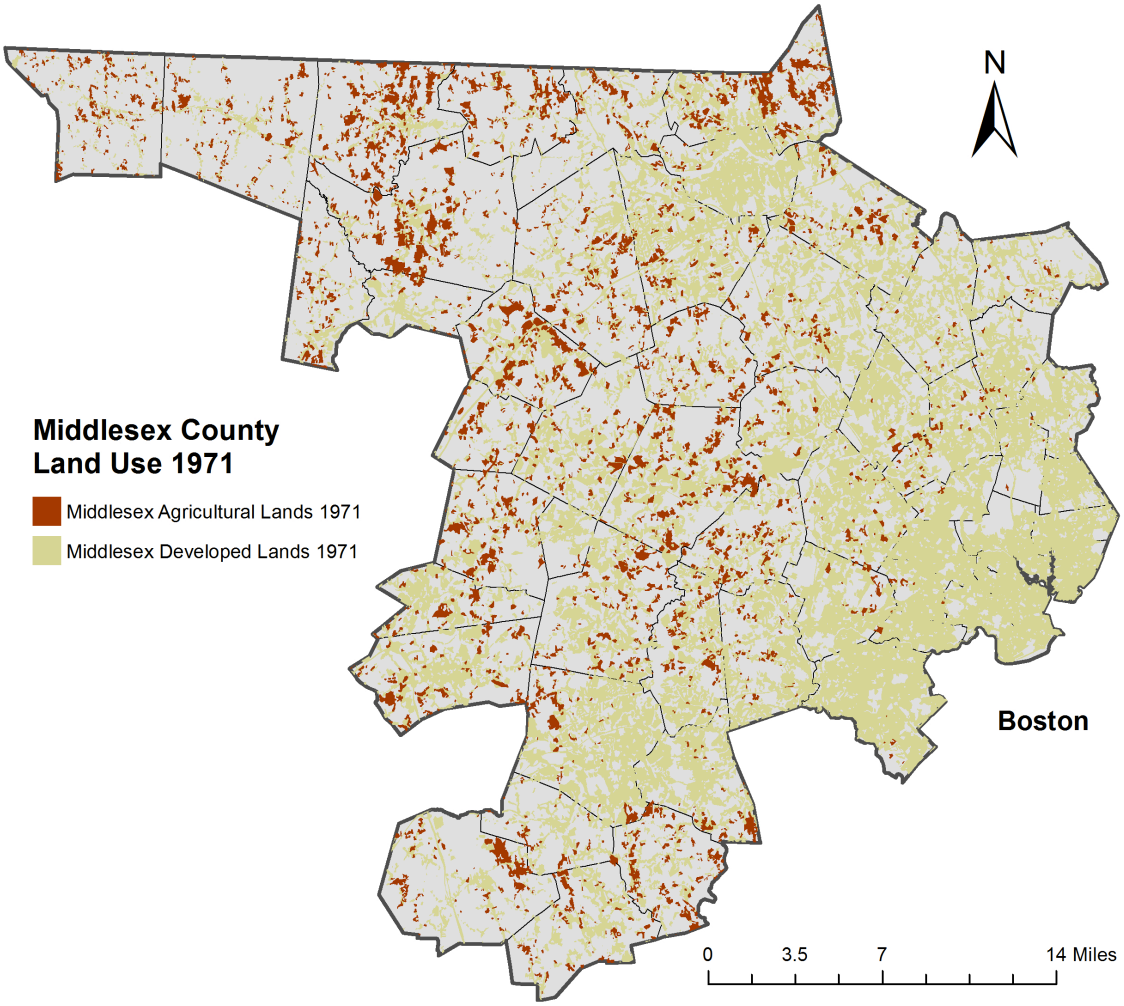
Table 3.5: Trends in Land Agricultural Land Use Between 2002 and 2007 (Middlesex County)

	2007	2002	% Change
Number of Farms	700	579	+21%
Total Land in Farms	33,893	33,160	+2%
Average Size of Farm	48	57	-16%

Source data: "Middlesex County Profile," USDA NASS Census of Agriculture, 2007

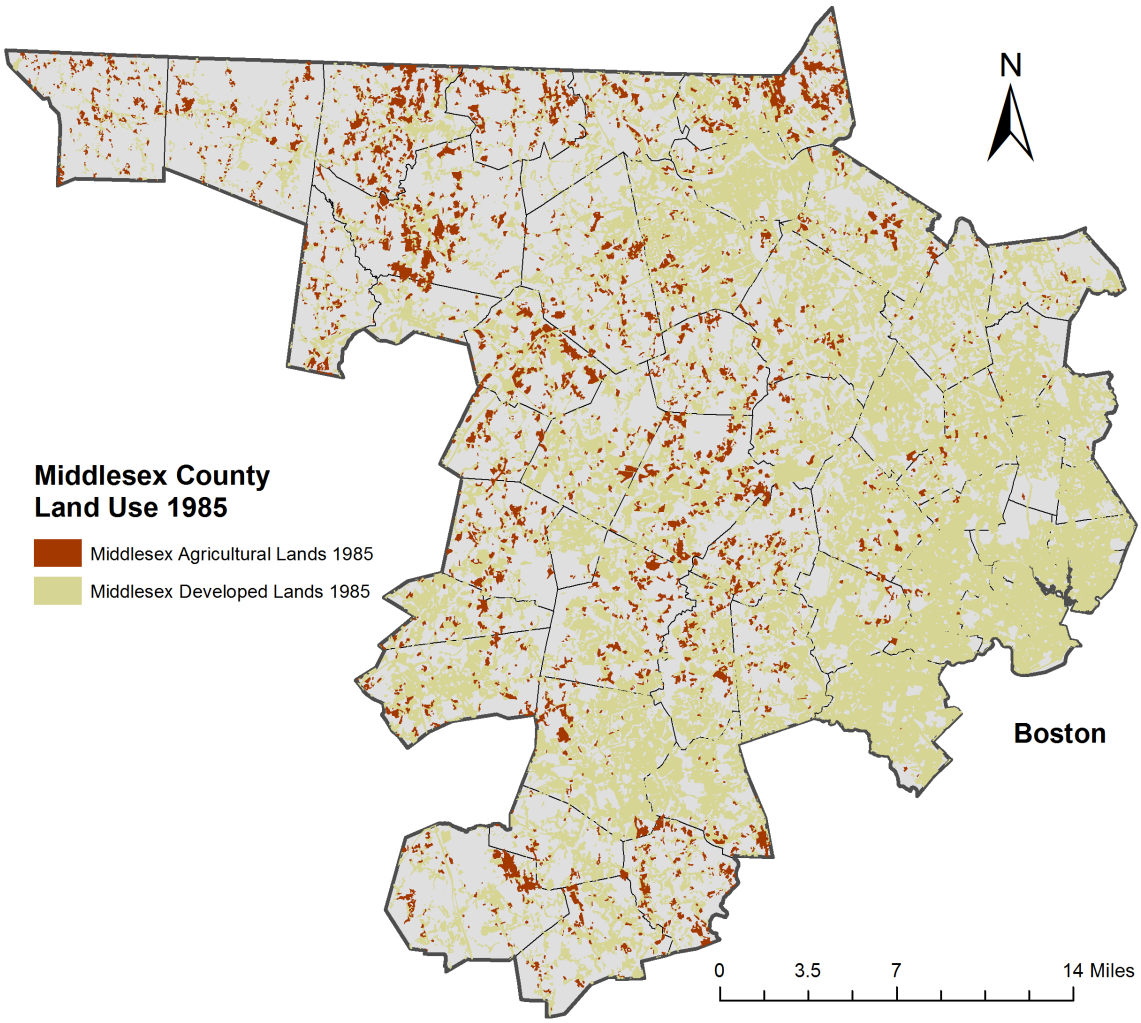
Appendix B: Agricultural Land Use Trends in Middlesex County

Figure 3.1: Middlesex County Land Use Map (1971)



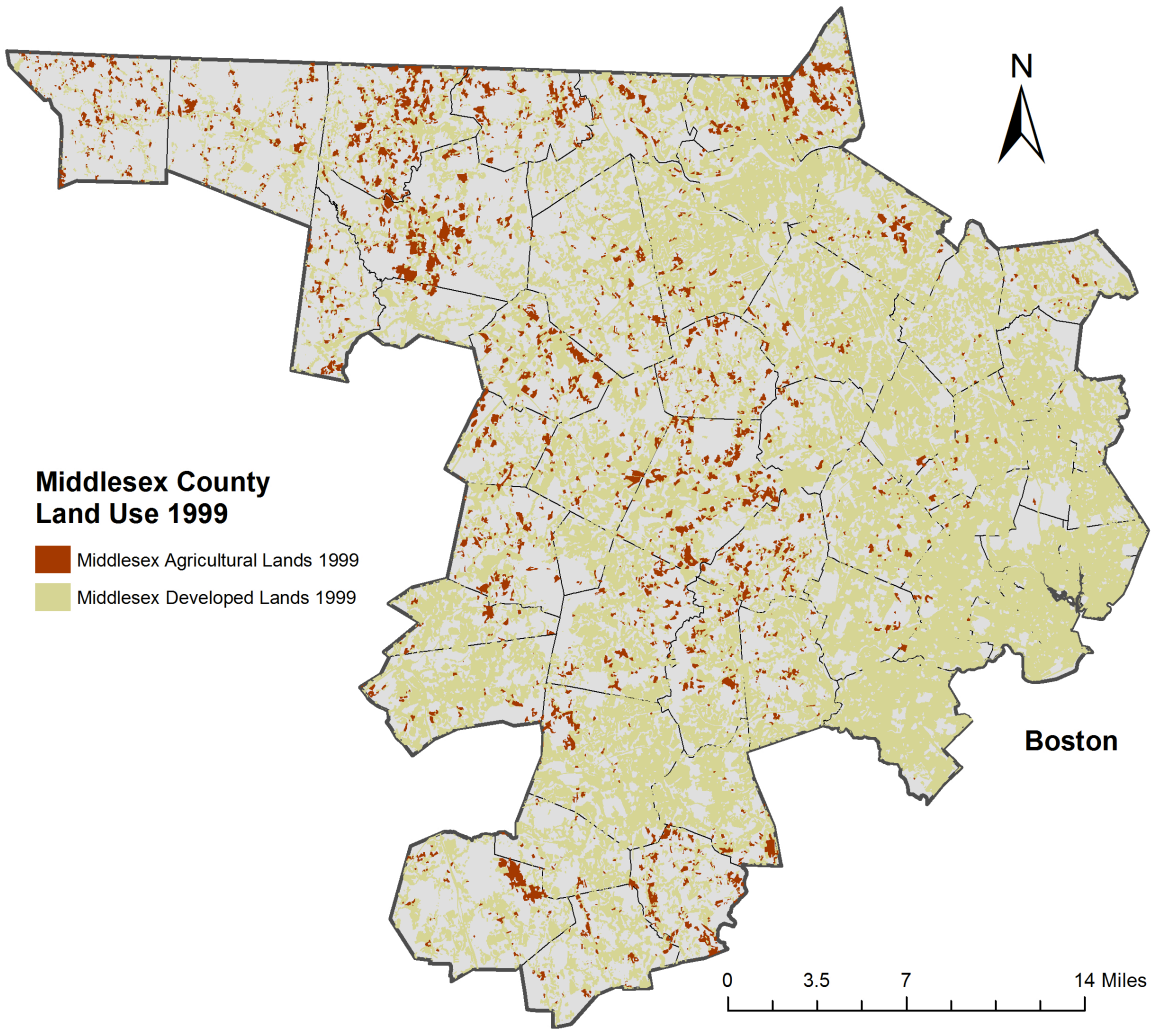
Total Agricultural Acres (1971): 37,615 Acres
Cartographer: Kyle Greaves
Date: 12/2/2011
Sources: MassGIS Land Use 2005 Data Set

Figure 3.2: Middlesex County Land Use Map (1985)



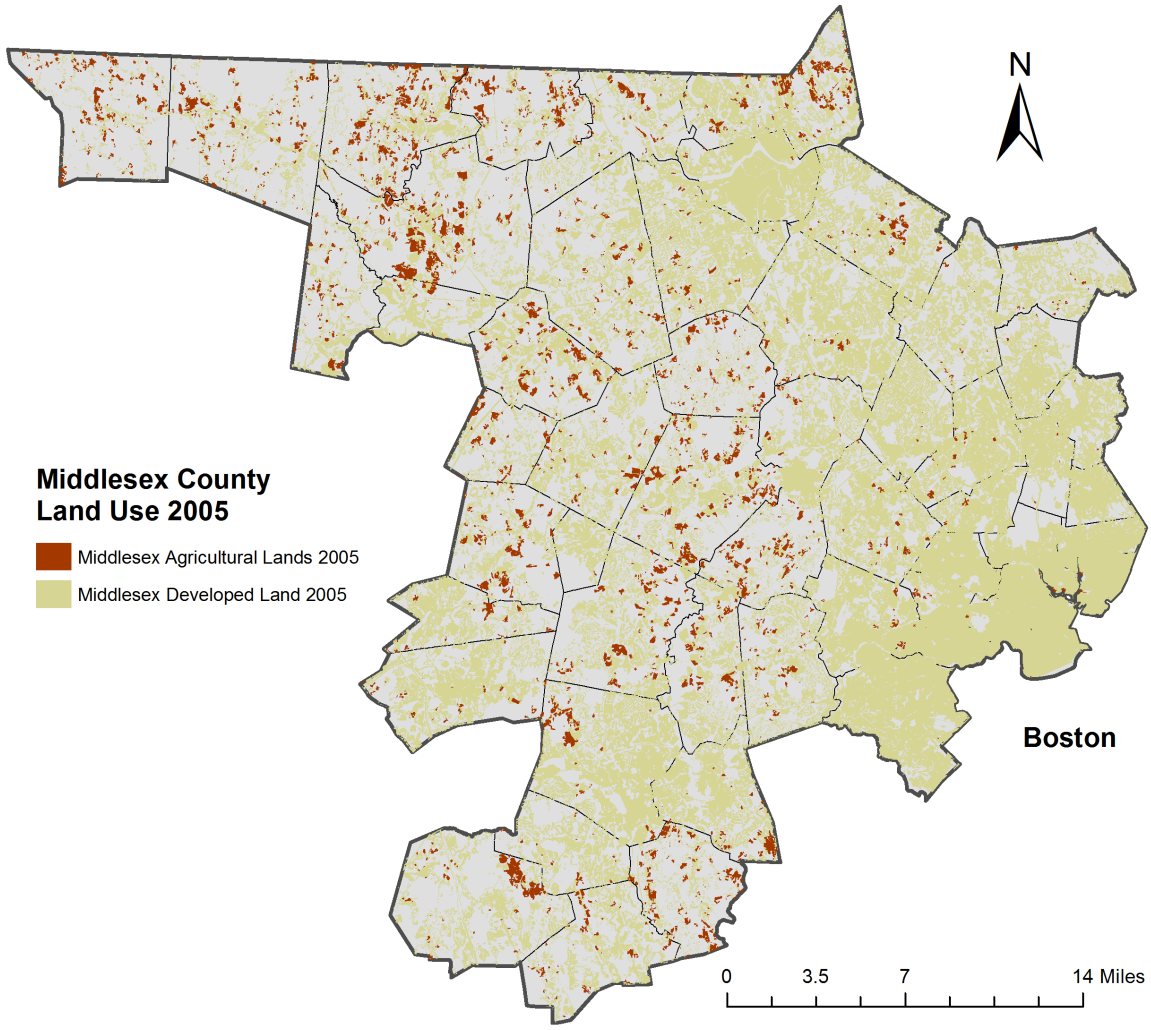
Total Agricultural Acres (1985): 33,234 Acres
Cartographer: Kyle Greaves
Date: 12/2/2011
Sources: MassGIS Land Use (1951 – 1999) Data Set

Figure 3.3: Middlesex County Land Use Map (1999)



Total Agricultural Acres (1985): 25,334 Acres
Cartographer: Kyle Greaves
Date: 12/2/2011
Sources: MassGIS Land Use (1951 – 1999) Data Set

Figure 3.4 Middlesex County Land Use Map (2005)



Total Agricultural Acres (1985): 14,234 Acres
Cartographer: Kyle Greaves
Date: 12/2/2011
Sources: MassGIS Land Use (1951 – 1999) Data Set

Appendix C: Common Easement Program Criteria

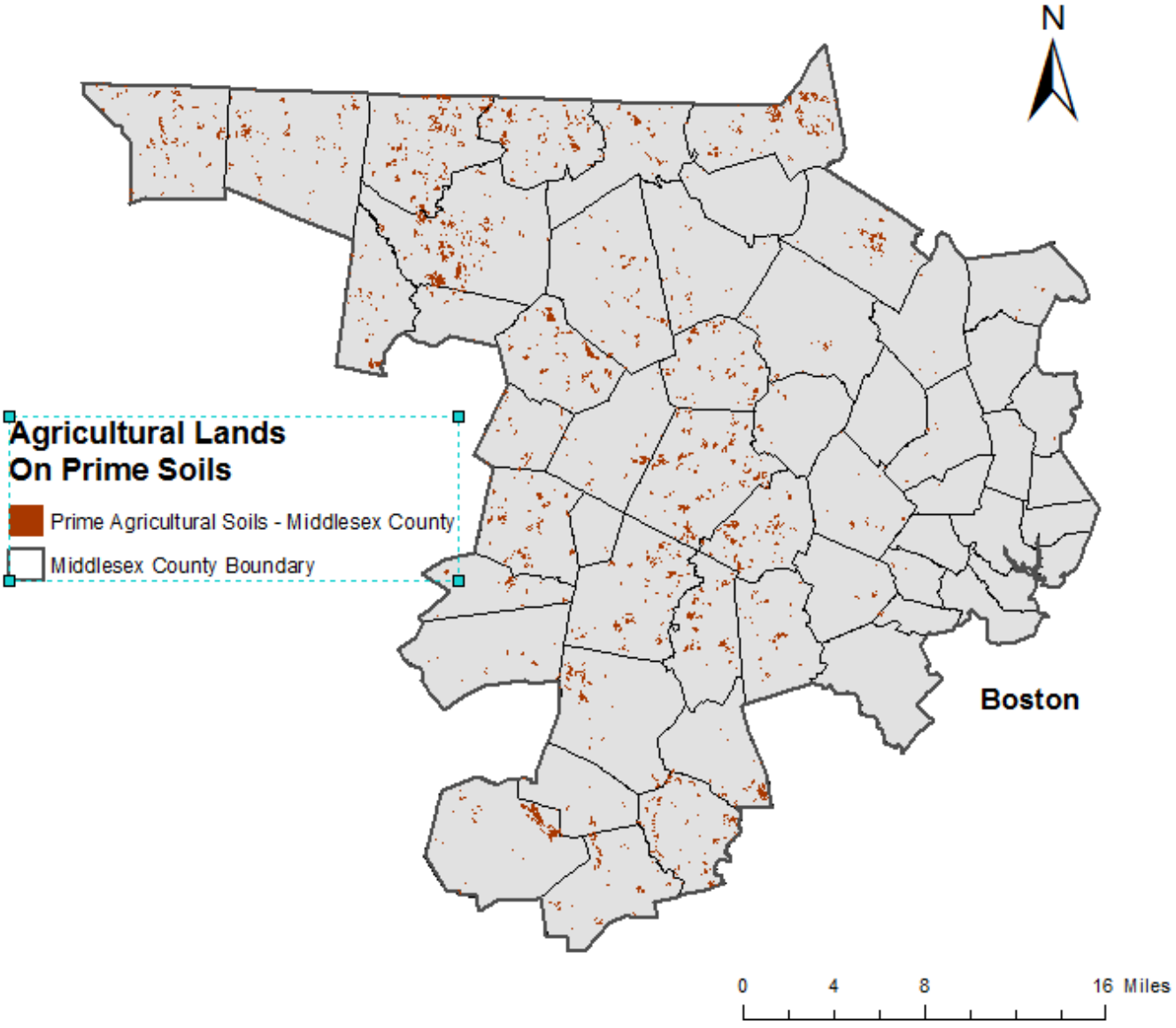
Table 4.1: Most Frequently Used Criterion in Agricultural Easement Programs

Qualitative	Quantitative
1. Location/Geographical Targeting	1. Agricultural Land Quality
2. Contiguity to Other Protected Land	2. Contiguity to Other Protected Land
3. Threat (Urgency) or Potential of Development	3. Farm Management
4. Agricultural Land Quality	4. Parcel Size
5. Active Agricultural History	5. Development Proximity
6. Natural Resource / Historic Value	6. Natural Resource / Historic Value
7. Parcel Size	7. Consistency with Local Planning

Source: AFT "A National View of Agricultural Easement Programs: How Programs Select Farmland To Fund – Report 2." American Farmland Trust and The Agricultural Issues Center. 2006, (16)

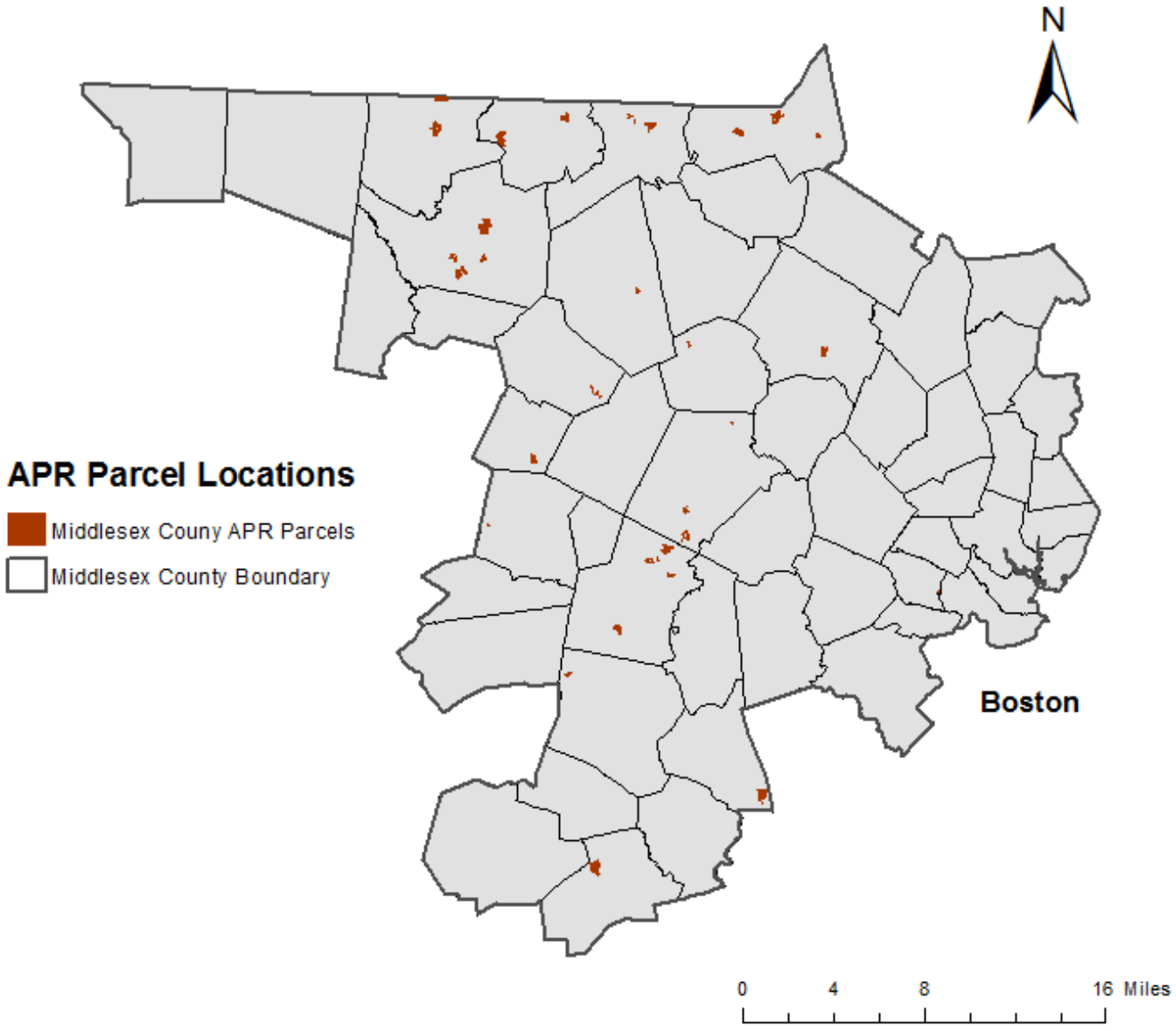
Appendix D: Maps of Agricultural Soils In Middlesex County

Figure 4.1: Middlesex County Farmland with Prime Agricultural Soils (This includes soils of unique and statewide importance)



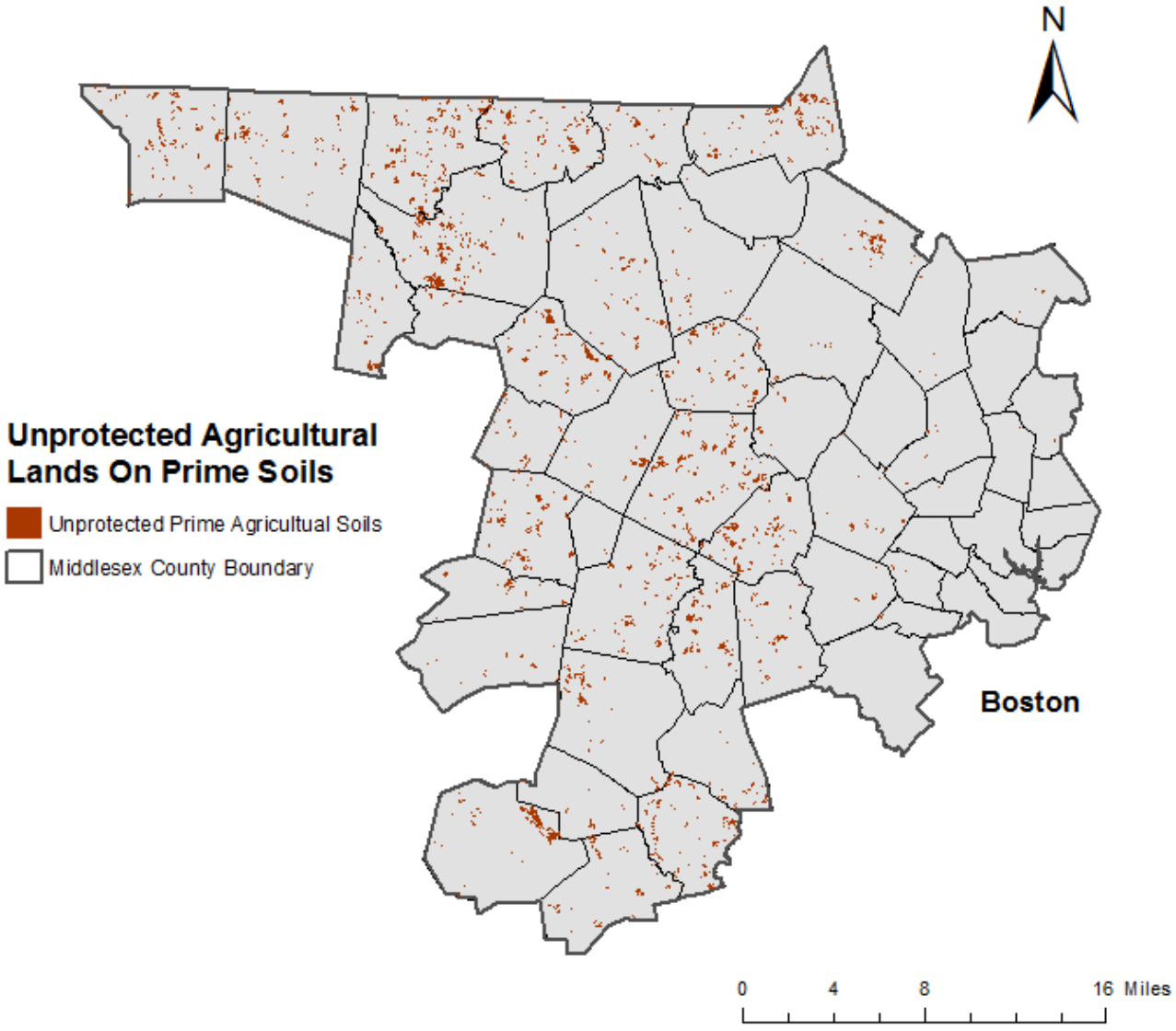
Cartographer: Kyle Greaves
Date: 12/2/2011
Sources: MassGIS Middlesex County Boundaries / NRCS SSURGO-Certified Soils / MassGIS Protected and Recreational Open Space

Figure 4.2: APR Easement Locations Across Middlesex County



Cartographer: Kyle Greaves
Date: 12/2/2011
Sources: MassGIS Middlesex County Boundaries / NRCS SSURGO-Certified Soils / MassGIS Protected and Recreational Open Space

Figure 4.3: Middlesex County Unprotected Prime Agricultural Lands (This includes soils of unique and statewide importance)



Cartographer: Kyle Greaves
Date: 12/2/2011
Sources: MassGIS Middlesex County Boundaries / NRCS SSURGO-Certified Soils / MassGIS Protected and Recreational Open Space

Figure 4.4: NRCS: Unprotected Farmland on All Soil Types

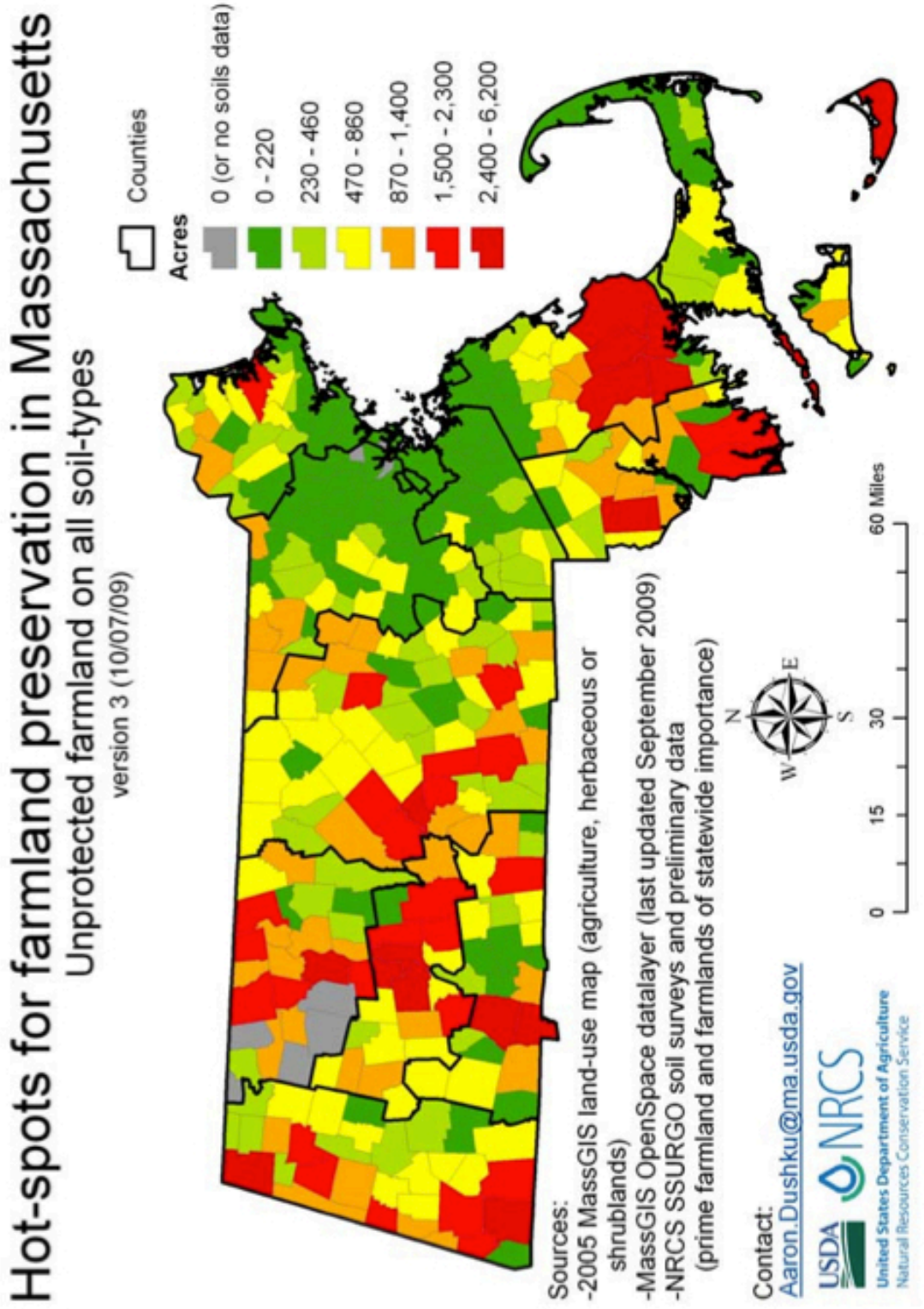


Figure 4.5: NRCS: Unprotected Farmland on Prime Soils

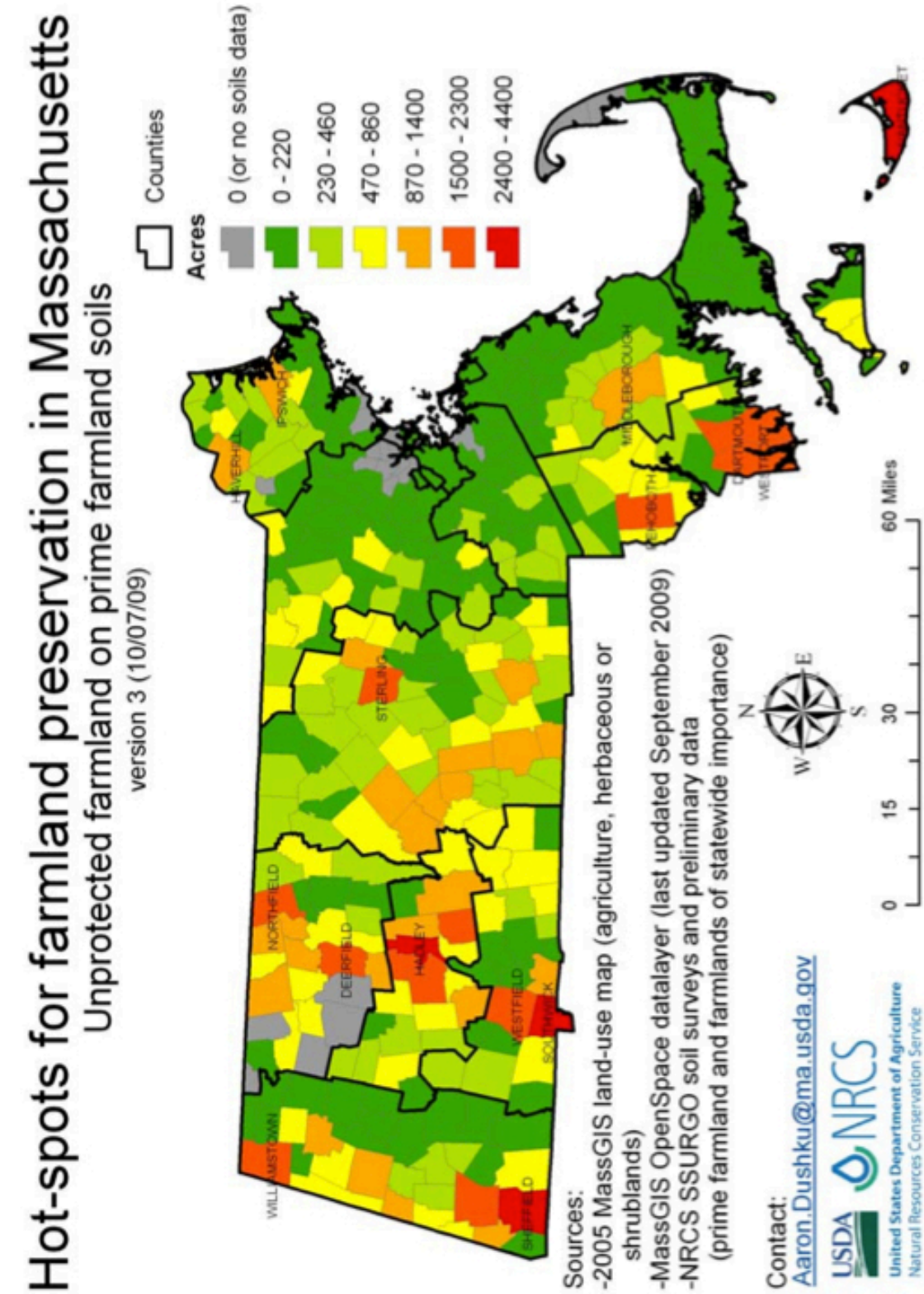


Figure 4.6: NRCS: Protected Farmland on All Soil Types

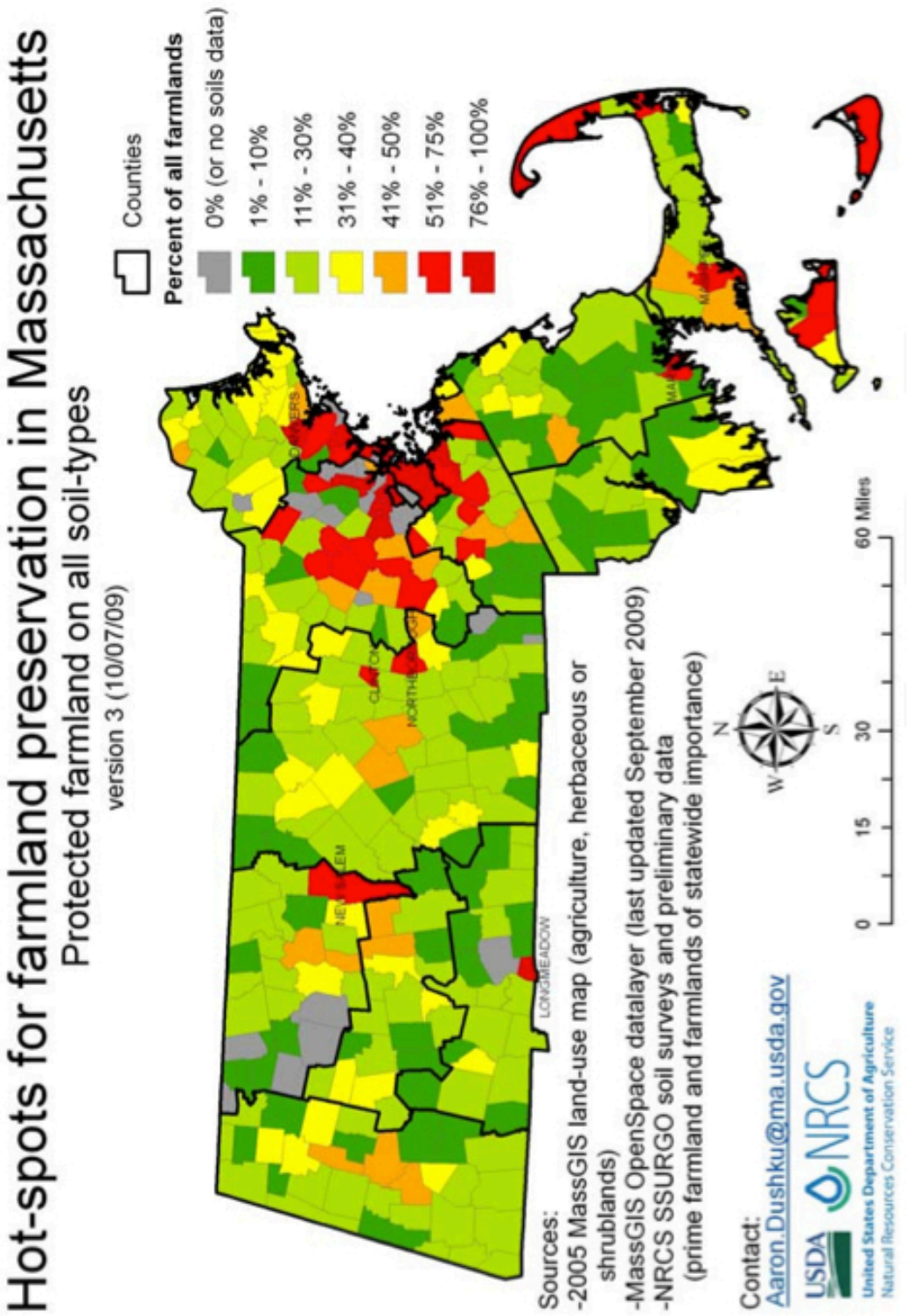


Figure 4.7: NRCS: Protected Farmland on Prime Soils

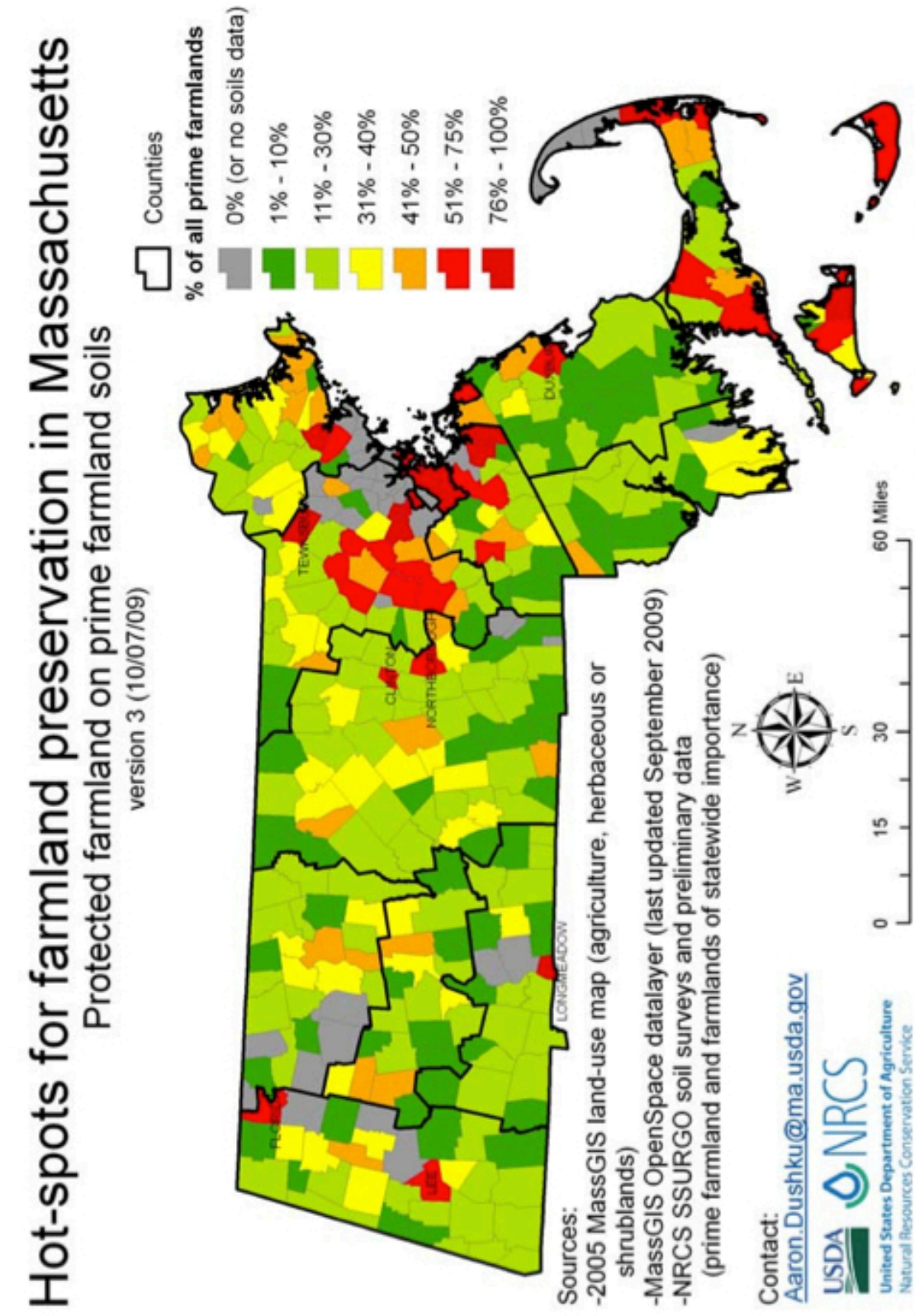


Figure 3-4. Percent of town agricultural lands protected vs. percent of prime agricultural lands protected.

Appendix E: APR Municipal Application

APR Municipal Application

Municipality:_____ **Contact Name:**_____ **Title:**_____

Address:_____ **Email:**_____ **Date:**_____ **Phone:**_____

Landowner(s) Name Applying to APR Program: _____

Applicants need to provide adequate evidence of having met, or being in the process of making, a binding commitment to the following criteria. If such evidence has been submitted and accepted in previous applications, it need not be re-submitted.

	QUALIFICATION THRESHOLDS (SECTION II ON GUIDANCE DOCUMENT)	**YES**	**NO**
1a	Minimum 400 acres in active agricultural use within municipality and/or	☐ Yes	☐ No
1b	At least 1200 acres enrolled in Chapter 61 and 61A combined	☐ Yes	☐ No
2a	If Project is < 20 acres, at least 75% of project land in agricultural use is Prime Farmland, Unique Farmland, or Soils of Statewide Importance	☐ Yes	☐ No
2b	If Project is ≥ 20 acres, at least 50% of project land in agricultural use is Prime Farmland, Unique Farmland, or Soils of Statewide Importance	☐ Yes	☐ No
3a	Project targets a 20% financial match from municipal, landowner or other sources, and/or	☐ Yes	☐ No
3b	Municipality demonstrates a history of financial support, to the satisfaction of the Commissioner of Agriculture, and/or	☐ Yes	☐ No
3c	Match reflects a 5% reduction from the 20% target for each action criteria items 6,7, and 8 below	☐ Yes	☐ No
	ALTERNATIVE QUALIFICATION THRESHOLDS (SECTION III ON GUIDANCE DOCUMENT)	**YES**	**NO**
4	Project adds to an existing APR block of at least 200 acres, and/or	☐ Yes	☐ No
5	Is part of a defined farmland block, of which 75% is permanently protected	☐ Yes	☐ No
	TOWN ACTION CRITERIA (40 POINTS) (SECTION IV ON GUIDANCE DOCUMENT)	**Existing**	**Commit**
6	Established an Agricultural Commission or like entity	☐ 4	☐ 2
7	Enacted a municipal Right-to-Farm bylaw	☐ 4	☐ 2
8	Implemented a tracking system to prevent issuance of local permits for unauthorized construction on protected farmland	☐ 4	☐ 2
9	Promoted local and regional direct marketing opportunities, such as farmers markets	☐ 3	☐ 1.5
10	Identified/inventoried/mapped farmland to be protected	☐ 2	☐ 1
11	Established a town farmland protection fund	☐ 3	☐ 1.5
12	Developed community agricultural events and/or promotions, such as harvest festivals	☐ 3	☐ 1.5
13	Demonstrated support for farmland preservation under Chapter 61A by either exercising or assigning to non-profit land preservation organization the municipal Right-of-First-Refusal on a 61A withdrawal.	☐ 3	☐ 1.5
14	Created an agricultural overlay district and developed site plan review on single-family house lots within such districts	☐ 3	☐ 1.5
15	Created buffer requirements on non-farm development adjacent to agricultural lands	☐ 3	☐ 1.5
16	Implemented a program that redirects development to marginal, non-agricultural areas	☐ 3	☐ 1.5
17	Assisted in agricultural economic development, such as TIF (tax incentive) for a business that supports local agriculture, or assisted in locating and developing a value-added processing facility	☐ 3	☐ 1.5
18	Worked collaboratively with regional efforts to include agriculture in regional land use planning	☐ 2	☐ 1
	TOTAL EXISTING AND COMMITMENT POINTS (MAXIMUM 40)		

Appendix F: Summary of Regional Planning Agencies in Middlesex County

The Metropolitan Area Planning Commission (MAPC*)*

MAPC is a regional planning entity with advisory jurisdictions within 101 cities and towns surrounding Metropolitan Boston. In 2008 MAPC adopted Metro Future, the 30-year regional plan that promotes smart growth through "efficient transportation systems; conserving land and natural resources; increasing economic development and equitable opportunities for prosperity."[205] To date, MAPC has been most successful in encouraging member communities to eliminate "approval not required zoning," and to allow open space residential development (OSRD) that encourages smaller lots and preservation or open space. MAPC has also successfully supported zoning amendments that allow accessory business uses on farms like veterinarian offices, feed milling and delivery and small-scale animal and food processing that are normally prohibited under existing zoning but can increase the profitability of small enterprises.[206]

The 495 Metro-West Partnership

The 495 Compact was first started in 2003 as an organization that advocated for improving economic development, transportation, and water supply issues that proliferate the 495/MetroWest Corridor. The partnership has developed a Regional Strategic Plan that identified a historical lack of investment by policy makers in this region to address natural resource challenges. The plan seeks to increase regional collaboration and specifically invites policymakers and

statewide advocacy organizations like the APR program to participate in meetings, forums, committees, and commissions.[207]

The Northern Middlesex Council of Governments (NMCOG)

NMCOG represents nine member communities in the northern part of Middlesex County. NMCOG utilizes two primary vehicles to promote open space preservation. The Regional Strategic plan and the Open Space and Recreation Plan (OSRP) provide smart growth and open space preservation recommendations, but their main value derives from their ability to get local communities to think outside their own borders. ORSP's have been well received in this area of Middlesex County and have helped the communities to realize the value of existing open space. There are communities in this region like Chelmsford that are completely built out and have no space left for development. As a result of regional plans and OSRPS, many communities are realizing that more development, particularly residential development, is not always the right choice for a community.[208]

The Merrimack Valley Regional Planning Commission (MVPC)

Since 1950 the MVPC has served 15 communities in Northeastern Massachusetts. The partnership has developed a Priority Growth Strategy that seeks to direct growth to existing concentrated development centers (CDC) that currently contain the infrastructure to support additional growth, while protecting areas that contain significant natural resources. Among other strategies to protect open space,

MVPCs Framework plan recommends mandatory ORSDs and regulatory processes that examine a parcel's development suitability based on features like current and neighboring land uses.[209] Despite a declining agricultural land base in their region one of MVPC's clear goals is to preserve the remaining prime agricultural land base and working farms.

Appendix G: Interview List

1. The Agricultural Preservation Restriction Program (APR), Chris Chisholm, 11/18/2011, Agricultural Planner
2. The Community Preservation Coalition, Katherine Roth, 11/16/2011, Associate Director
3. The National Resource Conservation Service (NRCS) – Farm and Ranchland Protection Program (FRPP), Barbara Miller, December 2, 2011, Massachusetts State Resource Conservationist and Farm Bill Program Manager
4. The Metropolitan Area Planning Commission (MAPC), Mark Racicot, 11/16/2011, Land-Use Division Manager
5. Northern Middlesex Council of Governments (NMCOG), George Russell, 12/13/2011, Senior Planner

End Notes

[1] Pace. 1997. "Preserving Our Heritage: Tools to Cultivate Agricultural Preservation in New York State." *Pace Law Review* 17: 591-562 (595)
[2] Bunce, Michael F. "Agricultural Land As a Real Estate Commodity: Implications For Farmland Preservation in the North American Urban Fringe." *Landscape Planning* 12 (1985): 172-192. (178)
[3] Hance, Allen, Kathy Ruhf, and Alan Hunt. 2006. "Regionalist Approaches to Farm and Food Systems Policy: A Focus on the Northeast ." *Northeast Sustainable Agriculture Working Group* 1: 2-23 (8)
[4] AFT, American Farmland Trust. 2008. "Farms for the Future: Massachusetts' Investments in Farmland Conservation." *American farmland Trust* 1: 1-21(5)
[5] Bunce, 1985. 178
[6] AFT, 2008. 7
[7] "Ranking Tables for Counties: Population in 2000 and Population Change from 1990 to 2000." Census Bureau Home Page. http://www.census.gov/population/www/cen2000/briefs/phc-t4/index.html (accessed November 15, 2011).
[8] "Census of Agriculture - 2007 Census Publications - State and County Profiles - Massachusetts - Middlesex County." USDA - NASS - Census of Agriculture. http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Massachusetts/index.asp (accessed November 15, 2011).
[9] Brabec, Elizabeth, and Chip Smith. 2002. "Agricultural Land Fragmentation: the spatial effects of three land protection strategies in the eastern United States." *Landscape and Urban Planning* 58 (2002): 255-268. (256)
[10] "Mass State Income Tax Credit for Land Conservation," Massachusetts Land Trust Coalition, accessed November 10, 2011. http://www.massland.org/files/MAState_Income_tax_credit_land_conservation.pdf
[11] Teaford, Jon C. In *The metropolitan revolution: the rise of post-urban America*. New York: Columbia University Press, 2006. 146
[12] Flint. 2006, 32
[13] Brabec and Smith, 2002. 255
[14] Molotoch, Harvey. "The City as a Growth Machine: Towards a Political Economy of Place/" American Journal of Sociology 82 (1976): 309-332. (309)
[15] Molotoch, 1976. 311
[16] Brabec and Smith, 2002. 256
[17] New England Governors Conference. "Report of the Blue Ribbon Commission on Land Conservaton." New England Governors Conference, (2009): 1-46, (11)
[18] Bunce, 1985. 178
[19] Berry and Plaut, 1978. 160
[20] Nelson, Arthur C. "Economic Critique of U.S. Prime Farmland Preservation Policies." *Journal of Rural Studies* 6 (1990): 119-142. (119)
[21] Nelson, Arthur C.,1990. 119
[22] Bunce, 1985. 178

[23] Bunce, 1985. 178
[24] Bunce, 1985. 178
[25] Brabec and Smith, 2002. 255
[26] Brabec and Smith, 2002. 256
[27] Brabec and Smith, 2002. 256
[28] Brabec and Smith, 2002. 262
[29] Levia, D.F.. "Farmland Conversion and Residential Development in North Central Massachusetts." *Land Degradation & Development* 9 (1998): 123-130. (123)
[30] Nelson, Arthur C. "Economic Critique of U.S. Prime Farmland Preservation Policies." *Journal of Rural Studies* 6, no. 2 (1990): 119-142.
[31] Tulloch, David L., James R. Myers, John E. Hasse, Peter J. Parks, and Richard G. Lathrop. "Integrating GIS into farmland preservation policy and decision making." *Landscape and Urban Planning* 63 (2003): 33-48. (39)
[32] Daniels, Tom, and Mark Lapping. 2005. "Land Preservation: An Essential Ingredient in Smart Growth." *Journal of Planning Literature* 19 (3): 316-329. (323)
[33] Daniels and Lapping, 2005. 323
[34] deHaven-Smith, Lance, James Nicholas, and Teresa Herrero. "Farmland Protection Issues and Techniques." In *Plowing the urban fringe: an assessment of alternative approaches to farmland preservation*. Ft. Lauderdale: Florida Atlantic University (1989): 1-7. (7)
[35] AFT, 2008. 1
[36] Economic Research Services, USDA. "Smart Growth: Implications for Agriculture in Urban Fringe Area." Resources & Environment (2001): 24-28 (26)
[37] The Trust for Public Land. "The Economic Benefits and Fiscal Impact of Parks and Open Space in Nassau and Suffolk Counties, New York: A Report by The Trust for Public Land for the Long Island Community Foundation and the Rauch Foundation." 2010 (18)
[38] The Trust for Public Land. 2010, 19
[39] ERS, 2001. 24
[40] ERS, 2001. 25
[41] Baden, John. *The Vanishing farmland crisis: critical views of the movement to preserve agricultural land*. Lawrence, Kan.: Published for the Political Economy Research Center, Bozeman, Montana by the University Press of Kansas. 1984. (2)
[42] Nelson, 1990. 120
[43] Solomon, Barry. "Farmland Protection A Case of Quality Not Quantity." *Land Use Policy* October (1984): 357-366. (363)
[44] Solomon, Barry. "Farmland Protection A Case of Quality Not Quantity." *Land Use Policy* October (1984): 357-366. (363)
[45] Hellerstein, Daniel, Cynthia Nickerson, Joseph Cooper, Peter Feather, Dwight Gadsby, Daniel Mullarkey, Abebayehu Tegene, and Charles Barnard. 2002 "Farmland Protection: The Role of Public Preferences for Rural Amenities." *Agricultural Economic Report* 815: 1-74. (1)
[46] Hellerstein et al, 2002. 9

[47] Nelson, 1990. 121
[48] Brinkman, Blondel, Douglas J. Miller, and Cynthia J. Nickerson. 2005 "Impact of Farmland Preservation Programs on the Rate of Urban Development." *American Agricultural Economics Association Annual Meeting*, 1-34. (2)
[49] Schnidman, 1990. 1
[50] Brinkman et al, 2005. 1
[51] Berry and Plaut, 1978. 165
[52] Berry and Plaut, 1978. 165
[53] Pace, 1997. 621
[54] Pace, 1997. 620
[55] Pace, 1997. 620-622
[56] Rickard, 1986. 203
[57] DeHaven-Smith et al., 1989. 6
[58] DeHaven-Smith et al., 1989. 6
[59] Brinkman et al., 2005. 3
[60] Brinkman et al., 2005. 3
[61] Berry and Plaut, 1978. 166
[62] Berry and Plaut, 1978. 167
[63] Rickard, Timothy. 1986. "Problems in Implementing Farmland Preservation Policies in Connecticut." *Journal of Rural Studies* 2 (3): 197-207. (10)
[64] Conklin, Howard E., and William G. Lesher. 1977. "Farm-Value Assessment as a Means for Reducing Premature and Excessive Agricultural Disinvestment in Urban Fringes." *American Journal of Agricultural Economics* 59 (4): 755-759. (755)
[65] Berry and Plaut, 1978. 167
[66] Brinkman. 2005. 3
[67] Boisvert, Richard N., Nelson L. Bills, and Elizabeth Bailey. 1988. "A Model to Explain Participation in New York's Agricultural Districts and Use-Value Assessment Programs." *Northeast Journal of Agricultural and Resource Economics* 17 (2): 167-177. (167)
[68] Pace, 1977. 613
[69] Boisvert et al., 1988.170
[70] Pace, 1997. 615
[71] Conklin and Bryant, 1974. 610
[72] Pace, 1997. 597
[73] Brinkman et al., 2005. 5
[74] Byers, 2005. 202
[75] Brinkman et al., 2005. 6
[76] Brinkman et al., 2005. 5
[77] Brinkman et al.. 2008. 7
[78] Hanly-Forde, John, George Homsy, Katherine Lieberknecht, and Remington Stone. "Transfer of Development Rights Programs." Cornell University Restructuring, accessed November 15, 2011. http://government.cce.cornell.edu/doc/html/transfer%20of%20development%20rights%20programs.htm (accessed November 16, 2011). (1)

[79] "Transfer of Development Rights: Model Bylaws and Regulations for Towns in Barnstable County, MA." *Cape Cod Commission*. accessed Web. 2 Dec. 2010. http://www.capecodcommission.org/bylaws/tdr.html.
[80] "Smart Growth / Smart Energy Toolkit - Model Transfer of Development Bylaws." Mass.Gov. N.p., n.d. Web. 2 Dec. 2010.
[81] AFT. 2001, 1
[82] "Smart Growth / Smart Energy Toolkit - Model Transfer of Development Bylaws." Mass.Gov. N.p., n.d. Web. 2 Dec. 2010. http://www.mass.gov/envir/smart_growth_toolkit/pages/SG-bylaws.html.
[83] Hanly-Forde et al. 6
[84] Pace, 1997. 632
[85] Schnidman, Frank, and Michael Smiley. *Retention of land for agriculture: policy, practice, and potential in New England*. Cambridge, MA: Lincoln Institute of Land Policy, (1990): 1
[86] AFT, 2008. 4
[87] AFT, 2008. 1
[88] AFT, 2008. 4
[89] "Middlesex County Profile", USDA NASS Census of Agriculture, 2007, accessed November 16, 2001. http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Massachusetts/index.asp
[90] AFT, 2008, 1
[91] AFT, 2008. 5
[92] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[93] AFT, 2008. 3
[94] King, Robert P., Michael S. Hand, Gigi DiGiacomo, Kate Clancy, Miguel I. Gómez, Shermain D. Hardesty, Larry Lev, and Edward W. McLaughlin. "Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply Chains." ERS Report Summary, June (2010): 1-2 (1)
[95] King et al., 2010. 2
[96] AFT, 2008. 3
[97] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[98] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[99] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[100] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[101] "Table 8. Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2007 and 2002," USDA NASS Census of Agriculture 2007, accessed November 6, 2011. http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Indiana/st18_2_008_008.pdf
[102] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[103] Bunce, 1985. 178
[104] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[105] "Table 2. Market Value of Agricultural Products Sold Including Direct Sales: 2007 and 2002." USDA NASS Census of Agriculture, 2007: accessed November

6, 2011.
http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Indiana/st18_2_002_002.pdf
[106] "Table 2. Market Value of Agricultural Products Sold Including Direct Sales: 2007 and 2002." USDA NASS Census of Agriculture, 2007
[107] "Table 2. Market Value of Agricultural Products Sold Including Direct Sales: 2007 and 2002." USDA NASS Census of Agriculture, 2007
[108] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[109] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[110] Eliza Hall, "Divide and Sprawl, Decline and Fall: A Comparative Critique of Euclidian Zoning," University of Pittsburg Law Review (2007): 915, 1 - 39
[111] Jason T. Burdette, "Form-based Codes: A Cure for the Cancer Called Euclidian Zoning," Graduate Thesis Virginia Polytechnic Institute (2004): 1 - 81
[112] Feitshans, Theodore A. "PDRs and TDRs: Land Preservation Tools in a Universe of Voluntary and Compulsory Land Use Planning Tools." HeinOnline, 7, 2002 (44)
[113] Jeffrey G. Buckland, "The history and use of purchase of development rights in the United States," Landscape and Urban Planning, Volume (1987): 14, 237-252
[114] Feitshans, Theodore A. 2002, 44
[115] Buckland, Jeffrey G, 1987. 242
[116] Buckland, Jeffrey G, 1987. 244
[117] Massachusetts General Law Chapter 184 "Sections 31-33 Conservation Restrictions Defined", December 7, 2011
[118] Massachusetts General Law Chapter "330 CMR 22.00 Agricultural Preservation Restriction Program", December 2, 2011
[119] Schnidman and Smiley, 1990. 80
[120] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[121] Adelaja, Soji, Manuel Colunga-Garcia, Melissa A. Gibson, Mary Beth Lake. "The Future of Farmland Preservation Programs: From Retention to Viability to Resiliency." Paper Presented at Trans Atlantic Land Use Conference, Washington D.C (2007): 35
[122] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[123] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[124] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[125] AFT, 2008. 8
[126] "Massachusetts Agricultural Preservation Restriction Program" Presentation: APR Program Update 2008, Accessed November 23, 2011.
http://www.mass.gov.agr

[127] "Massachusetts Agricultural Preservation Restriction Program" Presentation: APR Program Update 2008, Accessed November 23, 2011. http://www.mass.gov.agr
[128] AFT, 2008. 10
[129] "Technical Assistance for Easement Acquisitions" FRPP Financial Management Division, Accessed on December 4, 2011. http://www.nrcs.usda.gov/Internet/FSE_MEDIA/stelprdb1045868.png
[130] Barbara Miller (*Massachusetts State Resource Conservationist and Farm Bill Program Manager*) interview with the author, December, 2, 2011
[131] "Massachusetts Agricultural Preservation Restriction Program" Presentation: APR Program Update 2008, Accessed November 23, 2011. http://www.mass.gov.agr
[132] AFT, 2008. 10
[133] Hall, Ron. Memo: "Interim Guidance Document for APR-Municipal (APR-Muni) Grants on Revised Financial Match Requirement." Massachusetts Department of Agricultural Resources. November, 2008.
[134] AFT, 2008. 11
[135] "Community Preservation Coalition." CPA Overview. http://www.communitypreservation.org/content/cpa-overview (accessed December 4, 2011).
[136] "Community Preservation Coalition." CPA Overview. http://www.communitypreservation.org/content/cpa-overview (accessed December 4, 2011).
[137] " Community Preservation Act Projects Database." Community Preservation Coalition, accessed December 5, 2011. http://www.communitypreservation.org/projects/report?category=open_space
[138] "Testimony on SB90, an Act to Sustain the Community Preservation Act," Ben Bowell at American Farmland Trust, accessed November 1, 2001. http://action.farmland.org/site/DocServer/AFT_testimony_on_SB_90_final.pdf?docID=2244
[139] "MDAR - Municipal Grant Information." Mass.Gov. accessed December 1, 2011. http://www.mass.gov/agr/landuse/APR/APR_muni_grant_info.htm
[140] "APR Municipal Grant Information", Massachusetts Department Of Agricultural Resources, accessed December 2, 2011, http://www.mass.gov/agr/landuse/APR/APR_muni_grant_info.htm
[141] "APR Municipal Grant Information", Massachusetts Department Of Agricultural Resources, accessed December 2, 2011
[142] AFT "A National View of Agricultural Easement Programs: How Programs Select Farmland To Fund – Report 2." American Farmland Trust and The Agricultural Issues Center. 2006, (13)
[143] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[144] AFT American Farmland Trust. "Fact Sheet: Farm and Ranchland Protection Program." 2010 (1)

[145] "APR Municipal Grant Information", Massachusetts Department Of Agricultural Resources, accessed December 2, 2011
[146] MDAR. "2011 Annual Report." Massachusetts Division of Agricultural Development. 2010 (46)
[147] APR Project Data Base 1980 – 2011, The Agricultural Preservation Restriction Program. *Massachusetts Department Of Agricultural Resources.*
[148] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[149] "Census Publications - Table 2: Market Value of Agricultural Products Sold Including Direct Sales between 2002 and 2007", USDA - NASS - Census of Agriculture, accessed December 6, 2011. http://www.agcensus.usda.gov/Public
[150] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[151] USDA NASS Census of Agriculture, 2007. Middlesex County Profile
[152] Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division"
[153] "Taxpayers Guide to Chapter 61A Land Classification," Massachusetts Department of Revenue, accessed December 2, 2011.
[154] "Taxpayers Guide to Chapter 61A Land Classification," Massachusetts Department of Revenue
[155] "Mass State Income Tax Credit for Land Conservation," Massachusetts Land Trust Coalition, accessed November 10, 2011.
http://www.massland.org/files/MAState_Income_tax_credit_land_conservation.pdf
[156] "Tax Incentives for Conservation Easements," Massachusetts Land Trust Alliance, accessed December 1, 2011.
http://www.landtrustalliance.org/policy/tax-matters/rules/conservation-donation-rules#Using%20the%20Enhanced%20Easement%20Incentive%20(Not%20Yet%20Renewed%20for%202010)
[157] "ARP Improvement Program (AIP)," Massachusetts Department of Agricultural Resources, accessed November 22, 2011.
http://www.mass.gov/agr/programs/aip/
[158] "Middlesex County Profile," USDA NASS Census of Agriculture, 2007
[159] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[160] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[161] MDAR. "2011 Annual Report." Massachusetts Division of Agricultural Development. 2010 (46)
[162] "Fact Sheet: Installment Purchase Agreements," American Farmland Trust, accessed December 11, 2011.
http://www.farmlandinfo.org/documents/27752/IPA_07-20081.pdf
[163] Petersen, Nancy. 2000. Plan gives new tool for saving farmland farmers would earn interest and delay tax until they get a lump-sum payment from a county for development rights. Philadelphia Inquirer, Sep 08, 2000.

http://ezproxy.library.tufts.edu/login?url=http://search.proquest.com/docview/287073081?accountid=1 4434 (accessed December 10, 2011).
[164] Petersen, Nancy. 2001. New option may save more farmland by selling the development rights under an installment plan, farmers can benefit on taxes and the county can buy more acres. Philadelphia Inquirer, Feb 01, 2001. http://ezproxy.library.tufts.edu/login?url=http://search.proquest.com/docview/287112827?accountid=1 4434 (accessed December 10, 2011).
[165] Fact Sheet: Installment Purchase Agreements," American Farmland Trust
[166] Petersen, Nancy. 2001.
[167] Chris Chisholm *(APR Regional Planner - MDAR)* interview with the author, November 22, 2011
[168] "Fact Sheet: Installment Purchase Agreements," American Farmland Trust
[169] "Fact Sheet: Installment Purchase Agreements," American Farmland Trust
[170] "Burlington County Comprehensive Farmland Preservation Plan," Burlington County Agriculture Development Board, accessed November 2, 2011. http://www.co.burlington.nj.us/upload/Resource_Conservation/Images/BCCFPP_EntireDoc.pdf
[171] Daniels and Lapping, 2005. 325
[172] Pfeffer, Max J., Mark, Lapping. "Farmland Preservation, Development Rights and the Theory of the Growth Machine: the Views of Planners." Journal of Rural Studies, (10): 245
[173] Nelson, 1990. 133
[174] George Russell, *(Senior Planner - NMCOG)* interview with the author, November 22, 2011
[175] AFT, 2006. 46
[176] AFT, 2006. 46
[177] "The Comprehensive Land Use Reform and Partnership Act (CLURPA)," The American Planning Association, accessed December 4, 2011. http://www.massmunilaw.org/wp-content/uploads/2011/06/CLURPAsum.pdf
[178] "The Comprehensive Land Use Reform and Partnership Act (CLURPA)," The American Planning Association, accessed December 4, 2011. http://www.massmunilaw.org/wp-content/uploads/2011/06/CLURPAsum.pdf
[179] "Fact Sheet: Land Use Partnership Act Lead Sponsors: Senator Harriette Chandler and Representative Kevin Honan" Citizens Housing and Planning Association, accessed Dec 13, 2011. http://www.chapa.org/pdf/FactSheetLUPA020909.pdf
[180] AFT. 2008, 10
[181] Pace, 1997. 632
[182] "Smart Growth / Smart Energy Toolkit - Model Transfer of Development Bylaws." Mass.Gov. N.p., n.d. Web. 2 Dec. 2010.
[183] "Smart Growth / Smart Energy Toolkit - Model Transfer of Development Bylaws." Mass.Gov. N.p., n.d. Web. 2 Dec. 2010.
[184] "Transfer of Development Rights: Model Bylaws and Regulations for Towns in Barnstable County, MA." *Cape Cod Commission*. accessed Web. 2 Dec. 2010. http://www.capecodcommission.org/bylaws/tdr.html.

[185] "Transfer of Development Rights: Model Bylaws and Regulations for Towns in Barnstable County, MA." *Cape Cod Commission*. http://www.capecodcommission.org/bylaws/tdr.html.
[186] Yaro, Robert D., Robert N. Lane, Robert Pirani, and James Nicholas. "Transfer of Development Rights for Balanced Development." *Regional Pan Association* 1 (1998): 2
[187] Yaro, Robert et al, 1998. 14
[188] Yaro, Robert et al, 1998. 23
[189] Yaro, Robert et al, 1998. 23
[190] Yaro, Robert et al, 1998. 25
[191] Kopits, Elizabeth, Virginia McConnell, Margaret Walls. 2005. " Discussion Paper: Making Markets for Development Rights Work. What Determines Demand?" *Resources For The Future* 5. (11)
[192] Hanly-Forde et al. 6
[193] Kopits, Elizabeth et al., 2005. 11
[194] Yaro, Robert et al, 1998. 43
[195] Brabec and Smith, 2002. 262
[196] Brabec and Smith, 2002. 263
[197] Brabec and Smith, 2002. 264
[198] Brabec and Smith, 2002. 265
[199] Taintor, Rick. 2001. "Transfer of Development Rights Report." *South County Watersheds Technical Planning Assistance Project*. Rhode Island Dept of Environmental Management. (11)
[200] Taintor, 2001. 8
[201] Mark Racicot, *(Land Use Division Manager - MAPC)* interview with the author November 14, 2011
[202] Floor area ratio = (Total covered area on all floors of all buildings on a certain plot)/(Area of the plot)
[203] Mark Racicot, *(Land Use Division Manager - MAPC)* interview with the author November 14, 2011
[204] SSRPEDD - Southeastern Regional Planning and Economic Development District, "Draft TDR Market Feasibility Study," November 28, 2011, 4
[205] "Metro Future," Metropolitan Area Planning Commission, accessed November 3, 2011, http://www.mapc.org/metrofuture
[206] Mark Racicot, *(Land Use Division Manager - MAPC)* interview with the author November 14, 2011
[207] "Strategic Plan" 495 Metro-West Partnership, accessed December 14, 2011, http://www.495partnership.org/assets/documents/495%20Partnership%20Strategic%20Plan.pdf
[208] George Russell (*Senior Planner – NMCOG*) interview with the author, December 12, 2011.
[209] "Regional Strategic Framework Plan," Merrimack Valley Planning Commission, accessed December 12, 2011. http://mvpc.org/wpcontent/uploads/FrameworkPlanFinalReport_051711.pdf